

GOVERNMENT OF THE REPUBLIC OF SLOVENIA

NATIONAL ACTION PROGRAMME
TO ACHIEVE SUSTAINABLE USE OF PLANT PROTECTION
PRODUCTS FOR THE PERIOD 2012–2022

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1 INTRODUCTION

The principal goal of Slovenian agriculture is the production of safe and quality food in quantities that provide an appropriate level of self-sufficient food production in the Republic of Slovenia. The upgrading of the high technological, phytosanitary and veterinary as well as environmental-protection and animal-welfare standards in agriculture is thus necessary. The sustainable and efficient use of available production resources is the basis for ensuring food security, which means an adequate level of own long-term satisfying the demand of food, which may have the positive impact on the stability and quality of food supply in Slovenia also in the conditions of the global market that is increasingly at risk.ⁱ

Environment conditions in Slovenia are relatively disadvantageous for agriculture. Only limited areas are suitable for agriculture since more than 60% of the total territory is covered by forests. Less than 25% of the total territory is occupied by agricultural land; however, the proportion is still constantly decreasing as a result of forest overgrowing the agricultural land, the extension of urban areas and the new transport infrastructure. About 75% of the farmland is situated in areas with the conditions disadvantageous for agriculture (climate, inclination of the terrain). In the structure of the agricultural land used about 60% present the permanent grassland. About 35% of the total farmland are intended to the production of arable crops and vegetables, while 5% are covered by permanent plantations where the use of plant protection products (hereinafter referred to as: PPP) is the most abundant. This means that about 10% of the Slovenian territory is potentially burdened by the use of PPP for protecting cultivated plants against pests and weeds that cause economic damage in agriculture. In the structure of agricultural production, land under cultivation (fields and permanent crops) is particularly potentially burdened by PPP since the use of PPP is not permitted in forests and usually not necessary on the permanent grassland. However, since these 10% of land are situated mainly on a flat land or in the vicinity of water streams and other surface water or coincides with drinking water collecting areas or protected zones or settlements, due regard shall be paid to decreasing the risk arising from the use of PPP.

Plant protection products are an important milestone in providing food production and self-sufficiency in food. They protect crops by eliminating or reducing competition arising from unwanted plants (weeds) and from contagion by pests. They also protect and ensure the suitable quality of agricultural produce and decrease the labour input. Thus PPP play an essential role in providing of food security and ensuring reliable supplies of agricultural produce each year. Moreover, PPP contribute to ensuring the availability of low-priced fruits and vegetables of good quality, which makes them available to all consumers. The use of PPP reduces the needs for agricultural land for the production of food and feed and enables the production of a wider variety of food at regional level, which can reduce transport costs and make more land available for other uses, e.g. amenity, natural parks and the protection of biodiversity.

However, despite their advantages associated in particular with agriculture PPP often have harmful properties and they are released into the environment during use which may lead to the exposure of humans and the environment.

In the Resolution on strategic guidelines for the development of the Slovenian agriculture and food technology by 2020 – 'Zagotovimo.si hrano za jutri' (Resolucija o strateških usmeritvah razvoja slovenskega kmetijstva in živilstva do leta 2020) – 'Zagotovimo.si hrano za jutri' (ReSURSKŽ) the strategic targets of agricultural policy in compliance with the principles of sustainable development of agriculture have been defined as follows:

- a) ensuring food security through a stable production of safe and quality food that is affordable for all consumers;
- b) enhancing the competitiveness of agriculture and food technology;
- c) sustainable use of production potentials and ensuring public goods associated with agriculture;
- d) ensuring the harmonious and socially sustainable rural development (in cooperation with other policies).

The Slovenian agricultural policy introduces multi-purpose agriculture and shall apply all sources available to support its sustainable development, which implies economically effective and competitive, socially responsible and also environmentally sound agriculture.ⁱ This includes also the sustainable protection of plants against various pests and weeds that cause unacceptable economic damage to food producers or are even detrimental to the biological diversityⁱⁱ, and result in the presence of micotoxins and other harmful substances in agricultural productsⁱⁱⁱ; therefore, in the production of food and feed such organisms are controlled by mechanical, biological and chemical methods (PPP). Plants and plant products in international trade are also subject to biosafety standards^{iv} in order to prevent the spread of pests and weeds from production areas to consumption areas, particularly when the trade among different continents is involved.^v

Agricultural policy measures applied to date have supported among others the shift of farms from conventional to integrated and organic farming, which emphasises the implementation of the principles of environmental protection, nature preservation and genetic conservation in agriculture. In 2011, 52% of wine-growers, 26% of field-crop growers, 80% of hop-growers, 70% of fruit growers and 65% of vegetable growers were included in integrated production; and 3.1% of all farm holdings, which apply the principles of good plant protection practice^{vi}, were included in organic farming; thus the risk posed by the use of PPP has been reduced considerably.

However, the maximum residue levels of PPP found in food, feed and the environment have still been exceeded in some cases, which requires a more thorough systemic approach to the integrated pest management (hereinafter referred to as: IPM) and the shift of farm holdings from the existing conventional production to sustainable farming practices (e.g. organic or integrated).

The use of PPP in agriculture cannot be avoided due to the degree of contagion of cultivated plants by pests and weeds. Climatic conditions which determine the agricultural production as well as the circumstances for the development of pests and weeds play a significant role in the open-air cultivation. Temperatures and average annual precipitation sums for certain places in Slovenia indicate that the Slovenia has the most humid climate in comparison with the selected European countries. Only in certain areas of North Italy the level of precipitation is similar to the Slovenian one. Precipitation levels are significantly lower in most production areas of European countries. Although the pace of development of individual species of pests usually depends on temperatures which directly influence the intensity of plant protection measures, the humidity of the climate or precipitation is an even more important factor that determines the intensity of PPP use. Abundant precipitation during growing season enables more intensive development of certain pathogenic fungi, which is reflected in the increased use of fungicides and contributes to a greater total use of PPPⁱⁱ despite their rational utilisation.

An increase in food production cannot be expected without intensifying the use of advanced technologies. Self-sufficiency in food in Slovenia can also not be increased without the use of PPP. The purpose of this document is to determine the objectives and orientations in relation to the reduction of risk arising from the use of PPP by using new knowledge, technical development, introducing innovations, educating users, introducing and promoting IPM and thus increasing the effectiveness of PPP use and decreasing the impact they have on the environment. Therefore we strive to produce enough food by sustainable use of PPP that is based on integrated pest management. Pesticides are regulated for the purposes of agricultural and non-agricultural use by the Plant Protection Products Act for PPP and the Chemicals Act that governs biocide products. In this document, the use of pesticides - plant protection products is discussed.

2 LEGAL BASIS FOR THE NATIONAL ACTION PROGRAMME

The European Union started to regulate systematically the use of PPP at the source, namely during PPP authorisation procedure, by issuing Council Directive 91/414/EEC concerning the placing of plant protection products on the market already in 1991, which specified the common tool and criteria for assessing the suitability of PPP in the EU territory. A thorough system for evaluating the risk to human health and the environment resulting from the PPP use has been established over the years at the EU level. However, in spite of the existing legal framework certain PPP may still be found within the EU area in undesirable quantities in soil,

water and in the wider environment. Agricultural products in the EU territory can still contain residues that exceed the prescribed limits. The reason for this is the phase of PPP use which is the basis for determining the total risk associated with PPP. Risk posed to the environment or human health can occur through direct exposure (farmers using such PPP) and indirect exposure (consumers, residents and bystanders) in particular during or after the use of PPP in agriculture and other activities.

For these reasons the Decision of the European Parliament and of the Council was adopted in EU in 2002 concerning the need for a further reduction of harmful impacts of PPP on human health and the environment. On the basis of this decision the **Thematic Strategy on the Sustainable Use of Pesticides** was adopted in 2002, providing for a number of measures for achieving the common objective of reducing the risk to human health and the environment resulting from the PPP use, and the use of pesticides.

One of the first measures to achieve the common objective was the new **Regulation on maximum residue levels of pesticides in or on food and feed of plant and animal origin** that was adopted in 2005; this Regulation replaced four directives and provided the new measures which contributed to limiting the risk to consumers at the end of the food chain. In order to reach the objectives of the Thematic strategy the Directive concerning the authorisation of PPP had to be revised and replaced by a new **Regulation concerning the placing of plant protection products on the market**.

It was not possible to include all measures foreseen in the Thematic strategy into the existing EU legislation; therefore, new legislation was prepared and also adopted in 2009 as follows: the **Directive on the sustainable use of pesticides**, the **Regulation concerning statistics on plant protection products** and the **Directive on the certification of pesticide application equipment**, which completed the EU legislation necessary for the realisation of objectives of the Thematic Strategy on the Sustainable Use of Pesticides.

By provisions of the Plant Protection Products Act (2001) and further amendments and implementing regulations Slovenia implemented in accordance with the applicable EU legislation the provisions concerning the regulation of the placing on the market of active substances which are PPP and their control, the authorisation of PPP and their placing on the market, the use and control of PPP, pesticide residues, the register keeping of PPP and the register of legal and natural persons engaged in placing PPP on the market, the record keeping and communication of the data in relation to the sale and use of PPP and the technical requirements related to the PPP application equipment. Additionally the regulations on chemicals regulate the production of chemicals necessary for the production of PPP and placing on the market of these chemicals, good laboratory practice, prior informed consent procedure (PIC), persistent organic pollutants, classification, packing and labelling of PPP and its control. The regulations on the environmental protection regulate PPP wastes, PPP waste packaging and PPP imissions in the environment.

In this way Slovenia decreased the risk resulting from the use of PPP questionable to humans and the environment; however, this did not offer the solutions for all problems associated with the use of PPP. Inappropriate or excessive use of PPP may always imply adverse consequences to the environment and human health. Certain countries such as Denmark have developed a plan for the reduced and sustainable use of PPP already in the second half of the 1980s by reason of evident irregularities and adverse impacts of the industrial type of agricultural production.ⁱⁱ As already mentioned the European Parliament and the Council adopted in 2009 a set of legal rules concerning the placing on the market and use of PPP. The Directives 79/117/EEC and 91/414/EEC were replaced by Regulation (EC) 1107/2009 concerning the placing of PPP on the market on 14 June 2011, which provides for a greater protection of humans, animals and the environment and defines clearer conditions that apply for PPP authorisation. The Regulation introduces additional exclusion criteria for active substances that are used in PPP. These conditions are related in particular to certain properties of substances, such as: carcinogenicity, reproductive toxicity, mutagenicity, genotoxicity, persistence in the environment, bioaccumulation, etc. The Regulation also provides for the application of precautionary principle.

