



Paolo Balsari, Emilio Gil, Hans-Joachim Wehmann [ed.]

# Sixth European Workshop on Standardised Procedure for the Inspection of Sprayers in Europe SPISE 6

Barcelona, Spain, September 13 – 15, 2016



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## MINISTERIO DE AGRICULTURA Y PESCA, ALIMENTACION Y MEDIO AMBIENTE

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## Preface

Plant protection equipment must dose and distribute products exactly and function faultlessly. In order to achieve this, plant protection equipment should be inspected regularly to be able to identify and eliminate any technical defects. However, there are three main arguments for the inspection:

- good control of the pest with the minimum possible input of crop protection product
- less potential risk of environmental contamination by crop protection products
- safety hazards for the operator

The inspection of plant protection equipment is becoming more and more interesting for the Member States (MS).

The 1<sup>st</sup> European SPISE workshop (Braunschweig, DE) took place in April 2004 in prompted by the publication of European Standard 13790; the 2nd European Workshop aims to support the MS in introducing inspections for plant protection equipment. This Workshop represented a platform on which to discuss further regulations for introducing, putting into practice and monitoring the inspections in the MS and for co-ordinating them. This was carried out in the form of lectures, working groups or excursions. In some MS such as Belgium, Germany and the Netherlands, equipment inspections have been developed and established over the past few years, and although they are organised in different ways (state-run, private sector); they have all resulted in high-quality technical inspections, ensuring reliable and efficient plant protection equipment.

Within the 2<sup>nd</sup> SPISE workshop (Straelen, DE), the legal/statutory regulations and technical standards for successful plant protection equipment inspections already in force in the countries stated above have been presented as examples and described in detail. The excursions to the three MS have shown their practical implementation which could be analysed and taken as a basis for implementation in one's own MS.

The 3<sup>rd</sup> SPISE workshop (Brno, CZ) represented a platform on which to discuss further regulations for introducing, putting into practice and monitoring the inspections in the Member States and for co-ordinating them. In the meantime the Directive of the European Parliament and of the Council establishing a framework for Community action to achieve the sustainable use of pesticides obliges the Member States to ensure that pesticide application equipment in professional use shall be subject to inspections at regular intervals. The 3rd European Workshop informed the participants about the newest legal developments and showed which procedures/documents accompanying the article 8 of the Sustainable Use Directive (SUD) under the responsibility of the Member States are required. The Directive determines the key points. The development of procedures between the MS is left to the Member States according to the principle of subsidiarity. They have a fair amount of leeway and are able to take their own experience and conditions into consideration.

The 4<sup>th</sup> SPISE workshop took place in Lana, South Tyrol in March 2012. The aim was to support the introduction of inspections of plant protection equipment already in use in the Member States (MS) of the EU. Following the publication of Directive 2009/128/EC in October 2009, the Member States have to introduce technical inspections for plant protection equipment at regular intervals and ensure that all items of plant protection equipment have been inspected at least once by 2016. Due to the region of South Tyrol

the focus this time was on the air-assisted sprayers. During the workshop the attendants were invited to register themselves in Technical Working Groups (TWGs). These 7 TWGs have the task to discuss and to prepare advices regarding up to now not clear details of article 8 of the SUD.

In October 2014 the participants of the 5<sup>th</sup> SPISE workshop met at Montpellier, France. During the 7 sessions the attendants were informed about the intermediate results of the TWGs. These groups met in the meantime seven times. They presented the state of work and of the preparation of the so-called SPISE advices.



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## **An overview of the pesticide application equipment in Ovcepole region in Republic of Macedonia**

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The Directive 2009/128 / EC of the European Parliament establishes a framework for the implementation of National Action Plan referring to the sustainable use of pesticides in every country. One of the areas covered by the Directive relates directly to the introduction of mandatory monitoring and inspection of pesticide application machines. Considering that the Republic of Macedonia does not have a compulsory inspection, and as a country candidate is bound to harmonize its regulations, the basic aim of this research is to determine the current condition of the pesticide application machines. The survey was conducted in the Ovchepole region, which covers the city of Sveti Nikole and surrounding villages. 46 machines were visually and operationally checked. The results of this research will be a good basis for further research and implementation of mandatory inspection of these machines in the Republic Macedonia.

