Report on

Best Practices and Reference Materials

on Sprayer Machines Use and Maintenance

State-of-the-Art

SUMMARY

0 - Introduction

With the aim to transferring to farmers, students, technical operators, functional control operators and editors agricultural machinery manuals, competences in the field of safe use and maintenance of sprayers, in accordance with the Intellectual Output 01 of the Project - Best practices and reference materials on sprayer machines use and maintenance State-of-the-art, it was necessary to start from an analysis of the different training needs in the three countries involved in the project (Turkey, Spain, Italy), with reference to the whole European Union. For this reason it was prepared a specific template to collect all the contributions from the partners and make a comparison of the different backgrounds.

This first step is necessary because from the main issues represented in the state-of-the-art will be edited the questionnaires for the survey on training needs related to sprayers use and maintenance and further implementation on the teaching materials. As provided in the IO 02, the two questionnaires will be subsequently distributed to one to farmers/students and another to trainers/experts in order to analyse and report the corresponding training needs.

Each partner has added in the template: data and description concerning her/his knowledge on the requested topic and best practices as well as suggested other topics, keywords, etc. Each partner was invited to add at the beginning of each table the normative references and at bottom related bibliography to obtain a wide view on the existing situation and prepare specific questions to achieve predetermined objectives.

00 – Keywords

- ***Environment;***
- ***human health;***
- ***pollution;***
- ***pesticides;***
- ***products;***
- ***safety;***
- ***training;***
- ***sprayers;***
- ***health and safety in agriculture;***
- ***calibration;***
- ***agricultural accident***

000 – Abbreviations and definitions

This report employs or refers to the following wordings and abbreviations (codes):

EC: European Commission
ENTAM European Network for Testing of Agricultural Machines
EU: European Union
MSs: Member States
NAP: National Action Plan
PAE: Pesticide Application Equipment
PPP: Plant Protection Products
SoA: State-of the-art

1 - Sprayer machines of new construction

Concerning Sprayer machines of new construction, what is mandatory? Are there Voluntary certification systems (Safety / Performance aspects) in the partner countries?

This item refers to the presence of mandatory or voluntary certification systems in the three countries.

ITALY /SPAIN

1.1 - What is mandatory (about sprayer machines of new construction)?

In order to commercialize the sprayers in EU, is mandatory that all the manufacturers produce their machinery according to the Machinery Directive[1]: the manufacturer must conduct a hazard assessment at the outset and then design and construct the machine taking this assessment into account.

Declaration of conformity

The EC declaration of conformity confirms compliance with the Directive in its entirety. It must be signed by a natural person - preferably the person ultimately responsible for safety issues - and must accompany the machine on handover.

CE marking

The CE marking is the visible confirmation that the manufacturer has completed this safety assessment of the machine. No third party - be it a private or public body - is responsible for measuring the conformity of the machine against the EC Machinery Directive and „releasing“ it in any way. On the contrary, EC machinery legislation operates in the opposite fashion, with the manufacturer alone being responsible for „self-certifying“ compliance with all EC regulations, i.e.

[1] *The Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 is a European Union directive concerning machinery and certain parts of machinery. Its main intent is to ensure a common safety level in machinery placed on the market or put in service in all member states and to ensure freedom of movement within the European Union by stating that "member states shall not prohibit, restrict or impede the placing on the market and/or putting into service in their territory of machinery which complies with [the] Directive.*

first and foremost the EC Machinery Directive (and similarly the Electromagnetic Compatibility (EMC) Directive). The CE marking is then the outwardly visible symbol of the manufacturer's statement „My machine conforms to EC legislation" and must be permanently affixed to every machine (not simply attached to the operating instructions or posted on the company's home page).

Mandatory analysis for the environmental safeguard: the Directive 2009/127/EC

In order to guarantee the environmental sustainability of the new sprayer machines, with the publication on the Official Journal of the European Union (25 November 2009) of the Directive 2009/127/EC of the European Parliament and of the Council of 21 October 2009 (amending Directive 2006/42/EC with regard to machinery for pesticide application), in the MSs all the sprayer machines of new construction have to satisfy a series of environmental requirements.

