NATIONAL ACTION PLAN TO REDUCE THE USE OF PLANT PROTECTION PRODUCTS

1. Introduction

1.1 Background and legal framework

This National Action Plan (NAP) to reduce the use of plant protection products stems from Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides, which was transposed into national law by the Law of 19 December 2014 on plant protection products.

The Directive provides for Luxembourg, like all the other European Union Member States, to adopt a National Plan to set up quantitative objectives, targets, measures and timetables to reduce the use of pesticides and their risks and impacts on human health and the environment. The Plan is also intended to encourage the development and introduction of the integrated management of harmful organisms (*Schaderreger*) and of alternative approaches or techniques in order to reduce the use of pesticides.

1.2 Definitions and scope

'Pesticides' means plant protection products and biocidal products. Plant protection products such as herbicides, fungicides and insecticides serve to protect plants, while biocidal products are used as disinfectants, wood treatment products, insecticides for household use and for other purposes.

Directive 2009/128/EC applies only to plant protection products. Although its scope may be modified in future to extend it to biocidal products, the NAP applies only to plant protection products.

For the purposes of this Plan, the following definitions apply:

- AEV: *Administration de l'environnement* (Environmental Administration);
- AGE: *Administration de la gestion de l'eau* (Water Management Administration);
- ANF: *Administration de la nature et des forêts* (Nature and Forestry Administration);
- ASTA: *Administration des services techniques de l'agriculture* (Agricultural Technical Services Administration);
- biological control: the targeted use of secondary organisms which are inimical to harmful organisms so as to limit the damage that the latter cause; this includes the use of pathogens affecting them;
- biotechnical control: control measures causing a change in the behaviour of harmful organisms;
- DIRSAN: *Direction de la santé* (Health Directorate);
- ITM: *Inspection du Travail et des Mines* (Labour and Mines Inspectorate);
- MAVPC: *Ministère de l'Agriculture, de la Viticulture et de la Protection des consommateurs* (Ministry of Agriculture, Viticulture and Consumer Protection);

- MDDI: *Ministère du Développement durable et des Infrastructures* (Ministry of Sustainable Development and Infrastructure);
- plant protection products of concern: plant protection products which exhibit high toxicity or which are less toxic but frequently detected in the different parts of the environment;
- SDK (*SuperDrecksKëscht*): a State-run initiative covering in particular the management of problematic household waste, assistance and advice for businesses and public- and private-sector entities, and the organisation of the collection of small amounts of waste from businesses and public- and private-sector entities; the framework for the initiative is provided by the Law of 25 March 2005 on the operation and financing of the *SuperDrecksKëscht*;
- SER: *Service d'Economie Rurale* (Rural Economy Department);
- substitution: the replacement of one plant protection product by another plant protection product of less concern or by a non-chemical method of control.

1.3 General objectives and structure of the National Action Plan

The Luxembourg NAP pursues the following objectives:

- spreading the use of agricultural systems and known means which make it possible to reduce the use of plant protection products;
- reducing the risks to human and animal health and to the environment brought about by the use of plant protection products;
- reducing unintentional effects on the environment of the use of plant protection products;
- establishing indicators to monitor the amounts of plant protection products placed on the market and used both professionally and non-professionally;
- securing the substitution of plant protection products of concern by substances of less concern or by alternative techniques;
- on the basis of indicators, envisaging a 30 % reduction in 'big movers' by 2025;
- developing and implementing strategies to phase out certain active substances (e.g. glyphosate) so as to steer the sectors concerned along this path;
- banning plant protection products of concern for non-professional use;
- in drinking water protection areas defined by a Grand-Ducal regulation, increasing the number of agricultural areas farmed under contracts for relevant agri-environmental measures or programmes of measures designed to protect drinking water;
- improving the protection of pollinators and maintaining a position opposing active neonicotinoids which pose an unacceptable risk to pollinators;
- reducing the use of plant protection products by 50 % (reduction in tonnes applied) by 2030.

The NAP is divided into two parts. Part 1 sets out a list detailing the NAP's main objectives, indicating for each one the measures and success indicators to be set up so as to attain the objective in question. The list indicates the main entities responsible for implementing the various measures, together with an indicative timetable (short term: by the end of 2018; medium term: 2019-2020; long term: after 2020). The objectives and measures are classified by domain affected by the use of plant protection products (PPPs). Each domain affected is described briefly. The domains in which action needs to be taken independently of the impact of PPPs are at the end of the list.

Part 2 includes more general information about the plant protection products and objectives targeted by the NAP. It provides an introduction to the subject and describes the current situation in Luxembourg. Where applicable, references in the list in Part 1 to the sections in Part 2 make it possible to find more information about the various issues and about the measures already taken with a view to avoiding or reducing the impact of PPPs.

Part 1

2. List of objectives, including the measures and indicators associated with their achievement

1. Effect: Water quality

When PPPs are handled before and after their application, or during application itself, a certain quantity may contaminate surface water and ground water through drift, run-off or seepage. Chemical and biological water quality may thus be affected. See point 4.1 in Part 2 for more details.

Measure 1-1	**Objective**: reduce contamination of surface water by spray drift **Measure**: establishment of a non-treated general buffer zone for surface water **Success indicator**: adoption of the legal provisions laid down in Article 10 of the Law of 19 December 2014 on plant protection products **Responsible**: MAVPC and MDDI **Timetable**: short term
Measure 1-2	**Objective**: improve detection of PPP contamination of ground water and surface water **Measure**: as part of cooperation in water protection areas, measures to improve the organisation of testing for substances of concern in water; updating of the database of targeted metabolites and PPPs **Success indicator**: assessment of changes in the actual level of water contamination towards the target level; reduction in pollutants in ground water **Responsible**: AGE and ASTA **Timetable**: medium/long term
Measure 1-3	**Objective**: identify 'plant protection product X/agricultural parcel X' pairs likely to pollute surface water and ground water **Measure**: identification of pairs by the PESTEAUX computerised decision support tool **Success indicator**: introduction of the PESTEAUX tool accessible to farmers and agricultural advisors **Responsible**: MAVPC **Timetable**: medium term

Measure 1-4	**Objective**: analyse and reduce contamination of surface water and ground water in water protection areas **Measure**: identification, management and prohibition of PPPs likely to pollute ground water in areas at risk; introduction of a map identifying areas at risk; implementation of a module providing advice on organic farming methods; implementation of a module providing advice on water protection **Success indicator**: adoption and adaptation of the regulatory framework; number of agricultural advisors **Responsible**: MAVPC and MDDI **Timetable**: medium term
Measure 1-5	**Objective**: protect ground water and systematically reduce its contamination by PPPs; the provisions of the Grand-Ducal Regulation of 12 December 2016 on the protection of ground water against pollution and deterioration state that measures must be drawn up if the starting-point for implementing measures designed to reverse significant and lasting upward trends in the parameters targeted by the Regulation is reached **Measure**: consideration of significant upward trends in order to ban or restrict the use of certain plant protection products **Success indicator**: adoption and adaptation of the regulatory framework in the event of deterioration **Responsible**: MDDI **Timetable**: medium term
Measure 1-6	**Objective**: 70 % of agricultural land in drinking water protection areas farmed under contracts for relevant agri-environmental measures or programmes of measures designed to protect drinking water **Measure**: increase in the proportion of agricultural land farmed under contracts for relevant agri-environmental measures or programmes of measures designed to protect drinking water; raising the awareness of farmers **Success indicator**: number of hectares of agricultural land farmed under contracts or programmes **Responsible**: MAVPC and MDDI **Timetable**: medium term

2. Effect: Biodiversity

PPPs have the potential to harm non-targeted organisms and may thus have undesirable effects on biodiversity. See point 4.2 in Part 2 for more details.

Measure 2-1	**Objective**: protect biodiversity, and in particular species likely to be adversely affected by the use of PPPs **Measure**: promotion of biodiversity contracts, especially on land of high ecological value **Success indicator**: agricultural land managed under biodiversity contracts **Responsible**: MAVPC, ANF and MDDI **Timetable**: short term
Measure 2-2	**Objective**: protect pollinating insects **Measure**: continuation of BeeFirst research project; raising the awareness of PPP users; continuation of biotechnical control of grape berry moths throughout the area under vines by means of confusion; promotion of relevant agri-environmental measures and biodiversity contracts; maintenance at national and EU level of a position in favour of protecting pollinating insects and restricting the use of active neonicotinoids **Success indicator**: research project report; PPP residues in pollen and honey; number of awareness-raising sessions; land managed under biodiversity contracts and relevant agri-environmental measures **Responsible**: MAVPC, MDDI and ANF **Timetable**: short/medium term

3. Effect: Soil condition

Depending on their physical/chemical and biological characteristics, soils may act as a filter for PPPs with varying degrees of effectiveness. Nevertheless, soils are themselves ecosystems, the functioning of which may be inhibited by the application of PPPs. See point 4.3 in Part 2 for more details.

Measure 3-1	**Objective**: identify the functions of soils which are vulnerable to the negative effects of plant protection products **Measure**: organise and support soil monitoring programmes intended to collect information on the current condition of Luxembourg soils and their vulnerability; in the long term, improvement in knowledge about the influence of PPPs on soil **Success indicator**: publications relating to the subject (e.g. maps, reports) **Responsible**: ASTA and AEV **Timetable**: long term

4. Effect: PPP waste

Remnants of PPPs and their packaging must be regarded as hazardous waste. Appropriate waste management is needed so as to avoid any environmental risk. See point 4.4 in Part 2 for more details.