A legal basis for the National Action Plan was also adopted at the EU level which is laid down in the Directive 2009/128/EC of the European Parliament and of the Council establishing a framework for Community action to achieve the sustainable use of PPP, which has been transposed into the Slovenian law by the new Plant Protection Products Act (Official Gazette of the Republic of Slovenia, No 83/12). The National Action Plan (hereinafter referred to as: NAP) that Slovenia like other Member States shall adopt by the end of 2012 aims at setting targets, measures, timetables and indicators to reduce risk resulting from the use of PPP and impacts of these products on human health and the environment, with a special emphasis on integrated pest management and alternative plant protection approaches and techniques in order to reduce the use of PPP.

In its Article 4 the Directive 2009/128/EC of the European Parliament and of the Council indicates that NAPs take into account plans under other Community legislation concerning the use of pesticides, such as measures planned under the water framework Directive 2000/60/EC.

3 USE OF PLANT PROTECTION PRODUCTS IN SLOVENIA

Until the middle of last century chemical substances that were used for plant protection were predominated by inorganic products based on sulphur, copper, zinc, and at the beginning also arsenic. With the development of the chemical industry numerous synthetic products have been developed that enabled a sufficient control of pests and weeds. The knowledge of the impact of such chemical substances on humans and the environment has fallen behind their use; thus temporary and permanent adverse effects of certain substances on the environment or even human poisonings have been established later. The general environmental protection

awareness was raised not earlier than in the 1980s of the 20th century and contributed to the change of the non-critical attitude towards the use of PPP.ⁱⁱ At that time the most dangerous products from the group of mercury and persistent organo-chlorine compounds and other persistent compounds for example herbicides belonging to the groups of triazine (= mono-component atrazine products, while multi-component atrazine products remained valid with certain restrictions, as below), chlorinated aliphatic compounds and benzoic compounds have ceased to be used and were officially prohibited in the independent Slovenia in 1996.^{vii}

The older studies of PPP residues in the environment in Slovenia were conducted on agricultural products, in water or soil, where they appeared after the direct introduction on agricultural land. As from 1973 the results of the monitoring of the use of PPP and of researches concerning their behaviour in the environment suggested pollution due to the use of insecticides (chlorinated hydrocarbons, organic phosphoric esters and carbamates), fungicides (dithiocarbamates and metalaxyl)^{viii} and herbicides from the group of triazines, chlorinated aliphatic compounds, benzoic compounds and phenoxy compounds (2,4-D, MCPA, 2,4,5-T).^{ix}

The alignment of Slovenian legislation to the European Union legislation was pursued through the Plant Protection Products Act (Official Gazette of the Republic of Slovenia, No 11/01) which on account of the residues found in water has put restrictions to the use of products containing atrazine in multi-component PPP within the buffer zones of water resources or prohibited their use in areas where data on the monitoring of pesticides in drinking water and drinking water sources, springs, groundwater and in soil indicated that the permitted maximum levels of atrazine or its metabolites, as well as their breakdown and reaction products in drinking water, were exceeded.^x The authorisation procedure as provided for in the Plant Protection Products Act (2001) followed three key aspects of the scientific evaluations of every active substance as follows: to be safe (harmless to human health in the direct or indirect contact), specific (effective to the control of specified pests and weeds, acceptable for non-target organisms) and non-persistent (to break down into simple chemical substances without any harmful impacts on the environment). Old active substances have been re-evaluated and dangerous substances have been withdrawn from the use. Authorisations for certain PPP have been granted for a maximum of ten years and may be extended for several times as appropriate. If on the basis of technical and scientific evidence there is a reasonable ground for suspicion that a certain PPP which has already been authorised constitutes a risk to human health and the environment, the minister competent for agriculture has the power to restrict or prohibit the use of the PPP, as it has already been the case on several occasions of water pollution and honey-bee poisoning.

At the European Union level, the area of PPP is regulated also by the legislation which governs water protection. Directives that are important for this area are as follows: the [Framework Water Directive](#) (2000/60/EC) and its daughter directives: the [Groundwater Directive](#) (2006/118/EC) and the [Directive on Environmental Quality Standards in the Field of Water Policy](#) (2008/105/EC). The alignment of national legislation to the requirements of

the European Union was realised by the adoption of two decrees that established the criteria for achieving the objectives of the Framework Water Directive (2000/60/EC), namely: Decree on Surface Water Status (Official Gazette of the Republic of Slovenia, No.: 14/09 and 98/10) and Decree on Groundwater Status (Official Gazette of the Republic of Slovenia, No.: 25/09 and 68/12). Both regulations lay down environmental quality standards in the respect of individual pollutants or groups of pollutants, presenting a significant risk to or via the aquatic environment, including such risk to water used for the abstraction of drinking water.

Since 2001 all PPP users shall undergo a compulsory training in accordance with the Slovenian Plant Protection Products Act (purchasing of PPP is not possible without having passed an examination in phytomedicine and without presenting a certificate of knowledge in phytomedicine (hereinafter referred to as: certificate)), and they shall deliver their PPP application equipment for the inspection. The upgrading of the plant health forecasting service in 1997 has contributed to improved accuracy of the prognosis of critical periods for the protection of main crops in the production and facilitated access to information for producers.

All measures taken have been oriented into the awareness-raising of users concerning the proper use of PPP with emphasis on the protection of groundwater and surface water, protection of honey-bees, safe disposal of waste and waste packaging of PPP. Incentives in integrated and organic farming by the agricultural policy have further contributed to the testing of biological control and other non-chemical methods where these have been available, as well as to advising to use the PPP that were less harmful, less persistent and readily degradable, and to a better application of these products.

According to the data in 1995, 1,130 ha which represented at that time almost one quarter of all intensive orchards have been already included in the Slovenian integrated fruit production (SIPS), which has also comprised PPP application by use of low-volume spraying and low-drift nozzles. Out of all producers 93% of fruit-growers have been equipped with sprayers that satisfied the technical requirements. Of these 2/3 of small private fruit-growers have been using low-volume spraying equipment, while on bigger fruit plantations this percentage amounted to 87%.^{xi}

After payments have been introduced for the more environmentally-acceptable production methods the proportion of intensive orchards included in the integrated production reached 56.51% in 2011 and 2.25% ha were included in the certified organic farming (Table 1). The basis of integrated pest management and the selection of environment- and consumer-friendly PPP constituted the foundation for the integrated production in fruit-growing, vegetable cultivation, wine-growing and arable farming, which is recognised in Slovenia as a high-quality production and identified as such also when placing certain agriculture products on the market (fruits and vegetables).

Table 1: The volume (ha) of integrated and organic farming in fruit-growing, vegetable cultivation, wine-growing and arable farming in 2011

	conventional (ha)	integrated (ha)	IP/conv. (%)	organic (ha)	org./conv. (%)
fruit-growing	4.942,00	3.451,43	69,84	193,03	3,91
vegetable-growing	1.497,00	977,06	65,27	147,69	9,87
wine-growing	16.351,00	8.581,40	52,48	287,19	1,76
arable farming	176.000,00	46.298,03	26,31	2399,99	1,36

Source: MAE

Slovenia differs from other European countries in PPP use due to its typical climate and production conditions and the types of production. In Europe the highest quantities of PPP sold fall to herbicides (42%) and then fungicides (39%). In Slovenia, the first place is occupied by fungicides (67%), which are followed by herbicides (24%) and insecticides (7%). However, it shall be pointed out that 35% of all PPP sold are inorganic PPP – sulphur and copper.

The use of PPP in Slovenia has fallen almost by half over the last 20 years: in 2010 according to data by SEA¹ it amounted to 1,134 tons and in 1992 to 2,031 tons. Concerning the structure of PPP use it is encouraging that less harmful products prevail. More than one half of the quantity of fungicides used belong to PPP based on copper and sulphur, more than one third of herbicides are PPP based on glyphosate, and more than one half of insecticides are PPP based on mineral oils which may be used also in organic farming.

Table 2: Sale of PPP in Slovenia in 2010

PPP GROUP	SUB-GROUPS	SALE (T)	PROPORTION (%)
INSECTICIDES	insecticides based on pyrethroids	0,5	0,0
	insecticides based on chlorinated hydrocarbons	0,2	0,0
	insecticides based on carbamates	3	0,3
	insecticides based on organophosphorous compounds	7	0,6
	other insecticides	51	4,5
	INSECTICIDES TOTAL	62	5,5
FUNGICIDES	fungicides inorganic based on copper compounds	52	4,6
	other inorganic fungicides	405	35,7
	fungicides based on dithiocarbamates	154	13,6
	fungicides based on benzimidazoles	375	33,1
	fungicides based on diazoles and triazoles	9,5	0,8
	fungicides based on diazines and morpholines	7	0,6
	other fungicides	161	14,2
	FUNGICIDES TOTAL	789	69,6
HERBICIDES	herbicides based on phenoxy-phytohormones	16	1,4
	herbicides based on triazines	24	2,1
	herbicides based on amides	76	6,7
	herbicides based on carbamates	8	0,7
	herbicides based on dinitroaniline derivatives	8	0,7

¹ http://kazalci.arso.gov.si/?data=group&group_id=6

	herbicides based on derivatives of urea	7	0,6
	other herbicides	115	10,1
	herbicides plant growth regulators	0,4	0,0
	HERBICIDES TOTAL	254	22,4
OTHER	OTHER TOTAL	29	2,6
TOTAL		1.134	100

Source: Phytosanitary Administration of the Republic of Slovenia (PARS), 2011

As a result of a new more comprehensive revision of active substances of PPP on the EU market the number of active substances approved has fallen almost by half over the last 10 years (before revision: 1,000 active substances, after revision: less than 500 active substances). The principal criterion was the risk to human health and the environment.

4 OBJECTIVES

General objectives of NAP are:

- to minimise the hazard and risk to human and animal health and the environment from the use of PPP, including through the substitution of the most dangerous substances with safer (including non-chemical) alternatives;
- to reduce the levels of harmful active substances in food and drinking water, including through the substitution of the most dangerous ones with safer (including non-chemical) alternatives;
- to encourage the use of principles of integrated pest management in the agricultural production hence the PPP are used when absolutely necessary or economically justified only, in particular by raising users' awareness on the safe use of PPP, by promoting the development and introduction of organic farming and other sustainable agricultural practices;
- to develop a transparent system for reporting and monitoring the progress made in the achievement of the objectives of the Thematic strategy including the development of suitable indicators;
- to ensure the sustainable use of PPP in all plant species along with minimising the risk from the use of PPP.