In conclusion, with entry into force of Directive 2009/127/EC "essential health and safety requirements" means mandatory provisions relating to the design and construction of the products subject to Directive 2006/42/EC to ensure a high level of protection of the health and safety of persons and, where appropriate, of domestic animals and property and, where applicable, of the environment.

TURKEY

Mandatory (CE Marking):

- **Directive 2014/30/EU** of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to Electromagnetic Compatibility (recast) Text with EEA relevance
- **Directive 2006/42/EU** Machinery Safety
- The requirement to ensure compliance to the EU technical legislation is emerged for Turkey on 1th of January 1996, as a result of the establishment of the EU-Turkey Customs Union. Today in Turkey, 33 new approach regulations that are applied in the EU, have been implemented by different competent authorities. Among these, there is a new approach of 2006/42/AT Machinery Safety Directive that covers also the product group of Agricultural Machines. Machinery Safety Directive has entered into the practice after it was published in the Official Journal numbered 27158 and dated 03.03.2009 in Turkey.

  In Turkey, the competent organization for the publication and implementation of this directive is the Ministry of Science, Industry and Technology.

  The purpose of 2006/42/EC Machinery Safety Directive is to regulate marketing of machines, if they do not harm living beings, human health, and environment safety when they used according to the specifications of the machines, and their maintenance is performed; to organize the basic safety requirements that should be followed during the phase of design and manufacturing and the conformity assessment procedures that should be followed; to adjust the minimum criteria to be taken into account in the appointment of notified bodies that will do conformity assessment.

In addition to 2006/42/EC Machinery Safety Directive, "Machinery Safety (2006/42/EC) Amending Directive" was published in the Official Journal dated 02.04.2011 and numbered 27893, and in this regulation, additional health and safety requirements for Plant Protection Machines are identified.

1.2 – Voluntary certification (about sprayer machines of new construction)

ITALY

Safety: is it operative a voluntary certification of the safety aspects of the new sprayer machines in your country?
Yes; in Italy ENAMA has activated a certification scheme under accreditation (accreditation number: 088B issued by ACCREDIA, the Italian Accreditation Body). The certification scheme is based on Harmonized Standards in order to provide the sprayer machine of an added value due to the evaluation of the safety aspects on the machine and the use and maintenance handbook. The inspection on the machines is conducted using specific check lists.
The farmer/operator can found the list of sprayer machines that have obtained the safety certification consulting the ENAMA website.

Performance: Is it operative a voluntary certification on the performance aspects of sprayer machines of new construction?
Yes; in Italy ENAMA has activated a certification scheme on performance with the technical support of the University of Turin (Crop Protection Technology, accredited Laboratory). The test report contains results that comply with the requirements of the specific Harmonized Standards. The ENAMA Certification is recognised by ENTAM.
The farmer/operator can found the list of sprayer machines that have obtained the performance certification consulting the ENAMA website.

Safety + Performance = ENAMA complete certification

Normative requirements

- **ISO 4254-1:2013** - Agricultural machinery -- Safety -- Part 1: General requirements;
- **ISO 4254-6:2009** - Agricultural machinery -- Safety -- Part 6: Sprayers and liquid fertilizer distributors;
- **ISO 11684:1995** - Tractors, machinery for agriculture and forestry, powered lawn and garden equipment -- Safety signs and hazard pictorials -- General principles;
- **Directive 2014/30/EU** of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast) Text with EEA relevance;
- **UNI EN 15811:2015** Agricultural Machinery - Fixed Guards And Interlocked Guards With Or Without Guard Locking For Moving Transmission;
- **EN ISO 16119-1** Agricultural and forestry machinery – Environmental requirements for sprayers - Part 1: General