Measure 4-1	**Objective**: improve collection and disposal of waste from PPPs for professional non-professional use **Measure**: compulsory participation in a waste collection programme for beneficiaries of financial aid granted under agri-environmental/climate programmes; awareness-raising campaigns **Success indicator**: statistics and documentation on waste; adaptation of agri-environmental/climate programmes; number of awareness-raising campaigns **Responsible**: ASTA, AEV and *SuperDrecksKëscht* **Timetable**: short term
Measure 4-2	**Objective**: proper management by farms of PPP waste **Measure**: promotion of the *SuperDrecksKëscht fir Betriber* (SDK for firms) label and participation in the *AgriRecover* collection programme **Success indicator**: number of farmers holding the *SuperDrecksKëscht fir Betriber* label under ISO 14024; number of participants in *AgriRecover* **Responsible**: ASTA, AEV and *SuperDrecksKëscht* **Timetable**: short term

5. Effect: Exposure and protection of inhabitants and third persons

Apart from food exposure there is currently virtually no information about the exposure of inhabitants and third persons to PPPs. The collection of additional data on exposure is needed to make it possible to obtain a better understanding of the risks and, if appropriate, adjust the management of PPPs. Particular attention should be paid to the protection of vulnerable groups such as children, the elderly or sick and pregnant women.

Measure 5-1	**Objective**: improve knowledge of the actual exposure of inhabitants and third persons **Measure**: analysis of the concentration of PPPs in the air and of the exposure of the population at risk, e.g. through hair analysis **Success indicator**: test results **Responsible**: MAVPC, DIRSAN and AEV **Timetable**: medium/long term

Measure 5-2	**Objective**: protect inhabitants and third persons against exposure to PPPs **Measure**: identification, management and prohibition of PPPs likely to pose a toxicological risk and establishment, by regulatory means, of protection areas and areas in which the use of PPPs is restricted or banned **Success indicator**: adoption of a Grand-Ducal regulation; adaptation of the regulatory framework **Responsible**: MAVPC and DIRSAN **Timetable**: medium term

6. General objective: Statistics on plant protection products and digitisation

It is important to take stock of the situation regarding the placing on the market and use of plant protection products so that the effectiveness of the NAP can be assessed and future measures chosen. With a view to increasing digitisation among farmers and simplifying their administrative tasks IT tools tailored to their needs are to be introduced. See points 6.1 to 6.3 in Part 2 for more details concerning the statistics on plant protection products and digitisation of the agricultural sector.

Measure 6-1	**Objective**: improve knowledge of the amounts of plant protection products placed on the market **Measure**: collection of information about the placing of plant protection products on the market with local distributors **Success indicator**: statistics about the placing of plant protection products on the market; adoption of legislation **Responsible**: ASTA and SER **Timetable**: short/medium term
Measure 6-2	**Objective**: improve knowledge of the amounts of plant protection products used in agriculture **Measure**: collection of detailed information about the use of plant protection products and treated seeds in agriculture **Success indicator**: establishment of an indicator to assess treatment frequency **Responsible**: ASTA and SER **Timetable**: short/medium term

Measure 6-3	**Objective**: simplification and standardisation of registers of PPP use; monitoring of the use of specific plant protection products, especially active neonicotinoids **Measure**: development of an IT tool **Success indicator**: establishment of an IT tool; level of use of the tool **Responsible**: MAVPC and MDDI **Timetable**: medium/long term
Measure 6-4	**Objective**: creation of a system for compiling, interpreting and assessing data associated with the use, placing on the market and presence of PPPs; analysis of PPP effects on the different parts of the environment identified in the NAP; monitoring of implementation of the NAP **Measure**: establishment of a working party to determine and implement the objectives and the needs associated with them **Responsible**: MAVPC, MDDI and DIRSAN **Timetable**: short term
Measure 6-5	**Objective**: definition and identification of 'big movers' **Measure**: publication of a list of 'big movers' **Responsible**: working party referred to in Measure 6-4 **Timetable**: short term

7. General objective: Training of plant protection product distributors, users and advisors and raising awareness among them

The use of PPPs may entail risks to the health and safety of employees and to public safety. Such risks arise primarily from handling, i.e. the transfer between containers, use or application and storage of these products. Appropriate training for employees and plant protection product distributors, users and advisors promotes good health and safety practice at work and passes on to them the requisite precautionary principles for avoiding any accidents which might arise from handling PPPs. See points 5.2 and 5.3 in Part 2 for more details about training requirements and awareness-raising measures.

Measure 7-1	**Objective**: reduce the risks arising from the use of plant protection products **Measure**: introduction of training **Success indicator**: adoption of legislation; number of those trained; recording of accidents relating to the handling of PPPs **Responsible**: MAVPC and ITM **Timetable**: short/medium term

Measure 7-2	**Objective**: increase the awareness of non-professional users about plant protection products **Measure**: ban on self-service availability of plant protection products **Success indicator**: adoption of legislation **Responsible**: MAVPC **Timetable**: short/medium term

8. General objective: Reduction in PPP use and PPP substitution

The promotion of integrated management is a legal obligation and makes it possible to reduce the use of PPPs. Certain PPPs, although authorised, have characteristics which cause concern, and hence they need to be replaced as far as possible. See point 5.6 in Part 2 for more details.

Measure 8-1	**Objective**: restrict and prohibit the use of PPPs by non-professional users **Measure**: identification of PPPs of concern and ban on the distribution of such PPPs to non-professional users **Success indicator**: adoption of legislation **Responsible**: MAVPC, DIRSAN and MDDI **Timetable**: medium term
Measure 8-2	**Objective**: promote integrated management in the agricultural sector and knowledge transfer **Measure**: priority selection of research projects relating to integrated management; establishment of a network of pilot farms to spread integrated management methods; introduction of a module providing advice on integrated management **Success indicator**: number of research projects completed; number of agricultural advisors **Responsible**: MAVPC **Timetable**: short/medium term
Measure 8-3	**Objective**: reduce and replace PPPs of concern **Measure**: identification of PPPs of concern; in agriculture, encouragement of reduction in the use of PPPs of concern by means of State aid **Success indicator**: adjustment of State aid programmes; number of farmers participating in new State aid programmes; amount of PPPs of concern applied **Responsible**: MAVPC and MDDI **Timetable**: medium term

Measure 8-4	**Objective**: increase in agricultural land farmed organically **Measure**: promotion of organic agriculture and partial conversion; creation of a module providing advice on conversion to organic agriculture **Success indicator**: agricultural land farmed organically; number of farmers advised **Responsible**: MAVPC **Timetable**: short term
Measure 8-5	**Objective**: develop and implement strategies to phase out certain active substances so as to steer the sectors concerned along this path **Measure**: on the basis of discussions at EU level concerning renewed authorisation of the active substance glyphosate, it has been decided to develop a strategy to phase it out; this measure should help to identify alternatives and steer the sectors concerned along this path **Success indicator**: development and implementation of the phasing-out strategy **Responsible**: MAVPC **Timetable**: medium/long term

Part 2

3. General information on plant protection products and their management in Luxembourg

3.1 Legal and regulatory framework (list is not exhaustive):

- Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste;
- Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC;
- Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides;
- Law of 10 June 1999 on classified establishments, as amended, and its implementing regulations;
- Law of 8 January 2003 approving the Stockholm Convention on Persistent Organic Pollutants, done at Stockholm on 22 May 2001, as amended;
- Law of 19 January 2004 on the protection of nature and natural resources and its implementing regulations;
- Law of 19 December 2008 on water, as amended, and its implementing regulations;
- Law of 16 December 2011 on the registration, evaluation and authorisation of chemical substances and on the classification, labelling and packaging of chemical substances and mixtures and its implementing regulations;
- Law of 21 March 2012 on waste, as amended, and its implementing regulations;
- Law of 9 May 2014 on industrial emissions and its implementing regulations;
- Law of 19 December 2014 on plant protection products and its implementing regulations;
- 2014-2020 Rural Development Plan, as approved by the European Commission.

3.2 Review of the amounts of plant protection products placed on the market and used in agriculture

Regulation (EC) No 1185/2009 of the European Parliament and of the Council concerning statistics on pesticides lays down an EU framework for the production of statistics on the placing on the market of plant protection products and on their use in agriculture.

The statistics on the placing on the market of plant protection products relate to the amounts of active substances placed on the market in Luxembourg. All uses of plant protection products, whether agricultural or non-agricultural, are covered. Since 2011 an annual survey of vendors of plant protection products has been carried out in Luxembourg by STATEC. The statistics are forwarded to EUROSTAT. Given the limited number of vendors of plant protection products in Luxembourg, the figures relating to a certain number of active substances come under the rules on confidentiality and are not disclosed. The survey results are published for the whole of the European Union by EUROSTAT.

A Grand-Ducal regulation to implement the Law of 19 December 2014 on plant protection products, which is currently being drafted, lays down an obligation for distributors to keep

registers with figures on the amounts of plant protection products placed on the market. These registers will be made available to the competent authority and it will be possible to use them for statistical purposes. In the longer term the intention is to use the figures provided by these registers, instead of the vendor survey, to draw up the statistics on the placing of plant protection products on the market.

The statistics on the use of plant protection products in agriculture relate, for a given crop year, to the amounts of active substances used and the area treated per crop (major crops and wine-growing).

The figures for an individual crop year have to be forwarded to EUROSTAT per five-year period. The first five-year period covered 2010-2014.

The Agricultural Accounts Division of the SER uses the figures provided by agricultural holdings as part of their agricultural accounts to draw up a database on the amounts of plant protection products used in agriculture.

The figures relating to crop years 2011/2012 to 2013/2014 have been published jointly, together with an explanatory note, on the Ministry of Agriculture's website at: http://www.ma.public.lu/actualites/avis/20161117/index.html.

It should be noted that the database does not include products used to treat seeds; products with a biological active principle (such as pheromones, bacteria or viruses) are recorded but, in the absence of a measurement unit, amounts which can be compared with traditional products do not appear on the lists.