The specific objectives of NAP are:

- to minimize the use of PPP (in particular PPP that contain active substances which, when subject to approval renewal under the Regulation (EC) No 1107/2009 will not fulfil the criteria relevant for approval laid down in the paragraphs 3.6 to 3.8 of Annex II of that Regulation);
- technically justified use of PPP, which shall be based on the improvement of technological procedures in the production of cultivated plants, with the assistance of the plant health forecasting service;
- to improve the professional competence of users;

- to minimise the PPP residues in Slovenian commodities; MRL shall not be exceeded in any of domestic commodities;
- to minimise the contamination of surface and groundwater resulting from the use of PPP in regards of achieving environmental objectives for surface water in accordance with the regulations that govern the status of surface water, and for groundwater in accordance with regulations that govern the status of groundwater;
- to improve the control of the use of PPP (for agricultural and non-agricultural purposes) and of the disposal of PPP waste packaging;
- to establish a systematic monitoring of the impacts of PPP on certain non-target organisms, systematic monitoring of the poisoning of honey-bees, birds and fish, minimise the number of poisoned honey-bees, birds and fish resulting from the use of PPP;
- to establish a systematic monitoring of the impacts of PPP on PPP users' health.

Economic, social, environmental and health impacts, and the current economic and financial crisis have been considered in selecting the measures to achieve NAP objectives; hence the already established systems and agriculture policy have been applied. Non-chemical measures which have priority in the integrated and organic farming are usually more expensive or less effective than chemical measures. Therefore in order to achieve the objectives and maintain the competitiveness of food production at the same time due regard shall be given to the way this is manifested in the production economy, which requires a comprehensive economic analysis.

Measures directly associated with the use of PPP at the level of an agricultural holding include the general principles of integrated pest management as referred to in Annex III to the Directive 128/2009/EC. The competent institutions provide all tools, information and advice available for the strict implementation of the general principles.

5 MEASURES TO ACHIEVE NAP OBJECTIVES

5.1 TRAINING, SALES OF PPP, INFORMATION AND AWARENESS-RAISING

5.1.1 Professional training

A system for the training of users and distributors of PPP including lecturers has been set up in Slovenia already before 2001 and has been performed in accordance with the [Rules on professional training and assessment of knowledge in phytomedicine](#) (Official Gazette of the Republic of Slovenia, No 36/02, 41/04, 17/05, 92/06 and 99/08). Based on the training records in Slovenia the certificates of competence have been issued to about 65,000 operators (users),

distributors, and sellers of PPP, of which were about 63,000 users, 690 sellers, 470 responsible persons (selling point advisors), and 120 lecturers.

The existing training system in phytomedicine is divided into the following groups: training of responsible persons (selling point advisors) and lecturers; and training of operators and sellers. The training of groups differs in the duration, goal and partially in training subjects. When the training has been first established the key subjects have been related to plant health, to the use of PPP and relevant legislation. The content of the training has not been brought fully into line with the goals of PPP legislation valid at that time; therefore in 2009 the training material for sellers and users was amended by focusing on the impact of PPP on the environment and human health. Other components of the training structure including lecturers have not been amended. The existing training material for PPP sellers and users covers the following topics: pests and the impact of weeds, the impact of PPP on human health and the environment, PPP application techniques and legislation. Considering the requirements laid down in the Directive 128/2009/EC the relevant subjects shall be further adjusted and extended.

Based on the Directive 128/2009/EC the existing system shall be amended particularly in the part referring to the training and referring to persons who shall be subjected to the training. Under the new system advisors of the Agricultural Extension Service under the Chamber of Agriculture and Forestry of Slovenia who provide advice on the use of PPP to farmers shall also attend training courses and obtain and renew the training certificates in relation to PPP which has been stipulated among other provisions by the new Plant Protection Products Act (Official Gazette of the Republic of Slovenia, No 83/12).

Major deficiencies of the existing system were as follows:

- the training has not been brought fully into line with the requirements of the Directive 128/2009/EC; the plant protection content based on the general principles of IPM has been missing;
- the authorised lecturers have not provided a sufficient professional coverage for the entire training subject; this refers in particular to the requirements in relation to the impact on human health and the environment;
- certain groups of people have been granted training certificates on the basis of education (the syllabus of education institutions in agriculture do not cover the entire subject matter of the Directive 128/2009/EC);
- training has not been required for all field advisors (Agricultural Extension Service Advisors, PPP company advisors).

Key novelties and changes of the existing system:

- the new training material shall be prepared to include all subject matters as defined by the Directive 128/2009/EC;

- considering the new subject matters and targets of the training no exceptions to the training shall be allowed;
- all the advisors and sellers shall undertake the training with no regard to the purpose of advising if it is related also to the use of PPP.

Measure 1: The Administration responsible for plant protection products shall upgrade the content of the existing training system with particular attention to minimise the adverse impact of PPP on human health and the environment; and promoting the use of non-chemical methods.

The Administration responsible for PPP (Phytosanitary Administration of the Republic of Slovenia, hereinafter referred to as: Administration) shall prepare a new material for the training in phytomedicine which would include all components of Annex II to the Directive 128/2009/EC. The material shall include the following chapters: plant protection under the general principles of IPM; the demonstration of the use of application equipment including calibration at the level of agricultural holdings; impact on the environment, especially the risk to birds, mammals, honey-bees, groundwater and surface water, paying special attention to the methods for minimising the risk; and impact on health including the risk to operators, agricultural workers and consumers.

The new contents shall be followed in the training courses for operators, sellers and advisors. A special attention shall be devoted to advisors who provide advice in relation to plant protection against pests and weeds. The training shall be adjusted to different target groups of trainees.

5.1.2 Placing PPP on the market and their sale

The system of sale of PPP in Slovenia has been defined in a way that the users can buy PPP in two different ways: without presenting the training certificate or by presenting the training certificate. On 7th May 2012, 56 products have been authorised (21 active substances) that may be bought without presenting the certificate. The placing on the market and sale of PPP have been realised by distributors who are legal and natural persons and who are responsible for placing PPP on the market, including wholesale traders, retail traders, sellers and suppliers. They have to fulfil the required conditions related to education and professional capability of the personnel, premises and equipment, and they have to obtain the permit for this activity issued by the Administration. Also distributors selling PPP in florists' shops and retail stores with non-food goods shall fulfil certain minimal conditions and shall obtain the permit from the Administration.

The permit for sale of PPP is issued by the Administration after the positive outcome of the inspection of the conditions of premises, equipment and personnel. The Administration keep a register of PPP distributors; and collect data and keep the records on sale of PPP. The Administration communicate the records on sale of PPP to the Statistical Office of the

Republic of Slovenia for the purpose of collecting and processing statistical data on PPP placed on the market.

At this moment about 400 distributors have been registered for selling PPP who also provide advice on their use, which usually concerns the use of products included into their sales programmes.

Measure 2: The current system of PPP sales remains in force. PPP shall be sold only by legal entities that employ qualified persons who meet all the conditions in force for entry into the register of distributors. In addition to PPP and other goods distributors shall sell also suitable personal protective equipment for users; provide information regarding the safe use of PPP and alternative pest control methods (pests and weeds) in accordance with the advice of the forecasting service and the general principles of integrated pest management.

5.1.3 Public information and awareness-raising

At the moment, there is no specific legal regulation for the public information and awareness-raising. Various activities have been undertaken by the competent ministry regarding the safe use of PPP, the use of PPP which present the risk to honey-bees, the identification of counterfeit PPP, the proper handling of waste PPP which contain dangerous substances, etc. The activities of informing, awareness raising of PPP users and the general public shall be upgraded accordingly in order to raise the awareness of risk posed by PPP usage mainly from improper use of PPP and improper handling of PPP packaging and remnants.

The handling of waste PPP which contain dangerous substances has already been governed by a regulation that lays down the obligations of persons who deliver or supply PPP packed for final use directly to the final users; and informing customers on the arrangements of PPP waste take-back free of charge at sales points or at PPP waste collection points. The PPP waste collectors are obliged to inform the customers of the purpose and aims of collecting PPP waste, the proper handling of PPP, the possibilities of take-back free of charge, as well as of the methods for re-use and disposal of PPP. The information and awareness-raising of users shall be defined in the new Plant Protection Products Act in a way that the ministry shall adopt the awareness programme which shall include measures to promote and facilitate information and awareness-raising of the public concerning the impact of PPP use and the impact of improper handling of waste PPP that contain substances dangerous to human health, non-target organisms and the environment. The public shall be informed on the risk from use of PPP and the potential acute and chronic effects to human health, non-target organisms and the environment. Moreover, provisions have been made for gathering the data and information on PPP acute poisoning incidents, as well as potential developments of chronic poisoning with these products.

Interested public shall participate in the preparation of the programme.

Measure 3: *The Administration shall adopt the information and awareness-raising programme on PPP. The programme on the information of public shall include also the information on pesticide acute poisoning incidents where relevant; and the development of chronic poisoning among groups that may be exposed regularly to pesticides such as operators, agricultural workers or people living close to pesticide application areas.*

5.1.4 Updates of instructions on the handling of waste PPP that contain dangerous substances and their packages

Improper handling of waste PPP that contain dangerous substances or of their packages may result in adverse impacts on the environment and consequently in greater risk to animals and the pollution of soil, water (in particular groundwater) or air.

Waste PPP that contain dangerous substances are faulty PPP and their remnants, which remain in the waste sales packaging after use. The proper management of this waste is stipulated by waste legislation. In the part addressing the obligations of PPP users concerning the handling of waste PPP that contain dangerous substances until take-back under relevant regulations, the rules on the obligations of PPP users supplement the waste legislation.

Measure 4: *The Administration shall in cooperation with the stakeholders from PPP sales and Directorate MAE of the environment amend the guidelines for PPP waste management intended to the users and distributors of PPP containing dangerous substances and their packages.*

The guidelines shall be available to all users and buyers of PPP, training participants and owners of the spraying equipment.

5.1.5 The authorisation of PPP

PPP are authorised after the applications is submitted by applicants, usually producers/distributors of PPP. Risk assessment is the key component of authorisation procedure. The assessment is carried out by Administration together with authorised institutions. The intention for the authorisation usually depends on the economy of the PPP, meaning the intended use. Hence for the products which are not sold in economically justified quantities the applicants would not submit the applications for the authorisation. In this respect it shall be underlined that PPP belonging to the group of low-risk substances (pheromone traps, basic substances used for human and animal consumption, etc.) or to PPP based on microorganisms and viruses are usually less present on the market and also less frequently used by users, which implies their insufficient economic coverage.