- **EN ISO 16119-2** Agricultural and forestry machinery – Environmental requirements for sprayers - Part 2: Horizontal boom sprayers
- **EN ISO 16119-3** Agricultural and forestry machinery – Environmental requirements for sprayers - Part 3: Sprayers for bush and tree crops
- **ISO 4287** Geometrical Product Specification (GPS) – Surface texture: profile method – Terms, definition and surface texture parameters.
- **ISO 4288** Geometrical Product Specification (GPS) – Surface texture: profile method – Rules, definition and surface texture parameters.
- **ISO 9357** Equipment for crop protection – Agricultural sprayers – Tank nominal volume and filling hole diameter
- **ISO 13440** Equipment for crop protection – Agricultural sprayers – Determination of the volume of total residual.
- **ISO 14710** Equipment for crop protection – Air assisted sprayers – Dimension of nozzle swivel nuts
- **ISO 5682-2** Equipment for crop protection – Spraying equipment – Test method for hydraulic sprayers
- **ISO 5682-3** Equipment for crop protection – Spraying equipment – Test method for volume/hectare adjustment systems of agricultural hydraulic pressure sprayers.
- **ISO 9898** Equipment for crop protection – Test method for air assisted sprayers – Air flow rate and power required.

Bibliography:

- *Authors, date, title (translation in English of the title), language.*
- Thomas Klindt, Paderborn – April 2003, The Importance of the EC-Machinery Guideline for Farm Machinery Manufacturers –Landtechnik n.58

SPAIN

Safety: is it operative a voluntary certification of the safety aspects of the new sprayer machines in your country?

Yes; in Spain there is an Accredited Certification System. The certification scheme is based on Harmonized Standards in order to provide the sprayer machine of an added value due to the evaluation of the safety aspects on the machine and the use and maintenance handbook. The inspection on the machines is conducted using specific check lists (Edited Manual LNR).

Performance: Is it operative a voluntary certification on the performance aspects of sprayer machines of new construction?

Yes; in Spain it is an Accredited Certification System. The test report contains results that comply with the requirements of the specific Harmonized Standards. The test report on the machines is conducted using specific Protocols (Edited Manual LNR). The ENAMA Certification is recognised by ENTAM.

TURKEY

Safety: is it operative a voluntary certification of the safety aspects of the new sprayer machines in your country?

Yes. Ministry of Agriculture Directorate of Agricultural Machinery Test Center-TAMTEST and some individual experts on Conformity Assesment. But, the system is not working operatively. The certification scheme is based on Harmonized Standards in order to provide the sprayer machine of an added value due to the evaluation of the safety aspects on the machine and the use and maintenance handbook.

Is it used a specific check list for the inspection?

Yes, with references to specific Harmonised Standards.

Performance: Is it operative a (voluntary) certification on the performance aspects of sprayer machines of new construction?

Yes, but mandatory. In Turkey, there is one authorized test lab for plant protection machinery tests: Ministry of Agriculture Directorate of Agricultural Machinery Test Center-TAMTEST

Is it an Accredited Certification System?

No, but the technical laboratory involved (Directorate of Agricultural Machinery Test Center-TAMTEST) is accredited for tests on sprayers' nozzles. It is used a specific standards listed below (Table 1).

Normative requirements in Turkey:

- **TS EN ISO 4254-1:2013** - Agricultural machinery -- Safety -- Part 1: General requirements
- **TS EN ISO 4254-6:2009** - Agricultural machinery -- Safety -- Part 6: Sprayers and liquid fertilizer distributors
- **TS ISO 11684:1995** - Tractors, machinery for agriculture and forestry, powered lawn and garden equipment -- Safety signs and hazard pictorials -- General principles
- **TS EN 15811:2015** Agricultural Machinery - Fixed Guards and Interlocked Guards with or without Guard Locking for Moving Transmission
- **TS EN ISO 16119-1** Agricultural and forestry machinery – Environmental requirements for sprayers - Part 1: General
- **TS EN ISO 16119-2** Agricultural and forestry machinery – Environmental requirements for sprayers - Part 2: Horizontal boom sprayers
- **TS EN ISO 16119-3** Agricultural and forestry machinery – Environmental requirements for sprayers - Part 3: Sprayers for bush and tree crops
- **TS 6956 EN ISO 4287** Geometrical Product Specification (GPS) – Surface texture: profile method – Terms, definition and surface texture parameters.
- **TS 6212 EN ISO 4288** Geometrical Product Specification (GPS) – Surface texture: profile method – Rules, definition and surface texture parameters
- **TS ISO 9898** Equipment for crop protection – Test method for air assisted sprayers – Air flow rate and power required