The survey is carried out at farm and wine-growing holdings with agricultural accounts at the SER. The individual figures per holding are combined by means of the *Réseau d'information comptable agricole* (RICA – Agricultural Accounting Information Network) and are representative in terms of the population of professional holdings (those with a standard output of more than €25 000). Since there are no professional holdings specialising in horticulture or tree crops in the RICA sample, such holdings are not represented here.

The area treated has not so far been recorded as part of the agricultural accounts: only the figures for area under cultivation are available. It is planned to extend the database and also record the area treated with effect from the 2016/2017 crop year. The figures per active substance and per crop (for crops which are significant in terms of plant protection treatment) are forwarded to EUROSTAT.

The indicators to be developed for monitoring the amounts of plant protection products placed on the market and used in agriculture are described in more detail in Section 6.

4. Effects

Plant protection products may have negative effects on the different parts of the environment (e.g. water, air, soil or living organisms). In order to identify negative effects appropriate benchmarks are needed to measure them. The mere presence of plant protection products in a part of the environment cannot necessarily be regarded as an effect to be classified as negative.

For some parts of the environment the levels of plant protection products above which their presence must be regarded as having a negative effect are laid down by law or regulation. With regard to water, for instance, the environmental quality standards laid down by the amended Law of 19 December 2008 on water, and spelled out in more detail for surface water by the Grand-Ducal Regulation of 15 January 2016 on the evaluation of surface water bodies, help to signpost the concept of effect. However, for some domains this concept of a negative effect is not clearly defined by a legal text. This is the case, for example, with aspects associated with biodiversity.

The concept of risk comes into play in cases where it is not possible to measure whether there is a negative effect or not. It is defined as being the probability of a negative effect occurring and of its seriousness. Risk is determined on the basis of the properties of the components of plant protection products, the potential transfer pathways and the potential negative effects on the targets.

One of the NAP's objectives is therefore to identify proven negative effects related to the use of plant protection products and to assess the risks of negative effects where those effects cannot be measured directly. Once those effects and risks have been identified preventive and management measures must be defined so as to make good the negative effects identified and minimise the risks identified.

4.1 Water: water quality (excluding dependent ecosystems)

Surface water

The current state of knowledge indicates that all surface water bodies are exposed to pressure from plant protection products. The substances which have been detected most frequently in surface water in recent years are, in particular, the active substances glyphosate, bentazone, diflufenican, flufenacet, 2,4-D, MCPA, MCPP, tebuconazole, terbuthylazine, atrazine, epoxiconazole and isoproturon, together with certain metabolites of these active substances, the metabolite of dichlobenil and 2,6-dichlorobenzamide, together with certain metabolites of the active substances metazachlor and s-metolachlor.

Following regular breaches of the environmental quality standard (EQS) for the active substance isoproturon, which was declared a priority substance under Directive 2013/39/EU, and after consultation with our neighbour, France, in 2015 it was decided to classify all the water bodies in the Moselle and Alzette river basins as 'not good' with regard to their chemical condition. Following checks in 2016 this decision has proved to be correct. Given the non-renewal of approval of isoproturon at EU level, its use has been prohibited in Luxembourg since 1 October 2017. There will therefore probably be an improvement in the situation with effect from this autumn.

Furthermore, in response to the extent of the pressure on Luxembourg waters identified in particular from the metabolites metolachlor ESA and metazachlor ESA, in February 2015 the Luxembourg Government decided to ban the use of the active substance s-metolachlor throughout the country. The use of the active substance metazachlor was also banned in protection areas determined by Grand-Ducal regulation, in provisional protection areas and in the Luxembourg portion of the Upper Sûre Lake basin. The use of metazachlor has been limited to 0.75 kg/ha/4 years in the rest of the country. In addition, the list of specific organic pollutants needed to assess the ecological condition of the surface water bodies of the Rhine

and Meuse hydrographic basins has been modified. Most of the substances referred to above have been included in the list and EQSs have been set. These substances will therefore be monitored closely from now on.

The reduction in concentrations of certain active substances and/or of their metabolites (e.g. atrazine, deethylatrazine and dichlorobenzamide) observed in ground-water samples, which is attributable to the positive effects of the withdrawal of authorisation for those active substances, can also be observed in surface water.

However, it also has to be acknowledged that active substances which have no longer been authorised as plant protection products in Luxembourg for many years, notably chlortoluron, are intermittently detected in surface water samples.

Ground water

Sampling carried out in 2011 revealed traces of PPPs at more than 70 % of the ground-water monitoring points throughout Luxembourg. The substances most frequently detected, in descending order of importance, were deethylatrazine (± 55 %), atrazine (40 %), dichlorobenzamide (35 %), metolachlor ESA (30 %) and bentazone (15 %).

Recent tests have revealed that concentrations of metolachlor ESA, a metabolite of s-metolachlor, have increased since 2008. The use of products based on s-metolachlor, a substance used to replace atrazine in maize-growing, has been increasing since 2005. The concentrations now measured partly exceed the limit value of 0.1 µg/l applicable to drinking water and it should be noted that the concentrations of metolachlor ESA are showing an upward trend in many locations, unlike those of atrazine and deethylatrazine, which are declining. Testing carried out in October 2014 in the Upper Sûre basin and in reserves of ground water intended for the production of drinking water showed that the water was substantially contaminated with metazachlor ESA, a metabolite of metazachlor: concentrations were as high as 3 µg/l.

Table 1
Monitoring stations where the environmental quality standard for ground water is exceeded, on average, for the 'individual pesticide substance' parameter

		Ground-water body (GWB)					
Individual pesticide substances (µ/l)		Devonian GWB 1	Trias North GWB 6	Trias East GWB 7	Lower Lias GWB 3	Middle Lias GWB 4	Upper Lias/Dogger GWB 5
GWB monitoring stations where the average value exceeded the EQS for ground water (0.1 µg/l)	Absolute number	1*	1**	1***	3****	0	0
	in %	50 %	14 %	25 %	23 %	0 %	0 %

** Metolachlor ESA exceeded (arithmetical average: 0.107 µg/l) at the Troine monitoring station (SCC-601-01);*

*** Metolachlor ESA and deethylatrazine exceeded (arithmetical averages: 0.169 µg/l and 0.124 µg/l, respectively) at the Puits Oratoire monitoring station (PCC-803-01);*
**** N,N-dimethylsulphamide exceeded (arithmetical average: 0.245 µg/l) at the Walebour monitoring station (SCC-129-08);*
***** Metolachlor ESA exceeded at the Feyder 2 (SCS-210-52), Hanseschlaff (SCC-712-01) and Schiessentümpel (COC-118-11) monitoring stations (arithmetical averages: 0.171 µg/l, 0.301 µg/l and 0.141 µg/l, respectively).*

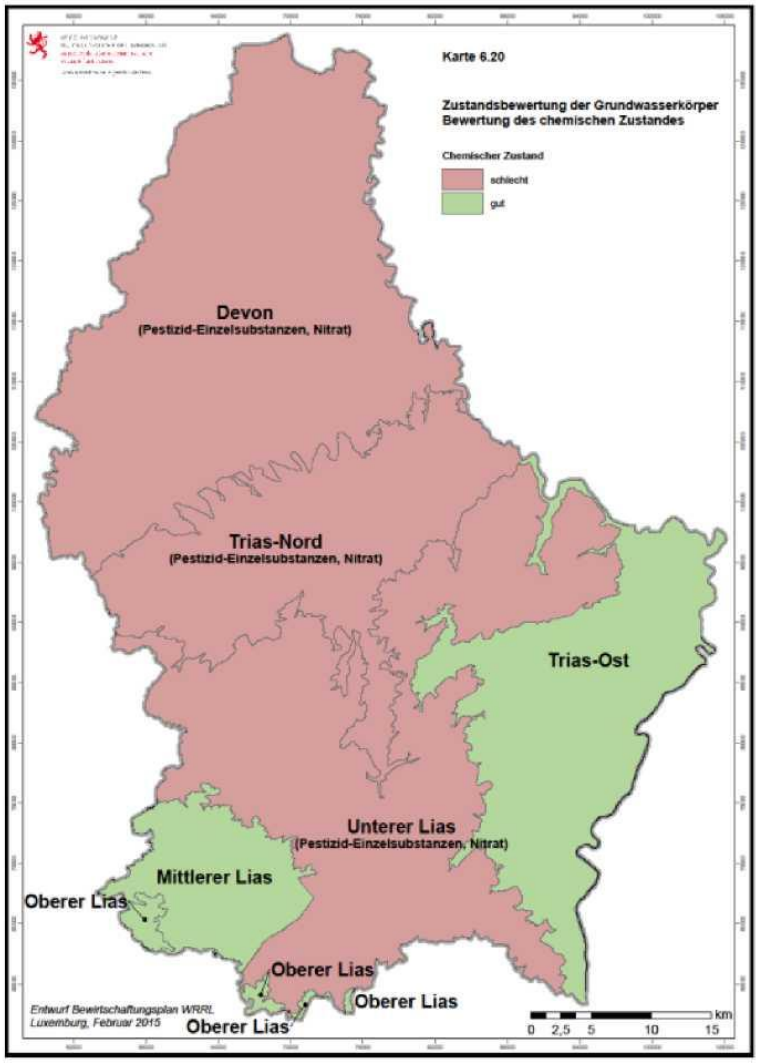
The test results are shown in the following table. The assessment of chemical condition is based on the results of the five tests. The assessment is deemed 'poor' when at least one of the results is poor.