Measure 5: *Applications for the authorisation of PPP that belong to the group of low risk substances to the environment and human health (pheromone traps, biological control*

products, PPP based on basic substances and low-risk PPP) are encouraged through lower authorisation fees.

The Administration consistently consider new scientific knowledge on the impacts of PPP on human health and the environment in accordance with the Regulation (EC) 1107/2009 and eliminate PPP that signify unacceptable impact.

The Government lay down authorisation fees for the low-risk PPP.

5.1.6 Training in plant protection within the scope of the measure of agro-environmental payments (hereinafter referred to as: AEP)

In addition to the professional training in phytomedicine PPP users have been obliged to undertake also a certain volume of trainings if they have taken part in the measure of agro-environmental payments within the scope of the Common Agricultural Policy (hereinafter referred to as: CAP). It shall be therefore verified whether the contents of the IPM training and contents relating to the protection of human health and the environment and waste management that result from the use of PPP may be included in the CAP training contents.

Measure 6: *The Ministry amend the AEP training programmes with the contents on integrated pest management, protection of human health and the environment and include in these programmes also contents on the water management plan.*

5.1.7 Protection of non-target arthropods and honey-bees

The protection of honey-bees and other non-target arthropods is necessary. The existing practices defined by regulations do not secure a desired level of protection of non-target organisms; therefore, similar questions arise at each honey-bee poisoning incident. By strengthening the safety measures, honey-bee poisoning and consequently also adverse impacts on other non-target arthropods would be prevented.

Measure 7: *The requirements shall be defined for the PPP users concerning the proper use of PPP to prevent adverse effects on honey-bees, other non-target arthropods and other wild animals by a ministerial regulation.*

The Ministry shall prepare together with the Administration and in cooperation with the stakeholders a code of good agricultural and beekeeping practice that will signify the minimum risk possible for honey-bees in the agricultural environment (e.g. access to the water, avoiding placing beehives in the critical vicinity of spraying, dialogue with agricultural producers).

*Within the framework of the integrated rural development (hereinafter referred to as: IRD) the research of the impact of PPP on honey-bees shall be stimulated in order to protect the Carniola honey bee (Kranjska čebela) (*Apis mellifera carnica*).*

5.2 MEASURES IN THE FIELD OF HUMAN HEALTH

5.2.1 Exposure of operators, agricultural workers and bystanders

Human exposure to the adverse effects of PPP may take several forms. Workers in the production of PPP and users of such products are subjected to the highest exposure. However, workers who access the treated surfaces and people living near treated agricultural or non-agricultural land may also be indirectly exposed to PPP.

Measure 8: The Ministry shall define the PPP use regime in the areas that are located in the direct vicinity or within the inhabited areas

The Ministry shall include instructions for the use of PPP within inhabited areas into the spatial management guidelines.

Users and workers shall have access to the personal protective equipment.

Users shall learn about the measures aiming at reducing drift of pesticide mixtures to the neighbouring surfaces.

5.2.2 Human exposure through diet

Humans may be exposed to PPP residues through diet and drinking water. The impact on humans may be acute and chronic. The maximum residue levels that do not present risk to humans are established in regulations concerning pesticide residues in food and drinking water. Nevertheless, every effort shall be made to achieve the lowest PPP residue contents in food and drinking water and thus prevent any human exposure.

Measure 9: Agricultural practices shall be stimulated (organic and integrated farming and other schemes) which evidently influence on reducing the appearance of PPP residues in food, drinking water and the environment.

A system shall be established to inform the public consistently on data on pesticide residue levels in food from different types of productions and analysed in monitoring procedures.

5.3 PPP APPLICATION EQUIPMENT

5.3.1 Inspection of the equipment in use

Regular inspections of tractor (mounted or drawn) equipment or self-propelled equipment for the surface application of PPP (sprayers) and tractor or self-propelled equipment for the air-blast application of PPP (blowers) are governed by three regulations regulating the conditions of control labels obtaining (marks) indicating their proper operation:

- Rules concerning the granting of the conformity certificate with regard to devices intended for the application of PPP for new equipment;

- Rules concerning the conditions and procedures to be met and followed by control bodies authorised for carrying out regular inspection of PPP application equipment in order to obtain MAE authorisations;
- Rules concerning the record keeping of the register of certified types of application equipment that have been the subject to successful or unsuccessful regular inspection.

Each year in April before the start of the spraying season authorised organisations for inspection of the PPP application equipment shall organise field inspections. Users of the spraying equipment shall have their PPP application equipment tested every 3 years.

Measure 10: The Administration shall upgrade the existing inspection system for the PPP application equipment (further training of inspectors, the control of equipment inspectors, the implementation of the contemporary inspection methods and modern devices for the inspection that comply with the standards).

The training of PPP users shall include practical presentation of calibration and inspection of the equipment before applying PPP.

5.3.2 Introduction of improved techniques for the application of PPP

PPP users shall learn about the general principles of good agricultural practice. Before deciding the surface to be treated each user shall consider the possibilities of spray drift and shall apply PPP in a way that the drift to the neighbouring surfaces is prevented. If a user decides to grow a certain plant on a land where the possibilities for spray drift from the neighbouring surfaces are high, he/she shall take over the risk on him/herself. Control organisations shall not allow any residues of unauthorised PPP in agricultural produce, irrespective of whether these result from the PPP spray drift from the neighbouring surfaces or from improper use by the user.

Improved PPP application techniques contribute particularly to a better coverage of the treated surface and thus improve the effectiveness and reduce the spray drift of PPP outside the application area during application. Direct spray drift that results from the wind during the application shall be minimised. Using the nozzles of different types drops of certain sizes are formed by different flow rates or pressure from the liquid spray mixture, which are transferred to the target surface by the help of air pressure. The extent of the spray drift depends considerably on the size of drops and forces that act on their way towards the biological target. The users may influence/reduce the spray drift of a pesticide mixture which occurs as a result of chemical processes and atmospheric phenomena after the application particularly through selecting a proper time for PPP application (e.g. appropriate temperature, moisture, wind).^{xii}

Measure 11: The Ministry shall stimulate the purchase of new application equipment for PPP and seed treatment that meets the requirements for reducing spray drift and for uniform adhesion of PPP on the seeds.

The option of incentives for upgrading the existing equipment by using appropriate nozzles to reduce spray drift shall be considered.

The Administration shall prepare legal requirements for an appropriate classification of the machinery and equipment into basic spray-drift reduction classes in terms of technical possibilities for reducing spray drift.

Low-drift nozzles (anti-drift nozzles) reduce spray drift significantly (from 50-90%) (various types reduce the required distances from non-treated areas by e.g. 30–75%). However, there is no guarantee that the quality of PPP application on the biological target is maintained. Spray drift may also be reduced by using of appropriate blowers or sprayers, which may result in 75-90% lower PPP spray drift by using low-drift nozzles and air-curtains taking into the account the environment and weather conditions during application and using various PPP application techniques. Researchers are able to develop an appropriate application quality and minimal spray drift of the pesticide mixture by applying an appropriate combination of water consumption for spraying or drizzle, running speed and air pressure in the device. However, the systems for testing and developing the PPP application technique in Slovenia have never gone further than a small number of researches and tests for certain production types (e.g. fruit-growing, hop-growing, maize production). The development of methods shall be promoted and financially supported in the research and demonstration centres aiming at introducing methods to reduce spray drift outside the target production areas by using PPP application equipment which enables the reduction of spray drift by using low-drift nozzles and by combining other methods for the reduction of drift; or by adjusting operational parameters when using standard (classic) nozzles for the different types of agricultural production and types of PPP application.

Measure 12: The Ministry shall provide support to research and development in the field of PPP application quality using low-drift equipment and low-drift nozzles (anti-drift nozzles), and by adjusting spraying operational parameters when using standard nozzles, for establishing a list of appropriate PPP application equipment and low-drift nozzles (anti-drift nozzles) within the framework of IRD research projects.

5.4 SPECIAL PRACTICES

5.4.1 Aerial spraying

Due to the partition of agricultural land and settlement pattern in Slovenia safe aerial spraying of PPP avoiding spray-drift of these products onto houses, humans and animals is not possible; therefore, the aerial PPP application or aerial spraying has been forbidden so far.

Measure 13: The aerial spraying of PPP in Slovenia shall remain forbidden.

5.4.2 The protection of the aquatic environment and drinking water

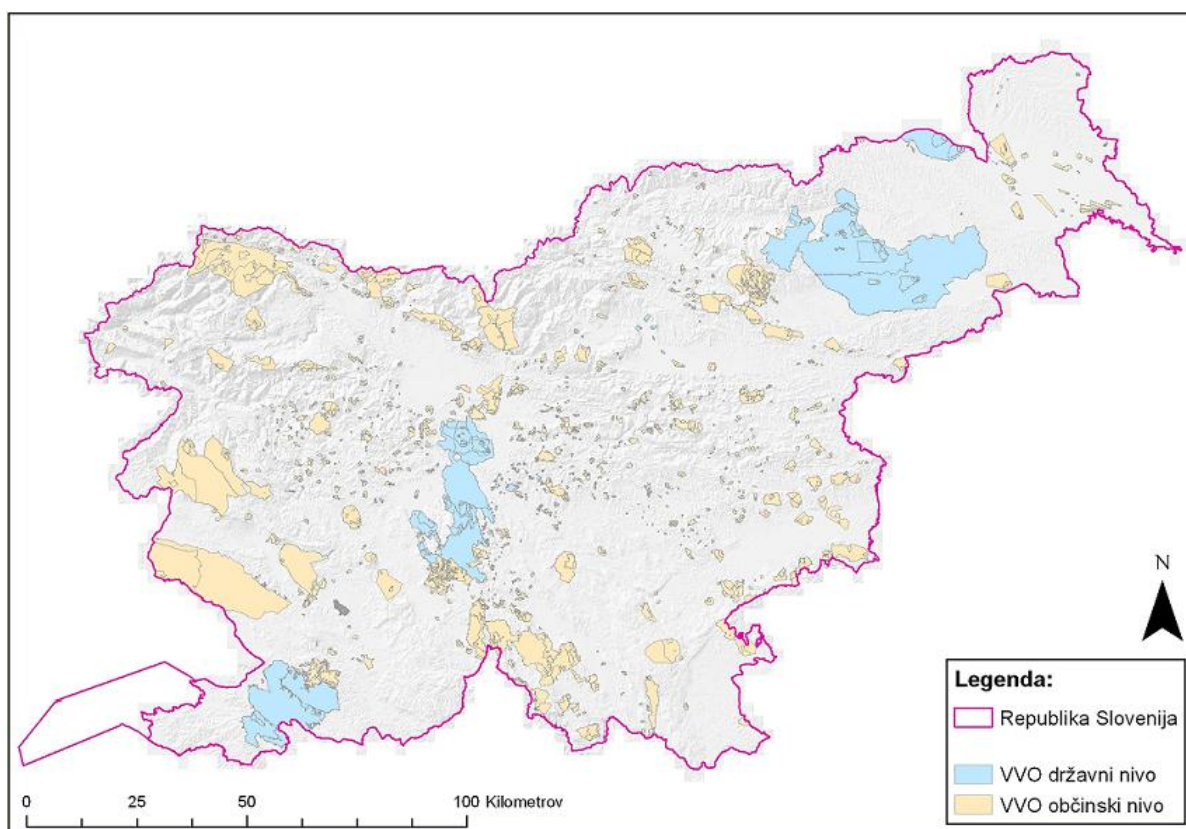
The protection of the aquatic environment and drinking water sources in the Republic of Slovenia is regulated by the Act on Water (Official Gazette of the Republic of Slovenia, No 67/02 and 57/08) which governs the management of water and the management of water and waterside land, which comprises the protection of water, the regulation of water and decision-making on the use of water.