There is NO Turkish Standard for:

- **ISO 9357** Equipment for crop protection – Agricultural sprayers – Tank nominal volume and filling hole diameter
- **ISO 13440** Equipment for crop protection – Agricultural sprayers – Determination of the volume of total residual
- **ISO 14710** Equipment for crop protection – Air assisted sprayers – Dimension of nozzle swivel nuts
- **ISO 5682-2** Equipment for crop protection – Spraying equipment – Test method for hydraulic sprayers
- **ISO 5682-3** Equipment for crop protection – Spraying equipment – Test method for volume/hectare adjustment systems of agricultural hydraulic pressure sprayers

Table 1 - Types of Plant Protection Equipment in Turkish market and Related Standards

Plant Protection Equipment	National/EN/ISO standards to be able to apply before marketing	National laws and regulations before market		National laws and regulations for operators
	TS 4807 TS 4808 TS 660 TS 4280 TS 5242	**Law No. 5996** Regulation- Issue no 27893 **Directive 2006/42/EU**		Regulation Issue no 29194
	TS 4807 TS 4808 TS 660 TS 4280 TS 5242	**Law No. 5996** Regulation- Issue no 27893 **Directive 2006/42/EU**		Regulation Issue no 29194
	TS 660 TS 4807 TS 4808	**Law No. 5996** Regulation- Issue no 27893 **Directive 2006/42/EU**		Regulation Issue no 29194
	TS 660 TS 4807 TS 4808	**Law No. 5996** Regulation- Issue no 27893 **Directive 2006/42/EU**		Regulation Issue no 29194

	TS 5243 TS ISO 5131	**Law No. 5996** Regulation- Issue no 27893 **Directive 2006/42/EU**		Regulation Issue no 29194
	TS ISO 19932-1 TS ISO 19932-2 TS 13128 TS 5099	**Law No. 5996** Regulation- Issue no 27893		No
	TS 13128 TS ISO 19932-1 TS ISO 19932-2 TS 5099	**Law No. 5996** Regulation- Issue no 27893 **Directive 2006/42/EU**		No
	TS 5099	**Law No. 5996** Regulation- Issue no 27893 **Directive 2006/42/EU**		No
	No standard	**Law No. 5996** Regulation- Issue no 27893 **Directive 2006/42/EU**		No
	No standard	**Law No. 5996** Regulation- Issue no 27893		No
	TS 4928	**Law No. 5996** Regulation- Issue no 27893 **Directive 2006/42/EU**		No

Related Standards List:

TS 4807	Agriculture machinery-Sprayers- Mounted type, PTO driven
TS 4808	Agriculture machinery-Sprayers- Trailer type, PTO driven
TS 660	Agricultural Wheel Tractors-Three-Point Linkage Categories 1, 2, 3 and 4
TS 4280	Sprayer nozzles
TS 5242	Pumps for sprayers
TS 5243	Agricultural machinery - Garden sprayers with engine
TS ISO 5131	Acoustic-Tractors and machinery for agriculture and forestry-Measurement of noise at the operators' position-Survey method
TS ISO 19932-1	Equipment for crop protection -Knapsack sprayers -Part 1: Requirements and test methods
TS ISO 19932-2	Equipment for crop protection - Knapsack sprayers -Part 2: Performance limits
TS 13128	Spray guns and lance of sprayers
TS 5099	Agricultural machinery-Knapsack mistblower (atomizer) with engine

Official Laws and Regulations for Plant Protection Machinery in Turkey:

There are special regulations related to manufacture and sale of plant protection machinery, implemented by General Directorate of the Food and Control, the Ministry of Food, Agriculture and Livestock, in Turkey. This regulation has come into force with the title "Regulation on Agricultural Tools and Machines", after being published in the Official Journal dated 02.04.2011 and numbered 27893. The purpose of this regulation is to provide healthy and reliable vegetable production, to prepare, to execute and to promote the integrated pest management programs and application projects for the development of the combat methods that are sensitive to human health and the environment. This regulation covers the approval, manufacturing and licensing of agricultural tools and machines, the principles and procedures that are related to the duties and responsibilities of franchises, and market controls.