# **An overview of the pesticide application equipment in Ovcepole region in Republic of Macedonia**

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## **Summary**

The Directive 2009/128 / EC of the European Parliament establishes a framework for the implementation of National Action Plan referring to the sustainable use of pesticides in every country. One of the areas covered by the Directive relates directly to the introduction of mandatory monitoring and inspection of pesticide application machines. Considering that the Republic of Macedonia does not have a compulsory inspection, and as a country candidate is bound to harmonize its regulations, the basic aim of this research is to determine the current condition of the pesticide application machines. The survey was conducted in the Ovchepole region, which covers the city of Sveti Nikole and surrounding villages. 46 machines were visually and operationally checked. The results of this research will be a good basis for further research and implementation of mandatory inspection of these machines in the Republic Macedonia.

**Key words:** plant protection, pesticides, inspection, application equipment

## **Introduction**

The overuse and misuse of pesticides pose a threat to the environment and health hazards for the farmers in the agricultural production. Pesticide residues in food affect directly the health of consumers and the increasing number of infected people. In addition, exporters of food must comply with the standards on the minimum allowed presence of residues in processed foods, fresh fruits and vegetables. The non-compliance with these standards can have catastrophic effect on the increasing of export, which is one of the primary economic objectives of our country.

With the new law on plant protection, the agricultural policy of our country pays special attention to the protection of agricultural land from pollution and to the principles of environmental protection. The law deals with the economic, health, environmental and social role of agriculture and establishes the principle of agricultural policy measures that are to be aimed at encouraging sustainable agricultural activities. The measures are aimed at maintaining the diversity of animal and plant species, conservation of soil and of its fertility and protection of natural conditions necessary for life in soil, water and air.

However, the outdated technology in Macedonia, worn and poorly maintained machinery and pesticide application equipment cause directly the increased number of treatments, poor protection and uncontrolled spread of diseases and pests in the agricultural production.

Last few years, the European Commission adopted a whole set of rules (directives) and broadened the scope of all those regulations. According to the guidelines presented in the directives, all national regulations in the Member States must be harmonized when the countries introduce new laws. The Directive 2009/128 / EC of the European Parliament establishes a framework for the implementation of the National Action Plan in each country, which refers to the sustainable use of pesticides. One of the areas covered by the Directive relates directly to the introduction of mandatory monitoring and inspection of pesticide application equipment. Considering that in the Republic of Macedonia the inspection is not mandatory, and as a country candidate it is bound to harmonize its regulations, the main goal of this research is to determine the current condition of the pesticide application equipment. The results are a good basis for further research and an opportunity to apply standardized procedures for mandatory inspection of machinery for pesticide application.



In the Republic of Macedonia at the end of 2014 began a process of harmonization of the old law for plants protection with new rules and regulations required by the European Commission. The new rules and regulations, inter alia, pay special attention to the pesticides application equipment and to their mandatory inspection at specific time intervals.

Because of that, within the Phytosanitary Administration are established committees whose objective is to work on alignment of the law and on collecting experiences from other member states of the European Union that have undergone this process or are at an advanced stage. This year in collaboration with the Phytosanitary Administration were organized several meetings with farmers, with the distributors of pesticides as well as with economic operators who sell machines for pesticide application. The goal is to consider all aspects for optimizing the new laws and regulations, and in terms of machinery for pesticide application, establishment of monitoring and rapid onset of inspection.

### **Material and methods**

The research was conducted in the Ovchepole region covering the city of Sveti Nikole and neighboring villages i.e. the municipality of Saint Nikole with larger villages: Erdelija, Mustafino, Amzabegovo, Crniliste, Kadrifakova, Peshirovo, Gorobinci, Sopot, Preod, Stanjevc, Gjugjanci, Nemanjici, Meckuevci and Knezje.