The Act on Water implements into Slovenian acquis the requirements of the Directive of the European Parliament and of the Council 2000/60/EC establishing a framework for Community action in the field of water policy. This Directive stipulates that Member States shall identify water bodies that are or shall be used for the drinking water supply providing more than 10 m³ of water per day or serving more than 50 individuals; and establishing the safeguard zones for those bodies of water.

According to the data of the Slovenian Environment Agency the water protection zones (hereinafter referred to as: WPZ) occupy less than 345,000 ha or 17% of the entire territory in Slovenia.

The PPP use regime in water protection zones is stipulated by regulations on water protection zones. On the basis of the Act on Water, 9 regulations on WPZ have been adopted so far; in addition to these WPZs laid down by municipal ordinances have still been valid.

Image1: Water protection zones in Slovenia – national and municipal level



VVO državni nivo = WPZ state level

VVO občinski nivo = WPZ municipal level

Source: MAE, Service for the Register of Agricultural Holdings, May 2012

Various levels of protection are determined within the water protection zone. The most rigorous protection regime applies in inner water protection zones (WPZ I). Only the PPP which do not contain [active substances that are prohibited for use in inner water protection zones](#) may be used in the WPZ I. The list of prohibited active substances is published on the web pages of the Ministry of Agriculture and the Environment (MAE). On land located within

middle water protection zones (WPZ II) and outer water protection zones (WPZ III) PPP are allowed to be used only in accordance with the technological instructions for the integrated production.

The regulations stipulate also the additional conditions that shall be respected during the control of pests and weeds on agricultural land within the inner WPZ. It is very important that the PPP are used only as a supplementary measure to other non-chemical plant protection measures, which shall be mechanical, biological and biotechnical measures. Priority is given to those chemical measures and PPP that are allowed to be used in accordance with regulations that govern organic farming.

The Act on Water determines also the full prohibition of the use of PPP on waterside land in the layout width of 15 m from the water bank edge for 1st category water (i.e. main rivers, sea and lakes) and 5 m from the water bank edge for 2nd category water (i.e. smaller streams and similar), in order to protect surface water.

Moreover, the existing legislation in the field of PPP authorisation include also the conditions regarding the protection of ground and surface water and the protection of aquatic organisms that a certain product shall meet before it is authorised for placing on the market in the Republic of Slovenia. The level of PPP found in groundwater is decreasing; however, in certain flat-land areas in Slovenia (Drava and Mura basins) with the intensive agricultural activity the levels of certain PPP exceed the quality standard. In surface water the concentration and the content of various PPP changed over the years. Although the concentration of certain PPP decreased new active substances occurred which levels can exceed the quality standards; and the most problematic regions are Mura, Drava and Savinja river basins.

The Water Management Plan for the Danube river basin and Adriatic basin (hereinafter referred to as: WMP) has been adopted on the basis of the Framework Water Directive. Based on the determination of properties and the condition of water region management objectives for water protection and the regulation of water use have been specified in the WMP in order to achieve the good water condition by 2015.

The Programme of Water Management Measures 2011–2015 which includes basic and supplementary measures is also a part of WMP. The programme of basic measures consists of the Community water policy measures defined by the regulations implementing the provisions of the [Framework Water Directive](#) (2000/60/EC) and directives indicated in Annex VI of the Framework Water Directive (2000/60/EC) into Slovenian legislation; as well as other basic measures established by national legislation; that is the basic measures in the areas of economics, use, management and protection of water. Water bodies of surface and groundwater for which environmental goals will not be reached by 2015 the supplementary measures are foreseen to be implemented with the aim to achieve a good water condition or a good water potential. Supplementary measures are also foreseen for all water bodies of surface and groundwater with a view to prevent deterioration in the status. They include measures to reach the expedient use of water. In addition to this supplementary measures associated with economic instruments and climate changes have also been developed, as well as the other supplementary measures which are mostly recommendations for amending the legal and administrative procedures; and for research and developmental projects.

Considering the use of PPP a supplementary measure has been recommended in the Programme of Water Management Measures 2011–2015, which foresees that taking measures shall focus on the local circumstances and issues in the areas where a poor condition of surface and groundwater has been detected as a result from use of PPP. This measure includes

a proposal for the review of the farming practices in these areas and types of the PPP used. On the evidence of the risk established suitable alternatives to the existing farming practice shall be developed when necessary and appropriate training be exercised to apply these alternatives.

Measure 14: When preparing RDP 2014–2020, the Ministry with the cooperation of the professional services for plant protection and the environment include the measures of protection of the aquatic environment and drinking water resources into the framework of the measure of agro-environmental payments.

Measure 15: Whenever two or more PPP are available on the market with the same or similar effectiveness, a user gives preference to the product that has less harmful impacts on surface and groundwater and does not contain any active substance from the list of priority substances or special pollutants defined in the regulations that govern surface water status.

5.4.3 Reduction of PPP use or risk resulting from their use or prohibition of their use in specific areas

To avoid possible risk to human health the use of PPP shall be restricted or fully prohibited on non-agricultural and public areas, where the safe use of such products cannot be guaranteed by professional operators; or where possible the use of alternative methods to control the pests and weeds may be applied. The potential exposure of humans on public areas who could be subject to the risk arising from PPP application shall be taken into account.

Measure 16: The Ministry shall define the restrictions of PPP use in public areas.

In doing so they shall consider the use of non-chemical methods, in particular the possibility of mechanical control of pests and weeds and biological control. On non-agricultural surfaces such as road verges or railways the feasibility and economy of non-chemical method control shall be considered (e.g. use of water steam and similar).

At sport playgrounds the use of PPP shall be restricted to spot treatment only if the use of pesticides is urgent. In this case the minimum exposure shall be guaranteed to humans who come to the playgrounds after the PPP application. Following a preliminary evaluation of the urgency of the measure the PPP may be exceptionally allowed for use on the whole surface.

6 MEASURES IN THE FIELD OF AGRICULTURAL PRODUCTION

6.1 INTEGRATED PEST MANAGEMENT

The general principles of integrated pest management are laid down in the Annex III of the Directive 2009/128/EC which establishes a framework for Community action to achieve the sustainable use of PPP. In their action plans EU Member States shall describe the activities

and methods to implement individual principles and requirements referred to in the said Annex. Considering the new obligation imposed on Member States to establish a system of integrated pest management in accordance with the provisions of the Directive 128/2009/EC integrated pest management shall become a common agricultural practice.

Certain requirements of the Directive 128/2009/EC have already been implemented by phytosanitary legislation in Slovenia. In this respect the Plant Health Act has already regulated observing and forecasting of the occurrence of pests and weeds, the provision of the equipment necessary for this activity, advising and information in relation to the protection of plants against pests and weeds, which has not recently been regulated by EU regulations and was subject to different regulations at the level of individual Member States. These activities are determined in Slovene Plant Health Act (ZZVR-1) as obligations of the plant health public service and in the Agriculture Act as activities of the public agricultural extension service. In Slovenia the integrated pest management as defined in the Directive 128/2009/EC is covered to a large extent by the concept of integrated production or integrated agricultural production, which has also not been regulated by EU legislation so far and it is regulated differently in different Member States.

Integrated pest management means a combination of agro-technical measures and plant protection measures against pests and weeds. This is primarily aiming at reducing risk from PPP use to human health and impacts on the environment and reaching an efficient plant protection. The essential objective of integrated production is the balanced implementation of measures for the production of healthy and quality food taking into account the economic, environmental and toxicological factors.

In Slovenia the integrated production is stipulated by the Agriculture Act while detailed conditions are specified in the rules governing integrated production. Integrated production of arable crops, fruits, grapes and vegetables in Slovenia is a voluntary higher standard manner of agriculture production stimulated by agro-environmental payments within the framework of the Rural Development Programme 2007–2013. The technology, the control procedures and labelling methods are determined by the rules on integrated production and technological instructions for integrated production issued by the Ministry of Agriculture and the Environment (MAE) every year. MAE also authorise the organisations to carry out the control and certification that provide a constant control of the production; and they issue the certificates in accordance with the regulations.

The integrated production has been introduced in Slovenia in 1991. First attempts have been designed in fruit-growing, while later the principles of integrated production have extended to wine and vegetable growing. Also the system of integrated arable crop production has been established since 2004. In the year 2011 there were 52% of wine-growers, 26% of arable-crop growers, 70% of fruit growers, 65% of vegetable growers and 80% of hop-growers included into integrated production in Slovenia. The primary requirements of integrated production are to use PPP only when all other options have been exhausted (the implementation of preventive measures, mechanical and biological pest control, etc.). Preference shall be given

to non-chemical methods (mulching, false seedbed techniques, the use of tined weeders, tillers, thermal control, etc.); while PPP shall be used only when pests and weeds exceed the damage threshold. In the greenhouse production the use of beneficial organisms shall be preferred to the use of PPP. When the damage threshold cannot be determined (e.g. fungal diseases) the advice of forecasting service for plant protection shall be used for choosing an appropriate PPP at an optimal timing to minimise the frequency of treatments and achieve their maximum effectiveness. When selecting the PPP priority shall be given to the PPP that have as little as possible adverse side effects on non-target (beneficial) organisms. On farms included in the integrated production they shall comply with an appropriate crop rotation (e.g. in arable farming 5-year crop rotation), fertilise in accordance with the results of soil analysis and detailed records of all operations carried out shall be kept.