Manufacture of Plant Protection Machinery

The manufacturing permits of plant protection machines is provided by provincial and district directorates of the Ministry of Food, Agriculture and Livestock. The manufacture of the plant protection machines is made by the manufacturers who get manufacturing permits and license. The Ministry creates a commission of at least three technical staff after the permit application is done. According to the report prepared as a result of investigations done by the Commission, the manufacturing permit, which is issued and approved by the Ministry, is given to the enterprise in question, if it is deemed appropriate.

The licensing of machines for plant protection is performed according to the provisions of the Regulation on Plant Protection Machines that are issued by the Ministry of Food, Agriculture and

Livestock. It is not possible to use and manufacture a plant protection machine that is not licensed.

After reviewing the permit application, if it deems appropriate, headquarter lead the tools and machines to the experiment organization to be done the license tests and experiments. Sprayer machines that will take test report, are evaluated according to the relevant standards of the TSE and testing center, and according to the principles of the experiment of Directorate of Agricultural Machinery Test Center (TAMTEST), for the purpose of licensing required by The Law, numbered 6968, on Plant Protection and Agricultural Quarantine and the provisions of the Regulation on Plant Protection Machines that is extracted related to this law.

Positive test report is provided to the appropriate machines while negative test report is given to the ones that are not appropriate according to the technique of spraying, machines that take positive test report, are licensed by the General Directorate of Food and Control for a period of 10 years.

Put into Market of Plant Protection Machinery

The plant protection machines that are licensed by the Ministry can be put into the market on the conditions of getting manufacturing permit and license and passing the experiment tests. Sales of plant protection machines that are put into the market are done by real and legal persons who have the dealership permission.

Manufacturer or his authorized representative of plant protection machine, in accordance with the process of risk assessment and risk reduction, must ensure that an assessment, related to the risk of unintentional propagation of pesticides to the environment, is carried out.

Law and Regulations:

(1) Law No. 5996: Veterinary Services, Plant Health, Food and Feed Law (Acceptance Date:11/06/2010)

According to the Law 5996;

ARTICLE 18-(1) The procedures related to the production, importation, use, packaging, labeling, identification, transportation, storage, prescription or non-presale sale, approval, control and procurement of plant protection products and machines as well as other products used in tussle against harmful organisms are determined by the Ministry of Agriculture.

(2) It is compulsory to obtain approval from the Ministry for the production, importation and market supply of plant protection products and machinery. The Ministry determines the guidelines for the approval of plant protection products. The confidentiality of approval information is principle.

(2) Regulation Name: Regulations on Plant Protection Machines. *Official Journal of the Republic of Turkey.* Issue no 27893, published on 2 April 2011.

According to the Regulation Issue no 27893:

ARTICLE-1 (1) Purpose of this regulation is to specify the procedures and principles regarding the approval, manufacture, importation, sale and inspection of plant protection machines.

ARTICLE-2 (1) This regulation covers the principles and procedures regarding the production, licensing, market supply, importation, sale, responsibility of manufacturer and dealers of plant protection machines.
ARTICLE 5 –(1) Manufacturing of plant protection machines a) Manufacturing Permit Certificate,
b) Manufacturing of plant protection machines are achieved by licensed enterprises
ARTICLE 12- (6), these licenses approved by the Ministry are the license to use the main product in Turkey at the same time and the validity period is ten years.

(3) Regulation Name: Regulation on The Recommendation, Application and Registration of Plant Protection Products. *Official Journal of the Republic of Turkey.* Issue no 29194, published on 3 December 2014.
According to the Regulation Issue no 29194:
ARTICLE 1:The purpose of this regulation; Identification of harmful organisms and herbal products, recommendation of plant protection products to be used, application of them in the direction of technical instructions and technical advice in the field of plant production and storage, and monitoring of the applications in terms of food safety
ARTICLE 18t-Professional applicants: agricultural engineers who have been authorized to apply commercial plant protection products from the Ministry, technicians and agricultural technicians who have taken lessons on plant health.