Table 2
Results of tests on the chemical condition of ground-water bodies

	Ground-water body (GWB)					
Chemical condition test	Devonian GWB 1	Trias North GWB 6	Trias East GWB 7	Lower Lias GWB 3	Middle Lias GWB 4	Upper Lias/Dogger GWB 5
General assessment of chemical condition	Poor	Good	Good	Poor	No risk	No risk
Saline or other intrusions	No risk	Good	-	No risk	No risk	No risk
Deterioration in chemical and/or ecological condition of surface water caused by transfer of pollutant from GWB	Good	Good	Good	Expert's estimate: poor*	No risk	No risk
Deterioration in terrestrial ecosystems caused by transfer of pollutant from GWB	-	-	-	-	No risk	No risk
Drinking water protection areas	Poor	Poor	Good	Poor	No risk	No risk
Assessment of chemical condition	Poor	Poor	Good	Poor	Good	Good

*-: not feasible; * not taken into account for assessing chemical state.*

The following map shows the assessment of the chemical condition of ground-water bodies.



Key

Karte 6.20	Map 6.20
Zustandsbewertung der Grundwasserkörper	Assessment of condition of ground-water bodies
Bewertung des chemischen Zustandes	Assessment of chemical condition
Chemischer Zustand	Chemical condition
Schlecht	Poor
Gut	Good
Devon	Devonian
(Pestizid-Einzelsubstanzen, Nitrat)	(Individual pesticide substances, nitrate)
Trias-Nord	Trias North
Trias-Ost	Trias East
Unterer Lias	Lower Lias
Mittlerer Lias	Middle Lias
Oberer Lias	Upper Lias

The assessment of the chemical condition of the Devonian, Trias North and Lower Lias ground-water bodies as 'poor' can be attributed to the deterioration in the quality of water intended for human consumption. Several sources of drinking water have been closed since 2008 and raw water treatment stations (active carbon filters) have been built following the deterioration in water quality which is attributable, in particular, to the presence of the metabolites metolachlor ESA and metazachlor ESA. This deterioration can be explained by an improved analytical method which has only recently made it possible to measure the

metabolites referred to above (metolachlor ESA since 2008 and metazachlor ESA since 2014). Like some neighbouring countries, no distinction is drawn in Luxembourg between relevant and non-relevant metabolites. The limit value for both metazachlor ESA and metolachlor ESA in drinking water is therefore 0.1 µg/l.

Table 3
Deterioration in drinking water quality since 2008

	Ground-water body (GWB)					
Deterioration in drinking water quality since 2008	Devonian GWB 1	Trias North GWB 6	Trias East GWB 7	Lower Lias GWB 3	Middle Lias GWB 4	Upper Lias/Dogger GWB 5
Sources of drinking water closed	1	3	0	3	0	0
Construction of raw water treatment stations	1	0	0	2		
Derogations under Article 11 of the Drinking Water Regulation	0	1	0	10	0	0

With regard to the 'nitrates and individual pesticide substance' and 'individual pesticide substance' parameters, respectively, the water quality of the Lower Lias and Devonian ground-water bodies poses a major environmental risk and significantly compromises drinkability (poor test result: general assessment of chemical condition). The cases found of limit values being exceeded in the Trias East ground-water body should be regarded as local and do not concern the ground-water body overall (good test result: general assessment of chemical condition).

The Trias North and Trias East ground-water bodies tend to show high geogenic concentrations of sulphates and chlorides in places. The test results obtained for 'saline or other intrusions' for the Trias North ground-water body do not show an upward trend, and this water body is in a good chemical condition where this test is concerned. This test was not feasible for the Trias East ground-water body, because no WFD monitoring station showed high concentrations. The second management plan introduces two additional monitoring stations so that this test can be carried out as necessary.

Assessment of surface water bodies

Although the Ernz Noire, Halerbach, Consdreferbach and Lauterburerbach surface water bodies, all of which cross the Lower Lias ground-water body, have been classified as being in average condition owing to high nitrate values, and although a ground-water effect is to be presumed, it is impossible to quantify this pollutant flow. This also applies to the 'individual pesticide substance' parameter: there is presumed to be a significant input of metolachlor ESA into the Ernz Noire (concentrations in both the river and the water table are close to 100 ng/l), but it is impossible to calculate the flow of this pollutant. The same findings apply to the Eisch and Mamer rivers, a substantial part of the courses of which also cross the Lower Lias

water body. It may be concluded that there is an impact, but that this can be estimated only very roughly in terms of water quality and therefore cannot form part of the assessment, all the more so since the figures available for the Lower Lias water body as a whole are currently inadequate. With regard to the other ground-water bodies, it can be assumed that the flow of pollutants in the water table is secondary in relation to the total flow of pollutants. More significant transfers of pollutants from ground water to surface water are possible in the Trias North ground-water body, e.g. in the Attert and Wark valleys.

The findings which are sometimes available on the deterioration in terrestrial ecosystems arising from a transfer of pollutants from ground-water bodies are insufficient to make it possible to carry out a test.

Assessment of ground-water bodies

The condition of ground-water bodies is determined on the basis of the worse of the two results obtained for their quantitative and chemical conditions.

Table 4
Assessment of the condition of ground-water bodies

	Ground-water body (GWB)					
Assessment of condition of ground-water bodies	Devonian GWB 1	Trias North GWB 6	Trias East GWB 7	Lower Lias GWB 3	Middle Lias GWB 4	Upper Lias/Dogger GWB 5
Assessment of quantitative condition	Good	Good	Good	Good	Good	Good
Assessment of chemical condition	Poor	Poor	Good	Poor	Good	Good
Overall assessment	Poor	Poor	Good	Poor	Good	Good

The map showing the assessment of the overall condition of ground-water bodies corresponds to the map of their chemical condition set out above.

To sum up, it can be considered that the poor chemical condition of the ground-water bodies arises primarily from the negative effect of ground-water quality on supplies of drinking water. The 'individual pesticide substance' parameter is decisive for the classification of all three ground-water bodies which are deemed 'poor'. The root cause is essentially the metabolites metolachor ESA and metazachlor ESA. In addition, the widespread poor quality of ground water in the Devonian (individual pesticide substance) and Lower Lias (individual pesticide substance and nitrates) ground-water bodies contributes to their poor rating. It should be noted that the application of s-metolachlor (throughout Luxembourg) and metazachlor (within drinking water protection areas) has been banned since 12 April 2015 (Grand-Ducal Regulation of 12 April 2015 (a) prohibiting the use of the active substance s-metolachlor and (b) prohibiting or restricting the use of the active substance metazachlor). In addition, the application of metazachlor outside drinking water protection areas is limited to 0.75 kg/ha/4 years.

In conclusion, it should be noted that an adequate database will be drawn up during the second management plan to make it possible to carry out satisfactorily the tests for a deterioration in the chemical and/or ecological condition of surface water caused by a transfer of pollutants from ground water, and for a deterioration in terrestrial ecosystems caused by a transfer of pollutants from ground water.

4.2 Biodiversity (including water-dependent ecosystems)

The application of plant protection products in agriculture and other sectors has a major impact on biological diversity. Several factors influence this.

1. It should be noted that, in the case of PPPs applied to agricultural land, a substantial portion of them do not remain in the area targeted by the application, but are spread beyond it by either wind or water.
2. Given that the vast majority of PPPs influence essential metabolic mechanisms, such as photosynthesis in the case of green plants or reproduction or growth, and since such mechanisms are common to many organisms other than the species targeted by the person applying PPPs, many non-targeted species are also affected by their action.
3. The toxic effects of the products, of the active substance or of the latter's decomposition products are very variable and affect a large number of species, depending on the substance.
4. A number of PPPs do not degrade at all, or do so only extremely slowly: they therefore remain present in the environment for a long time and may thus accumulate in organisms – plants, herbivores, carnivores – forming part of the food chain. As a result of such bio-accumulation the species most affected by PPPs are mostly at the top of the food chain (e.g. birds of prey and predatory mammals). Recent studies have nonetheless shown that a large number of insects, including bees in particular, are also very much affected, especially by PPPs of the neonicotinoid group; moreover, these are attractive to bees, which makes them even more harmful.

There are many studies which have shown these harmful effects. There is a fairly detailed analysis in the document 'Pesticides and the loss of biodiversity' by Richard Isenring for the Pesticide Action Network, the conclusions of which are set out below.

General conclusions

- Human survival is inextricably linked to the survival of numerous other species on which intact ecosystems depend.
- Communities of different animal and plant species perform vital functions within ecosystems. In general, communities which have higher diversity tend to be more stable.
- Heavy pesticide input has been a key feature of agricultural intensification. This is closely linked to changes in farming practices and habitat destruction or loss.
- In farmland habitats, population declines have occurred in about half of plants, a third of insects and four-fifths of bird species.
- Pesticides affect wildlife directly and indirectly via food sources and habitats.
- Wildlife poisoning by insecticides, rodenticides, fungicides (on treated seed) and toxic herbicides can cause major population decline.

Animals

- Pesticides accumulating in the food chain, particularly those which cause endocrine disruption, pose a long-term risk to mammals, birds, amphibians, and fish.
- Broad-spectrum insecticides and herbicides reduce food sources for birds and mammals. This can produce a substantial decline in rare species populations.
- By changing vegetation structure, herbicides can render habitats unsuitable for certain species. This threatens insects, farmland birds, and mammals.
- Bird populations are directly affected by poisoning from organophosphate or carbamate insecticides and anticoagulant rodenticides.
- Sublethal poisoning of birds by organophosphates can lead to detrimental changes in behaviour.
- Broad-spectrum herbicides threaten rare and endangered bird species by reducing the abundance of weeds (eaten by birds) and insects hosted by weeds. Insecticides reduce the number of insects which are important food sources for birds.
- Anticoagulant rodenticides often indirectly poison predatory mammals and raptors.
- Herbicides can cause changes in vegetation and habitat which threaten mammals, while insecticides may reduce the availability of important food insects.
- Pesticides which are highly toxic to bees, bumblebees and other beneficial insects: carbamates, organophosphates, pyrethroids, and neonicotinoids.
- Recently, clothianidin used in seed treatments has caused widespread bee poisoning. Imidacloprid residues in plants can negatively alter bee behaviour.
- Insecticides and herbicides in surface waters (from spray-drift or run-off) can alter the species composition of aquatic communities and affect fish and invertebrates.
- Certain insecticides have toxic effects on the nervous systems of amphibians which may alter their behaviour. Certain herbicides can impair the immune system of frog tadpoles, which can make amphibians more susceptible to harmful parasitic nematodes. Indirect effects can be fatal.
- Certain herbicides frequently contaminate surface and ground water. Copper-based fungicides are highly toxic to fish and have a potential to accumulate.