Organic farming with a limited range of chemically-synthesised PPP allowed for plant protection use plays a significant role in minimising the risk arising from the use of PPP; hence no PPP residues are expected to be found in organic products and foodstuffs. In the year 2011 there were 2,363 agricultural holdings included in organic farming (which is 3.1% of all farms in Slovenia) with 32,148.74 ha of agricultural land in use (6.8% of all agricultural land in use in 2011). Considering the orientation of the European strategic documents the organic farming will gain the status of an independent and obligatory measure in the new programming period which confirms the significance of organic farming in the European area.

The basic principles of organic farming and integrated production are similar with a difference that in the integrated production the use of all authorised PPP appropriate for the biological target concerned is allowed if the pests and weeds occur. Numerous factors are included in the IPM beside the principles of good plant protection practice to ensure high yield and its quality, such as:

- the use of healthy seeds and planting material irrespective of their origin;
- the knowledge of growing systems, resistant and tolerant varieties;
- the technological measures of plant cultivation, plant care, physiology and plant nutrition;
- the availability of biological control measures;
- the use of mechanical and other physical plant protection measures, including weed control;
- the monitoring of the influence of weather conditions on plant growth and development of pests and weeds and the use of the forecasting models for developmental stages or contagion;
- taking measures on the basis of advice of forecasting service dependant on calendar periods and the phenology of plants and pests and weeds established at the local level;

- the on-going local observing of individual plants and collection of data on extreme events;
- the compatibility of different PPP used and their side effects, e.g. on the predators of pests;
- the use of the most appropriate PPP and prevention resistance measures.

The Public Agricultural Extension Service organise annual training courses to inform users of PPP of the general principles of integrated pest management, which shall become a mandatory standard for agricultural production after 2014.

Measure 17: When preparing the measure of agro-environmental payments the Ministry shall include within the framework of RDP 2014–2020 and within the framework of quality schemes the option for the upgrading the integrated pest management measures.

Measure 18: The Ministry shall prepare in cooperation with the professional services the integrated pest management guidelines for each agricultural production sector.

Measure 19: In order to achieve the objectives of integrated pest management the Ministry shall provide for the programming (functional) connection of plant health, plant conservation, use of PPP and technology of specific agricultural production methods through the regular programming of expert tasks undertaken by public services, professional and research institutions and research work in the field of agriculture.

In this view, the Ministry shall set priority contents for the development of integrated pest management which implementation shall be delegated to different public services, professional and research institutions and research work in the field of agriculture through contracts by taking due regard also of professional services in the field of plant protection and of cultivation technology.

Measure 20: The Ministry shall support financially and by other means the purchase of machinery for carrying out the non-chemical control methods.

6.2 OBSERVING AND FORECASTING PLANT HEALTH SERVICE

With a view to keep the agricultural plant producers, allotment holders and amateur producers informed on proper or more targeted use of PPP as one of the pest control measures, modernisation and reinforcement of staffing of the plant health forecasting service is necessary. Systematic and continuous provision of meteorological, biological and other data are necessary for the prediction of occurrence of pests and weeds in agriculture; the monitoring of the development of pests that are usually present on plants and plant products and determination of optimal timing for their control; recording of outbreaks and expansion of populations of pests and weeds; the maintenance and upgrading of centres and infrastructure for the operation of the forecasting service.

This service operates as a public Slovenian plant protection service of the Ministry of Agriculture and the Environment and its operation being coordinated by the Phytosanitary Administration of the Republic of Slovenia under the Programme of work of the Republic of Slovenia for the Phytosanitary Field adopted by the Minister of agriculture. The Slovenian plant protection service performs tasks under the concessions subject to the Plant Health Act for the forecasting of pests and weeds (forecasting service) as well as plant health expert tasks which include diagnostic laboratories, research and development of new plant protection methods including biological control.

The activity is undertaken by five centres within the service which maintain the MAE-PARS agro meteorological network and prepare forecasting for plant protection to control the most important pests and weeds which cause economic damage in wine-growing, fruit-growing, hop-growing, olive-growing, arable farming and horticulture. Since 2002 the electronic PHYTO-INFO portal (www.fito-info.si) has been in operation which serves for the publication of forecasting information and for informing the system users via electronic means and by SMS messages on the occurrence of dangerous plant pests as well as of plant health measures to be taken, including warnings of natural hazards.

Table 3: The overview of pests in respect of which the forecasting activities are implemented and products for the control (PPP) in agriculture are advised in five Slovenian regions by considering their geographical, climate and agronomic characteristics:

Forecasts of the Plant Health Service of Slovenia (http://agromet.mko.gov.si)	
Arable farming: • cereals: Blumeria (Erysiphe) graminis, Septoria tritici, Septoria nodorum; Leptosphaeria nodorum, Rhynchosporium secalis, Pyrenophora teres, Oulema melanopus and Aphids • potato fields: Phytophthora infestans, Alternaria solani, Leptinotarsa decemlineata and Aphids; Horticulture: • cucumber plantations: Pseudoperonospora cubensis, Erysiphe orontii; • other vegetables: Ostrinia nubilalis, Delia radicum, Psila rosae, Napomyza gymnostoma Hop-growing: • Pseudoperonospora humuli, Sphaerotheca macularis, Phorodon humuli, Tetranychus urticae, Ostrinia nubilalis, Psylliodes attenuatus Koch;	Fruit-growing: • apple plantations: Erwinia amylovora, Venturia inaequalis, Podosphaera leucotricha, Panonychus ulmi, Aphids, Anthonomus pomorum, Hoplocampa testudinea, Cydia pomonella, Cydia lobarzewskii, Archips podanus, Adoxophyes reticulana, Leucoptera scitella • pear plantations: Venturia pyrina, Gymnosporangium sabinae, Pleospora allii, Cacopsylla pyri, Cacopsylla pyrisuga; • peach plantations: Taphrina deformans, Venturia carpophila, Stigmata carpophila, Laspeyresia molesta sin. Cydia m., Grapholita molesta, Anarsia lineatella, Cacopsylla pruni; • cherries and sour cherries: Blumeriella jaapii, Rhagoletis cerasi, Rhagoletis cingulata; • olive trees: Bactrocera oleae, Prays oleae; Wine-growing: • Vineyards: Plasmopara viticola, Uncinula necator, Phomopsis viticola, Pseudopeziza tracheiphilla, Botryotinia fuckeliana, Lobesia botrana, Eupoecilia ambiguella, Calpitrimerus vitis, Colomerus vitis, Panonychus ulmi, Pulvinaria vitis, Neopulvinaria innumerabilis, Scaphoideus titanus; • Cutting nurseries: Scaphoideus titanus

Table 4: The overview of centres for the plant protection prognosis in Slovenia

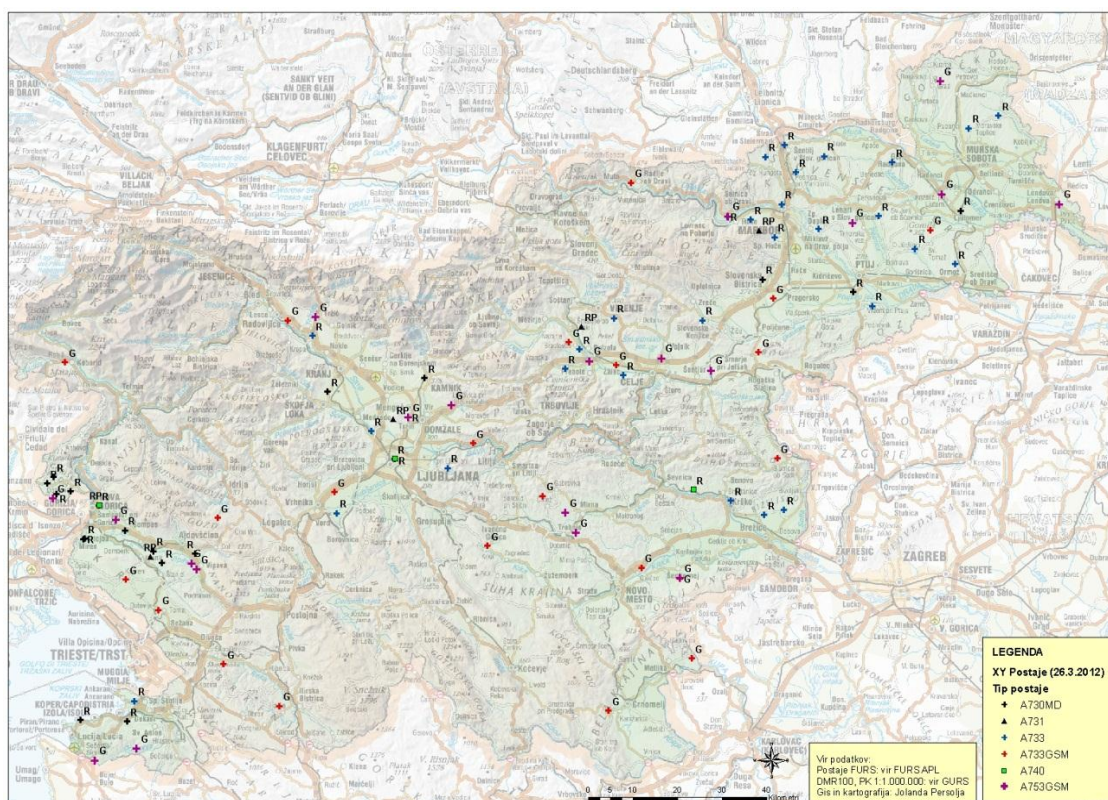
Operation (situation as of 26 March 2012)	Institution
Central Slovenia and general forecast for the entire Slovenia (3 forecasters) (17 agro meteorological stations)	Agricultural Institute of Slovenia, Ljubljana tel. answering machine: (01) 28 05 266 e-address: info@kis.si web page: http://www.kis.si

Celje and Koroška regions (3 forecasters) (13 agro meteorological stations)	Institute for Hop-Growing and Brewing of Slovenia, Žalec tel. answering machine: (03) 712 16 60 e-address: tajnistvo@ihps.si web page: http://www.ihps.si
north-eastern Slovenia (3 forecasters) (28 agro meteorological stations)	CAFS – Agriculture and Forestry Institute Maribor tel. answering machine: 090 93 98 12 e-address: info@kmetijski-zavod.si http://www.kmetijski-zavod.si/
south-eastern Slovenia (1 forecaster) (11 agro meteorological stations)	CAFS – Agriculture and Forestry Institute Novo mesto tel. answering machine: 090 93 98 17 e-mail: kss.oddelek-nm@gov.si web page: http://www.kmetijskizavod-nm.si/
western Slovenia (3 forecasters) (28 agro meteorological stations)	CAFS – Agriculture and Forestry Institute Nova Gorica tel. answering machine: 090 93 98 15 e-address: entolab@kvz-ng.si web page: http://www.kmetijskizavod-ng.si/

Table 5: The agro meteorological network consists of Adcon stations of different ownership origin (situation as of 26 March 2012), which provide for data access through the portal where also data from ARSO reference stations are collected to be used in agriculture (<http://agromet.mko.gov.si>)

	Owner			
Centres	Centre	Other	MAE	TOTAL
CAFS – MB CENTRE	19	7	2	28
IHPS	10	1	2	13
CAFS – NM CENTRE	9		2	11
CAFS – GO CENTRE	26		2	28
AIS	17		1	18
TOTAL				98

Image 2: Network of agro meteorological stations on 26 March 2012



Source: PARS; <http://agromet.mko.gov.si/index.asp?ID=Varstvo/default.asp>

The forecasting centres shall be closely connected with research-demonstration-experimental centres for examining the methods of control of pests and weeds in a sustainable and biological manner; and shall cooperate in the transfer of knowledge into practice by means of Agricultural extension service, agricultural technologists and other experts.