Persons who carry out the application of plant protection products

ARTICLE 14-Plant protection product applications are made with the persons mentioned below with the condition of being a citizen of the Republic of Turkey,

a) Professional operators

b) Farmers who produce crops on their own land

ARTICLE 18 5-Plant protection product applicants are responsible for the maintenance, repair and calibration of the equipment to be used in the application of the plant protection product.

7-Applicants of plant protection products use their work clothes and materials such as protective clothing, gloves and mask during the application of the plant protection product in accordance with the instructions.

2 - Adjustment for safety aspects of sprayer machines in use

Is it mandatory to evaluate the safety aspects of a Sprayer Machines in use before new placing into the market?

ITALY

Because of the high medium life of the agricultural machines in Italy (is it possible to find machines with more than 20 years), there is a significant used market.
Safety assessment: how to do it?
Farmers, Dealers and Manufacturers are obliged to verify and adapt the machines in compliance with the existing standards if they don't fulfil the safety requirements in respect of the current regulations.
After the 15th of May 2008 cannot longer be used machines and equipment not complying the safety regulations and particularly the Legislative Decree 81/08 (list V).
The principal persons involved are the employer and the dealer but also the manufacturer because they can withdraw the old products from the market in exchange with new products or may have information requests by their dealers.
For this activity a risk assessment will be necessary with the goal to adequate the machine in order to be sure that his safety level will be at least equal to that of a new machine in compliance with the Machinery Directive (2006/42/EC) and others.
In many cases it is impossible to reach acceptable levels of safety (or costs are not justified), so you may decide to replace the machine with a new one.

Normative requirements
D.lgs. 9 /04/2008 n.81 Testo unico sulla salute e sicurezza sul lavoro (Legislative decree n.81 – Unique text on health and safety at work)

Bibliography:
ITALY:
ENAMA – 2002 – "I Requisiti di sicurezza delle macchine irroratrici" (Safety requirements of sprayer machines) (ITA)
Regione Piemonte - 2011 – "Le macchine agricole usate – analisi e procedure di adeguamento" (the agricultural machines in use – analysis and adjustment procedures) (ITA)

SPAIN

Yes, in compliance with Machinery Directive and official instruction 1702/2011.

TURKEY

In Turkey it is not mandatory to evaluate the safety aspects of a Sprayer Machines in use before new placing into the market.

3 - Inspection of sprayer machines in use

Is there an inspection activity of sprayer machines in use in your country?

Normative requirements

- Directive 2009/128/EC of the European Parliament and of the Council for Sustainable Use of Pesticides;
- EN ISO 16122-1:2015 - Agricultural and forestry machinery - Inspection of sprayers in use - Part 1: General (ISO 16122-1:2015)
- EN ISO 16122-2:2015 - Agricultural and forestry machinery - Inspection of sprayers in use - Part 2: Horizontal boom sprayers (ISO 16122-2:2015)
- EN ISO 16122-3:2015 - Agricultural and forestry machinery - Inspection of sprayers in use - Part 3: Sprayers for bush and tree crops (ISO 16122-3:2015)
- EN ISO 16122-4:2015 - Agricultural and forestry machines - Inspection of sprayers in use - Part 4: Fixed and semi-mobile sprayers (ISO 16122-4:2015)
- National Action Plan (Italian NAP - Official Journal n. 35 12/02/2014, Italian Republic)