Other organisms

- Many plants which were previously common on farmland are declining owing to the abandonment of mixed farming and increased herbicide use.
- Large-scale use of sulfonylurea herbicides, and presumably also sulfonamides and imidazolinones, poses a risk to non-target plants, algae, and ecosystems.
- Triazine herbicides may present a risk to non-target and aquatic plants.
- Pesticides affect earthworms, symbiotic mycorrhizae, and other organisms in soil.
- The composition and activity of bacterial communities can be changed by pesticides.
- Plant protection products may therefore have a negative effect on soil fertility.

4.3 Soil condition

Soil is one of the recipients of plant protection products and plays a key role in what happens to the substances in the environment and, in particular, with regard to surface water and ground water.

Given the very nature of the substances in plant protection products, they may have a negative impact on the essential metabolic mechanisms of organisms other than the species targeted by their application. Thus, they may also disrupt the biodiversity which is naturally present in soils. As a result, certain soil functions may be negatively influenced by plant protection products, such as the diversity of the gene pool, the processes of mineralisation and humus formation and, in the long term, soil fertility. This is particularly the case if soils are exposed regularly to plant protection products and/or to excessive concentrations of these.

Soil may act as an active and selective filter in respect of active substances and their metabolites. Active substances may be affected in soil by the following processes: adsorption/ desorption, physical/chemical degradation, biodegradation and transfer. All these processes are dynamic and complex. Soil's capacity and operation as a filter depends on multiple parameters, including its texture, pH, temperature, microbiology, water functioning and content, as well as its quality in terms of organic matter. The long-term quality of soils as a filter therefore very much depends not only on the soil type but also on its management.

Thorough knowledge of the current state of soils, of how they change and of possible degradation processes is needed in order to ensure sound management of soils and of their ecosystem contribution in the long term.

4.4 Waste

4.4.1 Household waste

The study of residual portions of different types of waste in household waste showed that the sum of plant protection products and fertilisers was 3 g/inhabitant p.a. The assessment was of equal amounts attributable to fertilisers and to plant protection products, thus giving a figure of 1.5 g/inhabitant p.a. A reduction in the amount was observed by comparison with the same study in 2009: 10 g/inhabitant p.a. in 2009, compared with 3 g/inhabitant p.a. in 2013.

The *SuperDrecksKëscht* figures, on the other hand, show an annual average of 30.5 g/inhabitant p.a. of pesticide residues collected separately for 2009-2013, ranging between 26.86 g and 34.8 g/inhabitant p.a.

To conclude, it can be observed that the portion of residues of plant protection products disposed of in household waste declined during the 2009-2013 observation period, while the portion disposed of via the *SuperDrecksKëscht* was unchanged.

4.4.2 Professional waste

Professional users are now able to dispose of empty plant protection product packaging via a collection scheme run annually by *AgriRecover*. For several years *AgriRecover* has been organising the collection of such packaging through a network of collection points. In addition, every two years professional users can dispose of plant protection products which have become unusable, such as products which are no longer authorised.

Participation in this collection scheme is free and is promoted in a number of ways, including the agricultural press, posters at plant protection product points of sale, *SuperDrecksKëscht* leaflets and invitations to participate which are sent individually to professional users. Information about collection can also be found on the *AgriRecover* Internet site.

Appropriate documentation on the flow of plant protection product waste is compulsory for the beneficiaries of financial aid granted in connection with agri-environmental/climate programmes.

Efforts to improve the collection of empty PPP packaging will be launched.

5. Objectives and measures

5.1 Objectives

The general objective of this Plan is to reduce the use of plant protection products and also of the risks arising from that use.

In the long term this reduction will be achieved thanks to the introduction of integrated pest management and alternative techniques and approaches used in organic farming. Where the use of chemicals cannot be avoided the replacement of particularly dangerous plant protection products by products with properties which are less harmful to human health and the environment will be implemented as far as possible.

In the short term risks will initially be reduced by means of relevant training for plant protection product vendors, advisors and professional users, general awareness-raising for professionals and private users, restrictions on the purchase of plant protection products and the introduction of a regulatory framework covering all aspects of the use of plant protection products, from their placing on the market to disposal.

These different measures are described in more detail in the points below.

5.2 Training and skills certification

This will be implemented by means of a Grand-Ducal regulation which is currently being finalised and which provides for the introduction of the requirements set out below.

5.2.1 Sale

Only certified distributors will be able to place plant protection products for professional use on the market. Certification will be linked to detailed knowledge of the hazards associated with plant protection products, ensuring that distributors will be able to inform their customers appropriately about the precautionary measures to be taken. This also applies to distributors of plant protection products for non-professional use, except that the certification conditions will be less demanding.

5.2.2 Advisors

Those who wish to provide professional advice on pest control and the use of plant protection products will be subject to the same certification requirements as distributors of plant protection products for professional use.

5.2.3 Training of farmers and professional users of plant protection products

All farmers, wine-growers, agricultural workers and others using plant protection products in the course of their professional activities will have to hold a certificate attesting that they have been trained in using plant protection products in a way making it possible to minimise the risks arising from their use, and in particular their impact on human health and the environment. Those concerned will be able to obtain such a certificate on the basis of a relevant professional qualification, such as the completion of an apprenticeship or by means of relevant studies or, failing that, by attending a specific initial training course to be organised under the auspices of the State.

The intention is for those responsible for the use of plant protection products, such as team leaders at landscape gardening firms or farmers, to be required to have more detailed relevant knowledge than the workers assisting them and for whom they are responsible. These two categories of user will receive different certificates.

The Ettelbrück Agricultural College syllabuses for the sectors concerned will be adjusted to cover the content of the training referred to above. Future school leavers will thus automatically fulfil the conditions for certification.

All the types of certificate referred to above will have to be renewed at least every seven years by means of on-going training during that period.

5.2.4 Training for non-professional users of plant protection products

Private users of products for non-professional use will not have to follow any training, but awareness-raising campaigns will be run with a view to reducing the use of such products in gardens or on private land. The restrictions on the sale of products in shops (no more self-service), together with the increasing number of municipalities supporting the 'No pesticides' campaign, should also help to increase the general public's awareness.

5.3 Awareness-raising and information for professionals, private individuals and the public sector

Increasing awareness is a very important lever for achieving improved management of plant protection products. Increasing awareness of the impact of these products on human health, fauna and flora must be regarded as complementing legislative measures.

Awareness-raising must take place on a very broad front and cover, in particular, professionals and the public sector, but private individuals, as well. An analysis of the various users of plant protection products reveals different categories, depending on product use.

The first category uses these products, often in non-professional circumstances (private individuals, clubs and societies, etc.), for reasons which can be described as aesthetic, ease of use or compliance with 'good' management rules (clubs and societies, rules to be followed, etc.).

The second category is that of professional users providing a public service or service of general interest (the highways authority, the railway operator, the airport, municipalities, etc.). Within this category a distinction can be made between plant protection products being

applied for safety or technical reasons and those being applied for ease of use or 'aesthetic' reasons.

Finally, the third category includes professionals using or promoting plant protection products for economic reasons. Examples are farmers, wine-growers, horticulturalists or PPP distributors.

Depending on the categories concerned, increasing awareness of plant protection products should include technical explanations about how to apply them, toxicity, desirable and undesirable effects and also the effects on the environment and human health.

5.3.1 Action by the 'No pesticides' campaign

The partners in the national 'No pesticides' campaign have been committed for years to the abandonment of pesticides in Luxembourg. Awareness-raising measures were incorporated into the campaign from the outset.

Professional users (municipalities, the State and private individuals) have been made aware of the issues by means of seminars, working parties, site visits, hands-on workshops and demonstrations. The campaign also seeks to focus on more protection for users, a reduction in short- and long-term costs and even a reduction in maintenance work.

In this context the campaign has published a map of Luxembourg showing those municipalities which have decided to stop applying pesticides or reduce their use on their land. The key arguments used in raising the awareness of local politicians are the protection of human health and of the environment if pesticides are abandoned.

The campaign partners have also recently placed more emphasis on raising the awareness of private individuals. This does not so much involve detailed information as the need to change long-standing, well-entrenched habits. The availability of alternative approaches is the top priority for this target audience. Saving time and making work easier are significant factors in increasing the awareness of private households. In addition, the connection with PPP-free food production in vegetable gardens and good health (e.g. of children) helps to get the message across.

5.3.2 **SuperDrecksKëscht** *activities*

The activities by the *SuperDrecksKëscht* for private individuals are not restricted to the active collection of plant protection product waste: it also emphasises the promotion of alternatives. For instance, it also promotes the messages from the 'No pesticides' campaign.

5.4 Management of plant protection products

5.4.1 Sale

The following measures need to be analysed in the context of products being placed on sale:

– sale of 'ready-to-use' solutions, rather than concentrate-based products, in large stores and/or in agriculture;

– overhaul of agricultural advice: creation and establishment of an agricultural centre of excellence.

A Grand-Ducal regulation will stipulate that plant protection products for professional use can be purchased only by customers holding one of the certificates referred to in points 5.2.2 and 5.2.3 and that plant protection products for non-professional use can no longer be sold on a self-service basis. Thus, the Law of 19 December 2014 on plant protection products states that a certified distributor must be available at the time of sale to provide customers with appropriate information about the use of plant protection products, the risks to health and the environment and safety advice so as to manage those risks for the products in question.