Measure 21: *The Administration shall upgrade the forecasting system for pests and weeds and/or recommending plant protection measures which shall include all agricultural branches: the special attention shall be devoted to the development of methods in arable farming, vegetable cultivation and growing of ornamental plants.*

In addition to the forecasting of pests on different cultivated plants, the advising shall include also alternative pest control methods to chemical methods. Concerning the proposed chemical measures the preference shall be given to PPP which impose the lowest risk to human health and the environment and comply with the principles of integrated pest management. The Ministry shall with the assistance of the professional services provide the accessibility of information in different ways to all producers on a long-term basis.

The information intended to the users of PPP shall be comprehensive; all the risk arising from lower effectiveness of alternative and non-chemical methods used as well as impacts on the quality of the yield shall be indicated and also warnings of economic consequences.

For the efficient implementation of the measure the following shall be provided in accordance with the existing financial and staffing possibilities of the Ministry and relevant services:

- maintenance and strengthening of the public service in the light of financing of the existing systems;

- cooperation between the existing advisors working for Agriculture Forestry Chamber of Slovenia with other available experts working for public institutions, so that they are involved in the system of forecasting service as an integral whole;
- long-term maintenance, upgrading and financing of: the forecasting data storage, software for processing meteorological data, the preparation of forecasting notices, delivery of notices and web portals for public information – warning system and assistance to plant producers in taking decisions;
- maintenance of a network of observation/measurement points of an appropriate density (agro-meteorological stations: measurement devices, the monitoring of the phenology of agricultural plants and pests and weeds).

Measure 22: To support the introduction of integrated pest management by the operation of the forecasting service and experts in plant protection the Ministry shall take actions to improve advisory service, equipment, information systems, reinforcement of the staff and expansion of work contents by upgrading the existing good plant protection practices and integrated pest management or by organic farming where relevant.

6.3 DEVELOPMENT AND RESEARCH OF NEW PLANT PROTECTION METHODS

In order to meet the needs of Slovenian agriculture from the perspective of minimising the risk arising from the use of PPP the corresponding research-experimental-demonstration centres (arable farming and horticulture, fruit-growing and tree nursery, vine-growing and wine nursery centres) which shall lay the foundation for a permanent provision of research and the professional and technological innovation of integrated pest management shall be reinforced. In these centres new pest management methods, appropriate alternative methods such as biological control, mechanical and other non-chemical methods and suitable technological solutions related to general principles of IPM shall be introduced. The centres shall also provide the transfer of knowledge to advisors and other experts who would transfer the solutions into practice. This knowledge shall be incorporated in the IPM principles appropriately.

The existing centres shall be reinforced on the basis of joint programmes with plant protection experts at regional centres, institutes and universities within the existing disposability, which would guarantee a minimal level of qualified and equipped professional institutions with experts who may credibly participate in the national and international projects and the transfer of the knowledge of integrated pest management into the Slovenian practice.

The permanent tasks of diagnostic laboratories for organisms harmful to plants shall be linked with the observation of changes in the cultivation and in the environment and with early warnings of threats posed by pests and weeds by taking into account the adjustments to the forecasted climate changes.

The public plant health system shall be included into the activities of demonstration-experimental centres; the professional services shall assist in the control of pests that occur in the territory of Slovenia and cause the economic, social or environmental damage; and they

shall ensure the transfer of non-chemical preventive methods from the quarantine harmful organism control into plant health practice in a given agriculture production.

The existing mechanisms shall be spent on a transparent, performing and efficient national and international exchange of information concerning the new risk to human, animal and plant health and the environment:

- The fieldwork collection of biological and environmental information through monitoring and systematic special control of pests and weeds;
- The record keeping, processing and delivery of information on pests and weeds, including spatial analysis and model processing in the geographic information system;
- The linking of international contact points in Slovenia into the information network.

The existing centres shall evolve into the demonstration-experimental centres for IPM located in the areas with various climate and agricultural conditions related to different crop production (e.g. Jable centre, other experimental centres for fruit-growing, wine-growing, hop-growing, etc.).

6.3.1 Experimental centres for fruit-growing, wine-growing, olive-growing and hop-growing

Due to the environmental diversity in Slovenia two centres for grapevine-growing have been established: the Selection and Nursery Centre Vrhpolje near Vipava for the Primorje winegrowing region; and the Selection and Nursery Centre Ivanjkovci near Ormož for the Podravje and Posavje winegrowing region. The main task of both centres is the provision of pre-basic propagating material of the vine in particular of varieties, clones and indigenous varieties which ensure stable and quality yields in our climate and soil conditions and enhance the economy of production. Their main activity is the production of a healthy selected basic propagating material intended to grapevine growers, and the selection of new elite vines of all important varieties. These tasks require long-standing continuous work which owing to the nature of procedures shows results only after a long period of time; however, they provide wine-growers with a constant supply of quality certified planting material needed for the planned Slovenian vineyard renovation. The result of the long-standing substantial work was also the certification of 39 new Slovenian clones of the vine. The work continues with a new cycle of selection, choice and breeding of elite vines of important varieties and also interesting indigenous varieties.

Considering its favourable soil and climate conditions the fruit-growing is one of the most significant agriculture sector of the Primorje region, which is the biggest production region for stone-fruit due to its geographical position. The major task of the Fruit-Growing Centre Bilje is a regular supply of the healthy pre-basic propagating material (grafts) of stone-fruit to Slovenian suppliers of basic and certified propagating material. The majority of varieties in

demand of the standard (CAC) and certified status are obtained from stock nurseries and from the cultivation under plastic net cover, where the material of a high genetic value and appropriate health status is produced, which enables certification of planting material under the European standards. The supply of grafts is based on varieties which are subject to the highest demand with the exemption of protected varieties. Indigenous varieties also gain more and more commercial attractiveness. Another important task of the centre is the testing of varieties and rootstocks of stone-fruit species, in particular peaches, cherries, plums and apricots, and the examination of technologies in the respect of selected varieties and rootstocks. The data gained are intended for the evaluation of the suitability of new varieties for growing in our soil and climate conditions which has been followed in the selection of varieties in fruit selection revisions. Technological recommendations and instructions shall be issued to producers in order to be able to reach better results in the production of new varieties or rootstocks. The centre shall continue its cooperation with all professional institutions and business associations (commerce) in the testing of market-attractive varieties, indigenous varieties and rootstocks regarding the natural resources and climate changes; and in the selection undertaken to obtain their own parent plants; and further implementation of applicative and development experiments in fruit-growing.

The Fruit-Growing Centre Maribor is situated in the largest pome fruit production area and it is the most suitable for this kind of testing due to its geographic position. The major task is the supply of the quality pre-basic propagating material of pome fruit of a virus-free status to Slovenian suppliers of basic and certified propagating material; for this purpose a parent plantation for the production of virus-free grafts of apples and pears and a parent rootstock nursery for apples is maintained in the centre. The tasks of the special examination of the varieties and rootstocks of fruit species, including the searching for and testing of more appropriate species, varieties and clones adapted to more extreme production conditions include the applicative testing for the final fruit production, research testing in cooperation with research institutions and the technical and applicative testing of machinery. Another important aspect is examining the reduction of the input of synthetic chemical plant protection products and their replacement with the sufficiently effective natural active substances and mechanical methods; and the rational use of irrigation water by the determination of the minimum quantities of water to ensure stable fruitfulness and high quality of yield.

The activity of the centre is also testing the technologies for a sustainable environment and human-friendly production and developing the technologies of integrated and organic farming. A systematic approach is being introduced for the preservation and renovation of extensive meadow orchards, consisting of identification and evaluation of old (indigenous) varieties. The results of these activities are used as an important basis for establishing the fruit variety selection as a professional recommendation to fruit-growers.

The tasks of the centre for olive growing are: the care for the introduction plantations; the discovery and maintenance of unknown varieties and clones through the propagation and the maintenance of varieties collection; the care for mother plantations; the establishing of the

fruitfulness of the variety 'istrska belica' related to the various reproduction methods; the assessment of the impact of soil and nutrient content in leaves on fruitfulness; monitoring the control of olive fly, olive leaf spot and olive violet spot; and monitoring the ripening of two varieties with regard to the oil content and quality of olive oil at the different times of harvest.

The specialty of the activities taken in the centre for olive growing is the final product – oil. A significant proportion of resources are associated with processing and analysing.

At the Institute for Hop–Growing and Brewing of Slovenia in Žalec an intensive hop breeding programme has been undertaken for over 50 years to obtain new Slovenian hop varieties adapted to our soil and climatic conditions and resistant to diseases, in particular to hop downy mildew and powdery mildew on hops; and recently also to the hop quarantine disease – hop wilt. They also produce planting material within the certification scheme for hops by maintaining the pre-basic parent plants, basic parent plants and certified hop planting material which are virus-free and viroid-free. Healthy and quality planting material is the basis for further protection of hops under the guidelines for integrated production. At the Institute new PPP with lower risk to the environment, humans and non-target organisms have been tested for a number of years. They also introduce other agro-technical measures to reduce the population of pests and weeds and initiate the organic production of hops. They inform operators on a regular basis of the results of tests by organising the lectures, regular technological meetings, seminars and visits to learn about all the latest achievements and knowledge. They also perform tests in the field of application of PPP, namely the use of low-drift nozzles and all the measures that contribute to the reduction of drift of pesticide mixtures (the use of air-curtains, one-side border spraying, various application methods, etc.). They research the PPP application techniques also in other crops not only in hop-growing.