The instrument used during the field research was the questionnaire including data divided into three groups:

- a) General information about the owner
- b) General information on the pesticide application machines
- c) Visual and operational flaws of the machines

### **Results and Discussion**

The Ovchepole region is one of the major agricultural regions in the Republic of Macedonia, where most crops are grown and recently new vineyards and orchards are recently renewed and raised.

This research aims to determine the current condition of a part of the pesticides application machines and the number of machines complying with the requirements of European Standard EN 13790 and the new EN ISO 16122, which relate directly to the inspection of pesticide application equipment and machines.

Table 1 provides general information about the farmers owning pesticide application equipment. According to the data in the table it can be concluded that most of the farmers are registered and that they usually have secondary education. The fact that all surveyed farmers have not attended any training on quality and safe handling of these machines is worrying. This means that they use the machines according to their own experience or according to the experience of their relatives and friends that is often wrong or unsafe. The data in this table also show that field crops are the most common in this part of the municipality.

In Table 2 are presented pesticide application machines that are most common in this part of the Ovchepole region. According to the data we can conclude that the most common brand of pesticide application machine is Aromehanika Kranj. The fact that these machines are usually old between 10-20 and over 20 years is worrying. On the other hand, if they are not properly maintained and used they can contribute to the increasing pollution of the environment. As a result of the aid and subsidies that farmers receive for purchase of new machinery in the last 7-8 years we have noticed an increased number of new pesticide application equipment.

Tab. 1. General data on farmers in the Ovchepole region

Number	Registered farmers			Education of the farmer/manager			Attendance on trainings for PAE		Structure of the land in ha			
	Yes	No	Enterprise	Primary	Secondary	High	Yes	No	Field crops	Viticulture	Fruit production	Horticulture
1.	x	/	/	/	x	/	/	x	3	0.4	/	/
2.	/	x	/	/	x	/	/	x	4	1	/	/
3.	x	/	/	x	/	/	/	x	6	1.4	/	0.2
4.	/	x	/	x	/	/	/	x	4	2	/	/
5.	/	x	/	/	/	x	/	x	7	0.2	/	/
6.	x	/	/	/	x	/	/	x	40	0.4	/	/
7.	x	/	/	/	x	/	/	x	100	4	/	/
8.	x	/	/	x	/	/	/	x	27	/	11	/
9.	/	x	/	/	/	x	/	x	10	0.1	/	/
10.	x	/	/	/	x	/	/	x	5	1	/	/
11.	/	x	/	/	x	/	/	x	4	/	/	/
12.	x	/	/	/	x	/	/	x	80	/	/	/
13.	/	/	x	/	/	x	/	x	1500	75	35	/
14.	/	/	x	/	/	x	/	x	170	/	1	/
15.	x	/	/	/	x	/	/	x	4	0.5	/	/
16.	x	/	/	/	x	/	/	x	50	/	/	/
17.	x	/	/	/	x	/	/	x	20	/	/	/
18.	x	/	/	x	/	/	/	x	2	0.5	/	/
19.	x	/	/	/	x	/	/	x	200	2	/	/
20.	X	/	/	/	x	/	/	x	100	2	/	/
21.	x	/	/	x	/	/	/	x	100	/	/	/
22.	/	/	x	/	/	x	/	x	/	/	/	18
23.	x	/	/	x	/	/	/	x	5	3	/	1
23.	x	/	/	x	/	/	/	x	15	/	/	/
24.	/	/	x	/	/	x	/	x	90	1	/	1
25.	x	/	/	/	x	/	/	x	18	/	/	/
26.	/	x	/	x	/	/	/	x	3	0.2	0.6	
27.	/	x	/	/	x	/	/	x	/	0.2	/	/
28.	x	/	/	/	x	/	/	x	20	/	/	/
29.	x	/	/	/	x	/	/	x	2	1	1	/
30.	x	/	/	/	x	/	/	x	20	/	/	/
<b>Total</b>	<b>20</b>	<b>7</b>	<b>4</b>	<b>8</b>	<b>17</b>	<b>6</b>	<b>/</b>	<b>30</b>	<b>2611</b>	<b>95.9</b>	<b>48.6</b>	<b>20.2</b>