5.4.2 Storage

The existing rules require, in particular, that plant protection products be stored in a specific, ventilated, locked and clearly identified location which is not accessible to children or animals. Storage alongside medicinal or food products is prohibited. A Grand-Ducal regulation will spell out storage arrangements in more detail.

With regard to plant protection product waste which meets the criteria of hazardous waste under the current rules, the requirement is for it to be managed without endangering human health and without harming the environment. The means that such waste must also be stored in a location which is not accessible to children or animals and without plant protection product residues being released into the environment.

5.4.3 Handling

This is the riskiest stage for users, who must protect themselves effectively against accidental splashes and inhalation of plant protection product vapours (personal protective equipment to be worn). A Grand-Ducal regulation will provide that such protective equipment must be made available to employees.

5.4.4 Inspection of and checks on spraying equipment

In Luxembourg the equipment for applying plant protection products is already regularly inspected in the case of all farm and wine-growing holdings taking part in agri-environmental measures (premium for maintaining the landscape and countryside and specific agri-environmental measures (cross-compliance +)). The current frequency of checks is already every three years. The inspections are carried out by ASTA. Most holdings therefore already have equipment which complies with the requirements of Directive 2009/128/EC.

The regulatory framework will be modified to introduce the requirement for all spreading equipment to be inspected. The use of non-compliant equipment will then be prohibited. An information programme will be set up, in conjunction with the *Cercle d'entraide agricole* (Mutual Farming Assistance Group), to encourage the shared use of compliant spreading equipment. Provision will be made for a lighter inspection regime for manual sprayers and those with low rate of use, used in particular in wine-growing and for tree crops.

The equipment used for aerial spreading in wine-growing is already subject to an annual inspection requirement.

5.4.5 Spraying (including aerial spraying)

5.4.5.1 Filling and washing points

Filling and washing points make it possible to reduce the risks of point source pollution in agriculture. Point source pollution (= accidental or chronic) is pollution arising from mistakes, negligence or difficulties with handling products and equipment before and after treatment. Washing points make it possible to dispose of the water used to rinse the bottom of tanks and to wash the sprayer externally. Such filling and washing points are eligible for investment aid under the Law of 27 June 2016 on support for sustainable development in rural areas.

Given that not all users of plant protection products will have access to the points referred to above, the practices of spreading rinsing water on agricultural parcels which have already been treated, of not filling sprayers near a water point (rivers, wells, etc.) and of monitoring filling will be encouraged to a greater extent.

5.4.5.2 Spraying

Drift by plant protection products during treatment is one of the significant sources of soil, water and atmospheric contamination. Any treatment entails direct emission into the air, followed by dispersion over a varying distance. Such emissions depend on meteorological conditions (wind, temperature), but also on the type of equipment used for spreading. Spray drift is formed by droplets of different diameters, the finest of which may be carried by the air, while the largest droplets fall to the ground not far from where the product is applied. It is considered that drops with a diameter of less than 100 µm tend to disperse in the air and evaporate (source: CORPEN 2007, Groupe Phyt'air, France). In order to reduce drift it is proposed initially to encourage greater use of nozzles which minimise the formation of such micro-drops. Consideration needs to be given to the possibility of requiring in future all (professional) equipment for spreading plant protection products to be fitted with nozzles to reduce spray drift (anti-drift nozzles).

In future, subsidies may be provided only for spreading equipment fitted with anti-drift nozzles and a system for automatic rinsing of the spray liquid tank.

Professional users of plant protection products are already required to keep registers recording details of the application of each product. The possibility of setting up a specific IT system will be investigated, so as to facilitate record-keeping and the relevant checks.

5.4.5.3 Aerial spraying

The Law of 19 December 2014 on plant protection products lays down authorisation for aerial spraying in the form of a request for approval of the application programme, to be submitted by the user. Annual authorisation is needed so that regular aerial spraying of predetermined vineyard parcels can be carried out during the season.

The Grand-Ducal Regulation of 11 May 2017 amending the Grand-Ducal Regulation of 27 April 2016 on aerial spraying lays down the conditions for the aerial application of plant protection products. Flights are subject to ministerial authorisation.

5.5 Alert procedure and emergency plan

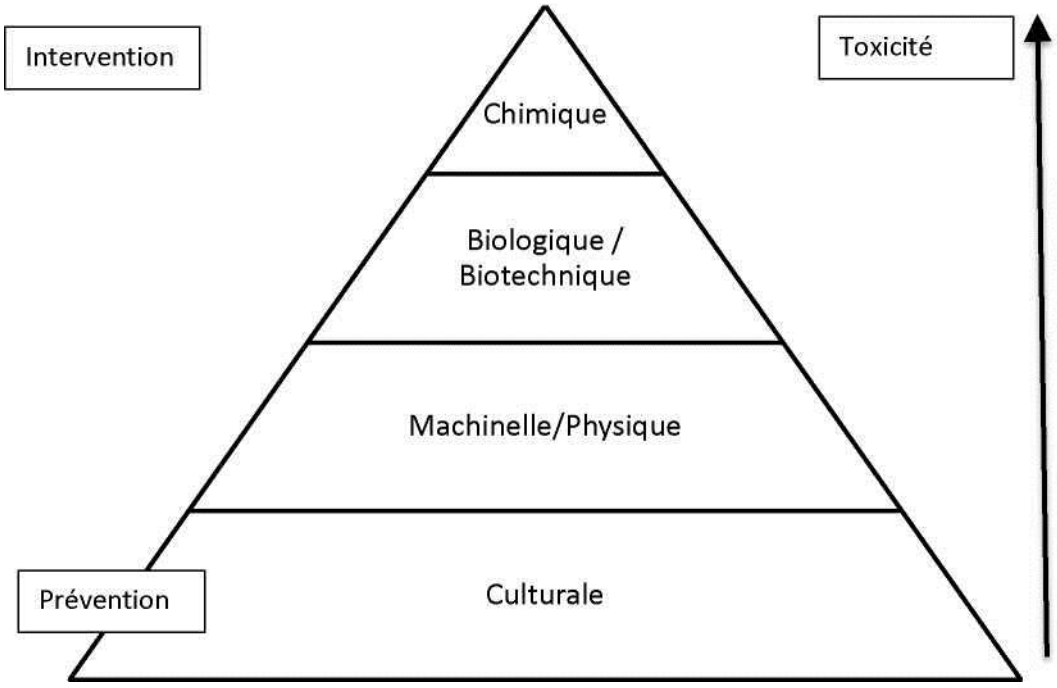
To ensure a rapid response in the event of an accident, a Grand-Ducal regulation will require any accidental spills of plant protection products to be reported immediately to the relevant emergency services.

In June 2015 Luxembourg signed an agreement with the Brussels Poison Centre, which has detailed information about all the plant protection products which are authorised for use in Luxembourg and acts as an initial contact point for health emergencies related to such a product. It is available 24 hours a day at freephone no. (+352) 8002-5500.

5.6 Integrated management and promotion of alternative techniques

5.6.1 Integrated management: strategy adopted

Integrated management is based primarily on the **principle of the IPM triangle**. The main objective is to reduce the use of plant protection products by promoting, within the bounds of economic viability, firstly sustainable cultivation measures, followed by biological and biotechnical techniques. The use of chemicals is to be limited to what is strictly necessary and is regarded as the last resort.



Key

Intervention	Intervention
Toxicité	Toxicity
Chimique	Chemical
Biologique/Biotechnique	Biological/Biotechnical
Machinelle/Physique	Mechanical/Physical
Prévention	Prevention
Culturale	Cultivation

5.6.1.1 Spreading and developing integrated management

Under national legislation integrated management consists in carefully taking into account all available plant protection methods and consequently combining appropriate measures which discourage the development of populations of harmful organisms, keep the use of plant protection products and other types of intervention at levels which are economically and environmentally justified, and reduce or minimise the risks to human and animal health and the environment. Integrated management favours the growth of healthy crops by seeking to disturb agri-ecosystems as little as possible and encourages natural pest control mechanisms.

Integrated management is based on preventive or even active measures, as indicated below.

Rotation of annual crops

The choice of a good rotation pattern provides the basis for integrated management. A well-designed rotation which suits the production location makes it possible to prevent the development of certain plant diseases or the emergence of worrying levels of pests and weeds. However, economic constraints, especially with regard to possible markets for some agricultural products, mean that producers have limited crop choices.

Tilling the soil

In the past the soil was tilled mostly by plough. Nowadays this is often replaced by less intensive or even minimal tillage, for economic reasons and to protect the soil. Each tillage method makes it possible to contain certain specific harmful organisms, but at the same time may encourage others to appear. On a given parcel plant health needs therefore mean that tillage should be adjusted to the crops being rotated and to the harmful organisms which may cause problems there.

Knowledge of the current condition and functionality of our soils is essential for their successful, long-term management. There must be effective, targeted soil monitoring so that well-founded decisions can be taken with a view to their sound use for farming, horticultural and wine-growing purposes.

Choice of varieties

Chemical control may be avoided as a result of plant varieties which are resistant to or tolerate certain harmful organisms. Plant selection projects seek to combine the agronomic and technical properties of plants, such as maximum yield and nutritional value, with the faculty of resisting diseases and pests, but this combination is frequently not possible or else the results of such plant selection are unsatisfactory. It may also be the case that a species of harmful organism capable of overcoming the resistance of certain plant varieties spreads to new areas. This actually happened recently in Luxembourg with a fungal disease infecting certain straw cereals. Consequently, since the development of a variety which is resistant to or tolerates a given harmful organism usually takes several years, chemical control may prove to be the only effective means of protection for a certain period.

Fertilisation

Excessive fertiliser input may make plants more attractive to harmful organisms and thus encourage infestation. On the other hand, a lack of nutrients hampers plants' own defence mechanisms, which increases the risk of reduced yield. It is therefore vital to optimise the input of crop nutrients.