Measure 23: The experimental centres for fruit-growing, wine-growing, olive-growing and the professional institutions in the field of horticulture, arable farming and hop-growing shall also carry out the research in the optimal production technologies that are effective in the pest control and they lead to the reduction of risk arising from the use of PPP and their adverse effects; and the research in biological plant protection methods and sustainable use of PPP due to the general orientation towards the reduction of use of PPP. They shall continue the testing of new resistant or tolerant varieties. They shall present the examples of good agricultural practice to users by organising the visits, lectures and practical presentations to keep them informed of all novelties in relation to plant health.

6.3.2 Experimental centres for horticulture

The experimental programme of horticulture centres and stations has been carried out since 1992. Horticulture experimental-demonstration centres or stations have operated in different production areas of Slovenia. Through their infrastructure they have ensured a quality implementation of the Programme of special testing of vegetable varieties and enabled a direct transfer of knowledge to the users in the separate production areas. Due to the large

variation of the agro-environmental conditions vegetable varieties and production technologies need to be tested at different areas and recommendations shall be prepared for separate production areas. The centres and stations that still operate today are the Horticultural Centre at the Agricultural Institute of Slovenia, the Horticultural Centre at the Biotechnical Faculty in Ljubljana, the Horticultural Station in Nova Gorica and the Horticultural Station in Ptuj.

The testing of the vegetable varieties in our production conditions is necessary for the establishing of their adaptation ability to our growing circumstances. The growing of the suitable vegetable varieties that are adapted to the growing conditions give good quality yields and are resistant to pests and weeds is very important for the better economy of production.

Measure 24: The Ministry shall promote the development, research and the introduction of new technological methods with the emphasis on integrated pest management and the testing of varieties that are resistant to pests and weeds or tolerant to stressful growing circumstances and suitable for our soil and climate conditions.

The Ministry shall also promote organic farming in small family gardens; together with the professional services they shall prepare the guidelines of good plant protection practice in gardens.

7 RISK INDICATORS

It is necessary to measure the progress achieved in the reduction of risk and adverse impacts arising from pesticide use on human health and the environment. The appropriate means are harmonised risk indicators intended to the monitoring of achieving the NAP objectives. They are used for risk management at the national level and for reporting purposes.

Based on the measures for achieving the objectives of NAP we propose the following risk indicators to be applied:

1. Volume of the sale of PPP

- sales data may be monitored also for the certain groups of active substances that pose greater risk to the environment and human health due to their properties, in particular substances that are identified as candidates for substitution under regulations that govern plant protection products;

2. Frequency of the Use of PPP

- Frequency of Use index expressing the information on how many times a certain agricultural surface may be sprayed in each year with the sold quantity of a certain PPP, provided that a product is applied in the recommended doses;

$$\text{FU-index} = \frac{\sum (\text{SA}_{a.s.} / \text{SD}_{\text{plant species}}) / \text{AUC}_{\text{plant species}}}{\text{all active substances}}$$

SA_{a. s.}: sold amount of a certain active substance in one year

SD_{plant species}: standard dose for every active substance in every culture

AUC_{plant species}: area under cultivation by a particular crop/crop type

When interpreting this indicator due consideration shall be given to the fact that the entire sale of an active substance is reported as the use in agriculture sector although certain active substances may be used also in other sectors.

3. **Load Index**, which is based on the calculation of proportion between the sold quantity of an active substance in a certain time period (one year) and the result of multiplication between the total area under cultivation and LD₅₀ or LC₅₀ (dose or concentration that causes death in 50% of the organisms exposed). The said index shall be calculated for all active substances sold and shall be expressed as follows:

$$LI = \sum (SA_{a. s.} / (TOX \times TCL_{year}))$$

all active substances

SA_{a. s.}: sold amount of a certain active substance in one year

TOX: LC₅₀ or LD₅₀

TCL_{year}: Total cultivated land in one year

When interpreting this indicator due consideration shall be given to the fact that the entire sale of an active substance is reported as the use in agriculture sector although certain active substances may be used also in other sectors.

4. **Use of pesticides in agriculture** (usage of an active substance in kg/ha);
5. **The number of users who have received the training under the new programme** (data on the number of participants of the training);
6. **The number of distributors, advisors and sellers who have received the training under the new programme** (data on the number of participants of the training);
7. **The number of users who have received the training under the Agriculture Environment Programmes**, which include contents on the integrated pest control;
8. **The number of PPP application equipment tested** under the new programme;
9. **The number of new PPP application equipment in use**;
10. **The average age of PPP application equipment in use**;

11. **The number of new devices intended to the non-chemical control** of pests and weeds;
12. **The proportion of samples of foodstuffs with exceeded maximum pesticide residue levels** (national production and other production);
13. **The proportion of samples of foodstuffs that contain pesticide residues** (data referring to different commodities: fruits, vegetables, cereals, etc.);
14. **The proportion of samples of groundwater** which does not meet the requirements under the Water Framework Directive;
15. **The proportion of samples of drinking water** which does not meet the requirement under the regulations on drinking water;
16. **The proportion of samples of surface water** which does not meet the requirement under the Water Framework Directive;
17. **The number/proportion of agricultural holdings included in organic production;**
18. **The proportion of agricultural cultivated area where organic farming is carried out;**
19. **The monitoring of adverse effects of PPP to human health** (toxic vigilance), as follows:
 - a) the number/proportion of adverse effects or intoxications of operators and/or agricultural workers with PPP;
 - a) the number/proportion of adverse effects or intoxications of humans with PPP through diet;
 - a) the number/proportion of adverse effects or intoxications due to improper use of PPP.

8 DATA COLLECTION AND METHODS OF REPORTING

The Ministry shall establish an expert group to collect the required data or reports by individual measures. On the basis of data, reports and analysis an annual report on the progress made in achieving the objectives of the NAP and proposals for future activities shall be prepared. The expert group may also propose the amendments to the NAP with additional measures for achieving the objectives of the NAP.

The Ministry shall use the statistical data to calculate the risk indicators collected in accordance with Community regulations concerning statistics on plant protection products, together with other relevant data. Trends in the use/sale of certain active substances shall be identified.

When calculating risk indicators priority shall be given to active substances (that belong to the group of substances of concern), plants, regions or practices that require particular attention or good practices that can be used as examples for achieving the objectives of this programme to reduce the risk and impacts of pesticide use on human health and the environment and to encourage the development and introduction of integrated pest management and of alternative methods or techniques in order to reduce dependency on the use of pesticides.

The Ministry shall respect the opinion of the expert group in specifying the quantity targets.

The expert group that participated in the preparation of the NAP shall take part in preparing the report on achieving the objectives of the programme. The additional members shall be invited into the expert group if necessary.

The expert group shall consist of the representatives of the institutions which perform activities related to the individual measures, including the non-governmental organisations.

The report shall be published annually on the Ministry web page.

ⁱ Resolution on strategic guidelines for development of the Slovenian agriculture and food technology by 2020 – 'Zagotovimo.si hrano za jutri'. Official Gazette of the Republic of Slovenia, No 25/11 as of 4 April 2011.

ⁱⁱ Urek, G., M. Knapič, M. Zemljič Urbančič, V. Škerlavaj, A. Simončič, J. Persolja, M. Rak Cizej, S. Radišek, M. Lešnik (2012) Raba fitofarmacevtskih sredstev in preučitev možnosti za njihovo racionalnejšo uporabo v Sloveniji (Use of plant protection products and studying the possibilities for their more rational use in Slovenia).- Agricultural Institute of Slovenia, Ljubljana, 163 p.

ⁱⁱⁱ International Plant Protection Convention – IPPC. Act ratifying the Plant Protection Convention (amended), Official Gazette of the Republic of Slovenia – International Treaties, No 23/00; Official Gazette of the Republic of Slovenia, No 84/00.

^{iv} Code of maximum values of residues in food and feed (FAO/WHO Codex Alimentarius).

^v Convention on Biological Diversity – CBD) and its Cartagena Protocol on Biosafety.

^{vi} WTO Agreement on the Application of Sanitary and Phytosanitary Measures; SPS Agreement.

^{vii} EPPO Standards.

^{viii} Decision on the prohibition and/or restriction of use and the placing on the market of certain toxic substances and preparations derived from them used as plant protection products. Official Gazette of the Republic of Slovenia, No 29/96.

^{iv} Urek, G., Gartner, A., Gregorič, A. 1995. Onesnaženost krompirja in krompirišč z ostanki fitofarmacevtskih sredstev (Contamination of potato and potato fields with pesticide residues). *Zbornik predavanj in referatov z 2.*

slovenskega posvetovanja o varstvu rastlin (Proceedings of lectures and papers from the 2nd Slovenian consultation on plant protection, 1995, p. 163–175.

^x Maček, J. 1992. Kontaminacija tal in rastlinskih pridelkov z ostanki fitofarmacevtskih sredstev v Sloveniji v obdobju 1973–1991. (Contamination of soil and crop products with pesticide residues in Slovenia in the period 1973–1991.) Zbornik Biotehniške fakultete Univerze v Ljubljani (Proceedings of the Biotechnical Faculty in Ljubljana), 1992, vol. 59, p. 229–240.

^{xi} Order concerning the prohibition or restriction of marketing and/or use of plant protection products containing certain active substances. Official Gazette of the Republic of Slovenia, No 105/01

^{xii} Tojanko, S., Schlauer, B., Vogrin, A. Slovenska integrirana pridelava sadja (Slovenian integrated fruit production). *Sodobno kmetijstvo* 1996, vol. 29, 4, p. 171–175.

^{xiii} Stanislav VAJS, Mario LEŠNIK, Milica KAČ. MOŽNOSTI ZMANJŠEVANJA POJAVOV ZANAŠANJA (DRIFTA) HERBICIDOV PRI ZATIRANJU PLEVELOV V KORUZI Z UPORABO STANDARDNIH ALI ANTIDRIFTNIH ŠOB (POSSIBILITIES FOR THE REDUCTION OF HERBICIDE DRIFT AT WEED CONTROL IN MAIZE BY USING STANDARD OR DRIFT-REDUCING NOZZLES). Zbornik predavanj in referatov z 2. slovenskega posvetovanja o varstvu rastlin (Proceedings of lectures and papers from the 2nd Slovenian consultation on plant protection), Radenci, 6 and 7 March 2007.