Tab. 2. General information on PAE in Ovchepole region

PESTICIDE APPLICATION EQUIPMENT								
Number	Brand	Type	Age				Functioning properly	Malfunctioning
			0 - 5	5 - 10	10 -20	> 20		
1.	Morava	400l				x	x	
2.	Morava	400l				x	x	
3.	Morava	400l				x		x
4.	Agromehanika Kranj	340l		x			x	
5.	Morava	330l				x	x	
6.	Morava	450l		x			x	
7.	Agromehanika Kranj	350l	x				x	
8.	Morava	300l				x		x
9	Mitterer	750l				x	x	
10	Mitterer	1000l			x		x	
11	Agromehanika Kranj	330l	x				x	
12	Agromehanika Kranj	330l	x				x	
13	Metalbraneks Prokuplje	450l	x				x	
14	Agromehanika Kranj	330l	x				x	
15	Morava	AM 1650l				x	x	
16	Morava	AM1650l				x	x	
17	Sprayer	АП 300l	x				x	
18	Morava	440l		x			x	
19.	Sampo 20	2210l			x		x	
20.	Lesko	330l			x		x	
21.	Morava	AM1650l				x	x	
22.	Morava	AM1650l				x	x	
23.	Lesk	660l			x		x	
24	Agromehanika Kranj	440l		x			x	
25	SVL ASETA	600l				x	x	
26	Agrin	440l	x				x	
27	AGRIMIR Vistula	400l				x	x	
28	Agromehanika Kranj	400l				x	x	
29	Lesko	400l		x			x	
30	Agromehanika Kranj	340l		x			x	
31	Agromehanika kranj	340l		x			x	
32	Agromehanika Kranj	330l		x			x	
33	Agromehanika Kranj	350L			x		x	
34	Agroproizvodzac	350l			x		x	
35	TCM	1200l				x	x	
36	Agromehanika Kranj	350l			x		x	
37	Agromehanika Kranj	350l	x				x	
38	Agromehanika Kranj	440l	x				x	
39	Agromehanika Kranj	350l			x		x	
40	Agromehanika Kranj	400l		x			x	
41	Agromehanika Kranj	350l			x		x	
42	Lesko	440l	x				x	
43	Agromehanika Kranj	350l				x	x	
44	Agromehanika Kranj	340l				x	x	
45	Agromehanika Kranj	350l			x		x	
46	Agromehanika Kranj	440l	x				X	
<b>Total</b>			<b>11</b>	<b>9</b>	<b>10</b>	<b>16</b>	<b>44</b>	<b>2</b>

Table 3 shows the representation of pesticide application equipment by way of hitching to the tractor and the type of machine. According to the table the most common are carried tractor machines for application of pesticides for agricultural crops. Certain gradual rise of the number of air assisted sprayers for the growing number of vineyards and orchards is noticeable.

Tab. 3. Data on PAE in Ovcepole region

PESTICIDE APPLICATION EQUIPMENT				
Way of hitching	Carried		Trailerred	
Types of PAE	Horizontal boom sprayers	Air assisted sprayers	Horizontal boom sprayers	Air assisted sprayers
<b>Total</b>	<b>28</b>	<b>10</b>	<b>2</b>	<b>6</b>

The survey of the pesticide application equipment included the determination of visual and operational flaws of the machines. The flaws of the machines were determined and are presented in Tables 4 and 5.