Use of beneficial organisms and alternative techniques

Measures within or outside parcels makes it possible to encourage the development of beneficial organisms. There are different species of arthropods, birds and mammals which may help to curb or limit the development of harmful organisms. Some arthropods are even marketed for that purpose and can be used outdoors or in greenhouses. Certain pests can even be combated by using specific pheromones. The application of plant protection products can be avoided in such cases. However, the use of beneficial organisms or alternative techniques has hitherto been limited primarily to market gardening and fruit crops.

Precision farming

The on-going development of precision farming techniques seeks to reduce the quantity of plant protection products used, as such techniques progress, and to improve the effectiveness of treatment. Techniques such as plant-by-plant spraying, strip spraying or reduced-dose spraying have become possible as a result of innovative application equipment. Alert systems and decision support systems are another significant tool for modern agriculture. Such systems make it possible to monitor pests or predict the emergence of plant diseases. Farmers thus have information about plant health hazards, enabling them to avoid ineffective treatments which serve no purpose.

The *Förderverein Integrierte Landbewirtschaftsberatung Luxemburg* (Luxembourg Association for the Promotion of Integrated Farming Advice) is currently implementing a research project on rape cultivation in Luxembourg, especially in water protection areas. The project covers several aspects of integrated management and will study the effectiveness of physical measures to combat weeds in rape, the effects of alternate crop rotation and the possibility of replacing rape with flax.

New tests on controlling weeds in maize crops started in Luxembourg in 2015. The system being studied consists in a combination of chemical and mechanical measures to combat weeds. The system should also make it possible to reduce significantly the amount of herbicides needed when maize is grown.

For every major crop, such as potatoes, cereals and fodder plants, the resistance of a major crop variety is assessed as part of varietal tests. Such tests lead to the annual publication of a brochure which is available to interested parties. It is therefore possible for farmers to choose to grow varieties which are less susceptible to plant diseases and to limit plant protection product input.

Producers must carry out an analysis of their soils, to determine their nutrient content, if they wish to benefit from the premium for maintaining the landscape and countryside and for encouraging environmentally friendly farming. They are also supported by several advisory bodies when they draw up their fertilising plans.

There is a specific agri-environmental measure for the establishment of herbaceous strips. Maintenance of such strips is laid down in detail for this measure so that they can provide a habitat for beneficial organisms.

Directive 2009/128/EC requires the Member States to make available to plant protection product users the pest-monitoring and decision-making tools referred to above. In Luxembourg such tools have been in operation for several years. They were developed on the basis of cooperation between the Luxembourg Institute of Science and Technology, ASTA, the *Institut viti-vinicole* (Wine Institute) and the *Dienstleistungszentrum Ländlicher Raum Rheinland-Pfalz* (Rhineland-Palatinate Rural Service Centre) wine research institute.

In agriculture, in particular, the purpose of the *Sentinelle* research project, which is co-financed by the State, is to monitor fungal and pest diseases in certain crops. Thus, where cereal crops are concerned, the presence and seriousness of infestation by agents causing glume blotch, downy mildew, brown, yellow and black rust, fusarium wilt, ramularia, rhynchosporium and helminthosporium are monitored every year at several locations spread across Luxembourg. With regard to rape, the same project monitors the most important pests, which are rape beetle, several species of weevil, rape midge and cabbage root fly, as well as the fungal diseases sclerotinia rot and cruciferae collar rot. Other pests affecting these crops are included in the monitoring programme if they are likely to cause substantial damage.

Weekly alerts indicating the monitoring programme's results and help with identifying harmful organisms are published in the farming press and made available to interested parties through several IT channels. They also include advice on the need for and return on the use of plant protection products and, where applicable, inform farmers about the likelihood of the various pests developing resistance to such products and how to manage this.

It should be noted that these recommendations are general in nature and simply provide support for pest control decisions. Farmers still need to inspect their fields visually to decide whether the harmfulness threshold has actually been reached and whether the application of plant protection products is indicated or not.

With regard to tree crops there is a similar monitoring and alert system covering apple scab, which is the main fungal disease affecting apple trees. In the wine-growing sector, a comparable system provides epidemiological forecasts for downy mildew, powdery mildew, black rot and grape berry moth.

These alert systems will be maintained and developed. They will thus cover more crops and more harmful organisms. Additional meteorological stations will be set up in order to increase the accuracy of the systems' forecasts. Finally, an IT tool will make it possible to send alerts automatically to subscribers. A Grand-Ducal regulation will make subscription to this tool compulsory.

Agricultural advice relating to plant protection will be stepped up and, as provided for by the Law of 19 December 2014 on plant protection products, in-service training courses will focus more on integrated management.

At the same time, the PESTEAUX decision support tool, scaled for individual parcels, is being developed in partnership with the *Centre wallon de Recherches agronomiques* (Walloon Agronomic Research Centre). This tool will be used to assess the risk of diffuse

pollution of surface water and ground water by plant protection products. It will enable plant protection product users to choose the products which are least likely to contaminate the aquatic environment.

Only plant protection products which spare secondary and pollinating insects are advised for wine-growing. In connection with the premium for maintaining the landscape and countryside and for encouraging environmentally friendly farming, a Grand-Ducal decree draws up an annual list of plant protection products which is more restricted than that of products authorised nationally. The products on the list, as well as the number of applications, are laid down specifically in accordance with the criterion of sparing secondary and pollinating insects.

The *Institut viti-vinicole* periodically sends vine protection recommendations to wine-growers. This advice is free. The recommendations include biological, biotechnical, chemical and cultivation measures. The dosages of plant protection products to be used are calculated on the basis of the vines' growth stage or on the basis of the leaf surface, so that only the minimum amount of PPPs needed is used.

In response to the National Action Plan there is growing interest in the Luxembourg wine-growing sector in inter-specific varieties which are resistant to fungal diseases. The list of varieties authorised in Luxembourg was supplemented in 2014 by a selection of the inter-specific varieties which are most common in the region. The *Institut viti-vinicole* is now testing these varieties more intensively. The wines are produced separately and presented to interested wine-growers at tasting events.

Finally, the Law of 19 December 2014 on plant protection products provides that the requisite measures to promote integrated management are to be laid down by a Grand-Ducal regulation.

5.6.1.2 Production methods or alternative techniques

The list of agri-environmental measures has been modified so as to encourage the voluntary use of techniques which are less dependent on plant protection products. These measures include:

- an undertaking by the farmer not to use any kind of herbicide between harvesting the previous crop and the start of winter, including the application of total herbicides during the period between crops; the undertaking covers all winter cereals sown for the corresponding year;
- an undertaking by the farmer not to apply herbicide treatments to straw cereal crops, oil crops and pure grain legume or fodder legume crops;
- an undertaking by the farmer to use non-chemical methods to control weeds in maize, potato and beetroot crops; herbicides are permitted only on crop rows;
- an undertaking by the farmer not to use fungicides and insecticides in oil, protein or straw cereal crops;
- a ban on the destruction of catch crops in the basic option.

In addition, in connection with the premium for maintaining the landscape and countryside the use of total herbicides will be banned between harvesting and 15 February if a new winter

crop or a catch crop is not sown. The practice of desiccation using total herbicides will also be prohibited in the new version of the premium.

In the wine-growing sector, 95 % of the area under vines is protected against the grape berry moth by means of sexual confusion. This method continues to be supported by State aid. Apart from a few exceptional cases this biological approach to controlling the grape berry moth has made it possible to abandon insecticide treatments completely. It also results, indirectly, in a replacement of plant protection products to combat grey rot. Without diffusers being installed the grape berry moth caterpillars would perforate the young grapes and cause lesions which would encourage the establishment of the fungus responsible for such rot.

In the wine-growing sector the technique of leaf stripping around the bunches of grapes is in the process of becoming a standard practice to reduce the use of plant protection products to combat rot (botryticides). The *Institut viti-vinicole*, which conducted the initial tests on this starting in 2003, regularly stresses early leaf stripping around the bunches of grapes and late pruning of vines. There are also plans to steer wine-growers more towards the use of plant hormones, to reduce the compactness of bunches, instead of botryticides.

Herbicides are usually used in wine-growing only on a narrow strip of 40 cm below the vines, which represents some 20-30 % of the total surface area of a vineyard parcel. However, several interesting avenues, which have already been embarked on by the wine-growing sector, need to be pursued in order to reduce the use of herbicides even further:

– further increasing the awareness of wine-growers regarding the non-treatment of the edges of parcels and the use of herbicides only when actual problems arise, rather than systematically;
– encouraging the use of cultivation techniques (mechanical weed control) or, where appropriate, of products which are less toxic to the natural environment (e.g. those based on organic acids).

The 2014-2020 premium for maintaining the landscape and countryside offers a financial compensation payment to vineyards which no longer wish to apply herbicides to vineyard parcels.

5.6.1.3 Organic agriculture

Organic agriculture is regulated nationally by Regulation (EC) No 834/2007, which sets out all the conditions to be met by producers to enable them to sell a product under the designation 'organic'. The implementing Regulation, Regulation (EC) No 889/2008, has several annexes, one of which lists the plant protection products which may be used in organic production and the specific conditions for using them. Herbicides and products based on synthetic active chemical substances are generally banned in organic agriculture. It is also clearly stated that all possible preventive measures, such as those also recommended in integrated agriculture, must have been taken before plant protection products may be used.

This type of agriculture is thus by far the most restrictive with regard to the use of plant protection products. Some 95 farm, horticultural or wine-growing holdings are currently registered as organic producers, covering more than 5 000 hectares, i.e. 4 % of all agricultural land.

Nationally, the action plan to promote organic agriculture supports various measures to spread this production method, including the creation of a network of demonstration farms and the organisation of talks, seminars or excursions for organic producers and those who may be interested in total or partial conversion. The *Institut fir Biologësch Landwirtschaft an Agrarkultur Luxemburg* (IBLA – Luxembourg Institute for Organic Farming and Agriculture) is responsible the specialist advisory service; it currently has three advisors (plant, animal and wine production) and is the author of many practical factsheets for producers, in collaboration with FiBL (*Forschungsinstitut für biologischen Landbau* – Research Institute of Organic Agriculture) in Switzerland.

The area of organic vineyards in Luxembourg, which currently amounts to 40 ha, has quadrupled in only a few years. The Government is committed to further encouraging organic wine-growing methods and techniques:

– the *Institut viti-vinicole* regularly sends recommendations on protecting vines organically to wine-growers. This advice is free. The recommendations include biological, biotechnical and cultivation measures. In its advice sheets the *Institut viti-vinicole* stresses the use of natural substances and the self-defence mechanisms of vines;
– since 2012 wine-growers who decide to convert to organic production can join a special advisory programme run by IBLA. A qualified advisor guides and advises organic wine-growers *in situ* throughout the growing period. This advisory service is not free, but it is subsidised by the State.

However, organic management of downy mildew is essentially dependent on copper-based products. Since copper is toxic to plants and accumulates in the soil, the use of such substances is only a medium-term solution. The *Institut viti-vinicole* has therefore embarked on steps to reduce the use of copper to a scientific level, acting in close cooperation with LIST and IBLA. In European terms, the Government is seeking to speed up the process for approving biological substances which will make it possible to reduce the use of copper or even replace it.

5.6.1.4 Risk analysis

Following a **risk analysis** of the plant protection products in use, the approach should be to apply the principle of the IPM triangle first and encourage the development of cultivation, physical or biological practices. If the use of chemical products proves to be indispensable, the use of replacement substances which are of the least concern for the environment and human health should be encouraged, so as to reduce the amounts and risks of the main plant protection products or groups of products used.

The risk analysis in question is based on qualitative and quantitative criteria ('big movers').

Qualitative criteria:

– human toxicity (toxic, mutagenic, etc.),
– environmental toxicity (bees, secondary fauna, water, etc.),
– persistence in the environment.

Quantitative criteria:

– amount of active substances applied,
– amount of active substances detected in the natural environment.

5.6.1.5 Replacement products of limited concern

The use of **replacement products of limited concern** for the environment and human health substantially reduces risk, but not the amount or number of treatments. It is therefore important to determine exactly which products are of no or of limited concern.

5.7 Regulation on the use of plant protection products in certain areas

It should be noted that the application of plant protection products in public spaces has been prohibited since 1 January 2016. Additional restrictions or prohibitions will be adopted if appropriate in the form of a Grand-Ducal regulation, especially for water protection areas or nature and natural resources protection areas.

With regard to the demarcation of water protection areas by Grand-Ducal regulation, the regulatory text covering protection areas around intake points with a heavy PPP load includes very tight restrictions (even a ban) on application. These restrictions/prohibitions may be waived by the Ministry of the Environment in the form of voluntary cooperation between the farmer and the water supplier, provided that the measures applied pursue the objective of securing a significant reduction in the amount of active substances within protection areas.

5.8 Exposure tracking and monitoring

Monitoring (placing on the market, use, etc.)

There are plans to establish an IT system for compiling information about the types of product and amounts used, processing it and making it available, for the purpose of risk management.

6. Indicators and digitisation

The indicators set out below will be developed to monitor trends in the amounts of plant protection products placed on the market, on the one hand, and the amounts of such products used in agriculture, on the other.

6.1 NODU (*nombre de doses unité* – number of unit doses)

The number of unit doses indicator was developed as part of the *Ecophyto plan* in France to monitor the amounts of plant protection products placed on the market. The work on calculating this indicator is under way in Luxembourg.

NODU is a monitoring indicator providing a national approach, across years, for all crops. It is calculated each year on the basis of sales figures from plant protection product distributors. Products for treating seeds and 'biological' products are not taken into account for calculating NODU in Luxembourg.

The indicator can be broken down by the different uses of plant protection products. It thus makes it possible to gain a proper insight into the contributions made by the various sectors towards the objective of reducing the use of plant protection products. It is not currently possible in Luxembourg to make a distinction between agricultural and non-agricultural use of the amounts of plant protection products placed on the market.

Stages in calculating NODU

1. A 'unit dose'/ha is calculated for each active substance on the basis of all the approved doses laid down for each product/use pair containing the active substance in question. These approved doses are laid down when the product is authorised for placing on the market and are indicated in the ASTA list of plant protection products.
2. For each active substance the amount sold is divided by the unit dose of that substance, giving a number of unit doses per active substance.
3. The sum of the numbers of unit doses is produced for all the active substances; this is NODU, the number of unit doses nationally (for all crops and all active substances).

Strengths and limitations of NODU

It is a summary indicator of the use of plant protection products which is robust in terms of the replacement of certain active substances by new substances which are effective at lower doses. It does not provide information by crop, or by territorial unit below national level. This indicator's main weakness is that it is not currently possible to distinguish between agricultural and non-agricultural use on the basis of the figures from the STATEC survey of the placing of plant protection products on the market. It is proposed to remedy this weakness in the longer term by using the figures from the registers to be kept by plant protection product vendors.

On the basis of the above, consideration needs to be given to improving the quality of the statistics about the products sold.

NODU will be used as a source of information for starting to reduce the use of certain active substances/certain plant protection products ('big movers' and highly toxic plant protection products).

6.2 IFT (*indicateur de fréquence de traitement* – treatment frequency indicator)

The treatment frequency indicator is calculated on the basis of the information about plant protection treatments (amount of product applied, area treated) recorded in the agricultural accounts at holdings. The indicator equals the sum of the ratios 'amount applied/reference dose' for all the PPPs used on a crop.

$$\text{Indicator} = \sum_{ppp} \left(\frac{\textit{amount applied}}{\textit{reference dose}} \right)$$

Amount applied: amount of the product applied to a crop (l/ha, kg/ha, amt/ha) (information provided by the producer as part of the agricultural accounts).

Approved dose: maximum authorised dose per treatment of a crop for a PPP and for a given target organism (l/ha, kg/ha, amt/ha). Approved doses are obtained on the basis of the list of plant protection products authorised by ASTA.

Reference dose: the smallest approved dose (if there are several different target organisms) authorised for a product and for a crop (l/ha, kg/ha, amt/ha). The reference doses are calculated on the basis of approved doses.

If two or more PPPs are used on the same crop in a single spreading operation (tank mixes) each PPP is regarded as a separate treatment and those treatments are added together for the indicator.

Treatments with lower doses (less than the maximum authorised dose) are taken into account appropriately for the indicator.

In the case of treatment of only part of a parcel (treatment of partial areas) it is the area actually treated which is taken into account for the indicator.

One indicator is calculated for each PPP category (herbicides, fungicides, insecticides and others) and they are then added together to obtain a global value for the indicator per crop.

The following crops are taken into account:

– cereals (winter wheat, rye, winter barley, spring barley, oats, triticale),
– winter rape,
– potatoes,
– maize,
– wine-growing.

Since crop years can vary widely in terms of plant health, data are required from several years (at least three to four years) in order to obtain an idea of the general level of frequency of use of PPPs in agriculture.

It is planned to calculate this indicator starting with the 2016/17 crop year.

6.3 Digitisation

In the medium term it will be possible to declare parcels electronically, and the digitisation of other administrative procedures will undoubtedly follow. It therefore makes sense to make software available to PPP users to enable them to keep their registers recording PPP use simply, efficiently and in a way which is linked to parcel declarations. As part of the cooperation arrangements to be set up in water protection areas, it will facilitate the exchange of data and will therefore serve to determine the origin of pollution where cases of water contamination occur. The software will subsequently be developed further in order to cover other aspects of agricultural holdings.

6.4 Water quality

Analyses of water for monitoring purposes and the assessment of surface water quality are based on checks under the Water Framework Directive. The purpose of these analyses is to signal:

1. trends in annual average concentrations per active substance and metabolite;
2. frequency of detection (%) per active substance and active substance metabolite;
3. frequency of instances (%) when the WQS is exceeded per active substance and active substance metabolite.

For ground water the purpose of these analyses is to assess its quality on the basis of the monitoring and operational checks in the Water Framework Directive. Monitoring relates to the following parameters:

1. monitoring of trends in annual average concentrations per active substance and metabolite;
2. frequency of detection (%) per active substance and active substance metabolite;
3. frequency of instances (%) when the WQS is exceeded per active substance and active substance metabolite.

Another indicator of the programme's success is provided by the assessment of the quality of water abstracted for drinking water supplies and the number of sources of water abstracted for drinking water which are out of use or which undergo mixing owing to the parameter for pesticides or pesticide metabolites being exceeded.

6.5 Checks under the legislation on plant protection products

Official checks relating to plant protection products are carried out by staff of UNICO (*Unité de contrôle* – Monitoring Unit) and the DOA (*Administration des douanes et accises* – Customs and Excise Administration).

UNICO is responsible for monitoring farmers, horticulturalists and wine-growers. The outcome of such checks may have an impact on their income, since infringements detected trigger a reduction in the premiums granted in connection with financial aid for rural development or with the premium for maintaining the landscape and countryside. Checks are carried out by UNICO using a list of control points including several sections, one of which concerns plant protection products. Five per cent of the total number of farm, horticultural and wine-growing holdings undergo such checks every year.

The DOA checks the trade in plant protection products and their placing on the market. It carries out the checks following consultation with the ASTA plant protection department. The frequency and content of the checks may therefore vary every year.

Given the adoption of new legislative provisions, checks relating to plant protection products will in future be stepped up and extended to cover sectors which do not currently undergo checks.