Tab. 4. Visual flaws of PAE in Ovcepole region

Parts of the machine	Visual flaws of PAE		Total
	No	Modifications	
Chassis	/	7	<b>7</b>
Hitching device	/	1	<b>1</b>
Power take-off	/	0	<b>0</b>
Wheels / pneumatic tires	1	/	<b>1</b>
Tank	/	5	<b>5</b>
Agitator	/	/	<b>0</b>
Pump	/	/	<b>0</b>
Filters	2	/	<b>2</b>
Command valve	/	9	<b>9</b>
Manometer	4	/	<b>4</b>
Hoses	/	6	<b>6</b>
Sprayer boom	/	12	<b>12</b>
Nozzles	/	1	<b>1</b>
Ventilator	/	1	<b>1</b>
<b>Total</b>	<b>7</b>	<b>42</b>	<b>49</b>

According to the data in the table can be noted that upon the visual inspection of the machines most defects and modifications are present in the machine's sprayer boom or the part on which are placed nozzles. The sprayer boom was often altered from field crops to vine and fruit crops or reinforced due to kinking, cracking etc.

Analyzing the current state of pesticide application equipment it can be concluded that the most common malfunction in machines is determined in the manometer, and two machines did not have any manometer at all (Table 5). It should be noted that this tool directly shows the operating pressure in the system and is one of the main control tools for proper and quality application of pesticides. Regarding the modifications of these machines they are usually observed in the hydraulic hoses and the sprayer boom of the machinery. The great pressure and the quality of hoses directly affect the length of their use and the need for replacement.

Tab.5. Operating flaws of PAE in the Ovcepole region

Parts of the machine	Current state of the parts of the machines			
	Functioning properly	Malfunctioning	Functioning properly with modification /leaking oil	No parts
Chassis	42	/	4	/
Hitching device	45	/	/	1
Power take off	43	1	1	1
Wheels/pneumatic tires	5	1	/	/
Tank	44	/	2	/
Agitator	46	/	/	/
Pump	43	/	<b>3</b>	/
Filters	44	1	/	1
Command valve	37	1	8	/
Manometer	35	<b>9</b>	/	2
Hoses	28	1	<b>17</b>	/
Sprayer boom	33	1	<b>10</b>	2
Nozzles	39	/	7	/
Ventilator	5	2	/	/

During the conversation with the farmers the most common defects and problems encountered when using these machines were discussed. According to the results of the research it can be concluded that most defects occur in the hoses and pump of the pesticide application equipment (Tab. 6).

Tab. 6. Most common problems and defects in the PAE in the Ovchepole region

Chassis	Hitching device	Power take off	wheels/pneumatic tires	Tank	Agitator	Pump	Filters	Command valve	Manometer	Hoses	Sprayer boom	Nozzles	Ventilator
/	/	/	/	2	/	<b>6</b>	1	/	/	<b>11</b>	<b>3</b>	2	1

## Conclusion

Unfortunately, according to the first results, we can conclude that a large number of controlled machines can not meet the requirements of European Standard EN 13790 and the new EN ISO 16122. All surveyed machines have only one tank, and many of them have modifications that are not in accordance with the above mentioned standards.

According to the survey results it can be concluded that most of the farmers are registered and have secondary education. The fact that all surveyed farmers have not attended any training on quality and safe handling of these machines is worrying.

The most represented brand of pesticide application machine is Agromehanika, but many of these machines are old over 15-20 years, and if they are not properly maintained and used, they can be major contributors for the increased pollution of the environment.

The visual inspection of the machines showed that most defects and modifications are present in the sprayer boom of the machine in the part on which nozzles are set. The sprayer boom is usually altered from field crops to vine and fruit crops or it is reinforced due to kinking, cracking etc.

Analyzing the current state of the functioning of the pesticide application equipment, it can be concluded that the most common malfunction in machines is in the manometer. Regarding the modifications of these machines they are mostly observed in the hoses and the sprayer boom of machinery. The great pressure and the quality of hoses affect directly the length of their life and the need for replacement.

During the conversation with the farmers they declared that from their extensive experience most failures occur in the hoses and pumps of pesticide application equipment. All farmers, owners of these machines have said they would like to expand their knowledge by attending training for proper and safe exploitation.

In the Republic of Macedonia there is no compulsory inspection of pesticide application equipment. But as a candidate country, Macedonia is bound to apply and harmonize its laws and standards with the European Union laws and standards. The introduction of mandatory inspection, as well as other laws regarding the proper use and handling of waste pesticides affect directly the protection of the environment and human health.

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