ITALY /SPAIN

The Directive **2009/128/EC** of the European Parliament and of the Council for Sustainable Use of Pesticides" was published in the Official Journal of the European Union on 24 November 2009 (OJ L309) and came into force the following day. The Directive needed to be transposed and implemented by Member States by 25 November 2011. Its overall objective is to establish "… a framework to achieve a sustainable use of pesticides by reducing the risks and impacts of pesticide use on human health and the environment and promoting the use of Integrated Pest Management and of alternative approaches or techniques such as non-chemical alternatives to pesticides".
One of the key features of the Directive is that each Member State should develop and adopt its National Action Plan and set up quantitative objectives, targets, measures and timetables to reduce risks 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 approaches or techniques in order to reduce dependency on the use of pesticides. Member States had until 14 December 2012 to communicate their National Action Plans to the European Commission and to other Member States. The provisions include compulsory testing of application equipment (**art. 8 – Inspection of equipment in use: –** All pesticides application equipment will have to be inspected at least once by 2016 to grant a proper efficient use of any plant protection product), training and certification of all professional users, distributors and advisors; a ban (subject to derogations) on aerial spraying; special measures to protect the aquatic environment, public spaces and conservation areas; minimizing the risks to human health and the environment through handling, storage and disposal.

Below the Annex II of the Directive where are indicated the principal prescriptions to be controlled on the PAE (pesticide application equipment) during inspections.

ANNEX II of the 2009/128/EC Directive.

"Health and safety and environmental requirements relating to the inspection of pesticide application equipment"

The inspection of pesticide application equipment shall cover all aspects important to achieve a high level of safety and protection of human health and the environment. Full effectiveness of the application operation should be ensured by proper performance of devices and functions of the equipment to guarantee the following objectives are met.

The pesticide application equipment must function reliably and be used properly for its intended purpose ensuring that pesticides can be accurately dosed and distributed. The equipment must be in such a condition as to be filled and emptied safely, easily and completely and prevent leakage of pesticides. It must permit easy and thorough cleaning. It must also ensure safe operations, and be controlled and capable of being immediately stopped from the operator's seat. Where necessary, adjustments must be simple, accurate and capable of being reproduced.

Particular attention should be paid to:

1. Power transmission parts
   The power take-off driveshaft guard and the guard of the power input connection shall be fitted and in good condition and the protective devices and any moving or rotating power transmission parts shall not be affected in their function so as to ensure protection of the operator.
2. Pump
   The pump capacity shall be suited to the needs of the equipment and the pump must function properly in order to ensure a stable and reliable application rate. There shall be no leakages from the pump.
3. Agitation
   Agitation devices must ensure a proper recirculation in order to achieve an even concentration of the whole volume of the liquid spray mixture in the tank.
4. Spray liquid tank
   Spray tanks including indicator of tank content, filling devices, strainers and filters, emptying and rinsing systems, and mixing devices shall operate in such a way as to minimise accidental spillage, uneven concentration distribution, operator exposure and residual content.
5. Measuring systems, control and regulation systems
   All devices for measuring, switching on and off and adjusting pressure and/or flow rate shall be properly calibrated and work correctly and there shall be no leakages. Control of pressure and operation of pressure adjustment devices shall be easily possible during application. Pressure adjustment devices shall maintain a constant working pressure at constant revolutions of the pump, in order to ensure that a stable volume application rate is applied.
6. Pipes and hoses

Pipes and hoses shall be in proper condition to avoid disturbance of liquid flow or accidental spillage in case of failure. There shall be no leakages from pipes or hoses when run with the maximum obtainable pressure for the system.

7. Filtering
   In order to avoid turbulence and heterogeneity in spray patterns, filters shall be in good condition and the mesh size of the filters shall correspond to the size of nozzles fitted on the sprayer. Where applicable the filter blockage indication system shall operate correctly.
8. Spray boom (for equipment spraying pesticides by means of a horizontally positioned boom, located close to the crop or the material to be treated).
   The spray boom must be in good condition and stable in all directions. The fixation and adjustment systems and the devices for damping unintended movements and slope compensation must work correctly.
9. Nozzles
   Nozzles must work properly to control dripping when spraying stops. To ensure homogeneity of the spray pattern, the flow rate of each individual nozzle shall not deviate significantly from the data of the flow rate tables provided by the manufacturer.
10. Distribution
    The transverse and vertical (in case of applications in vertical crops) distribution of the spray mixture in the target area must be even, where relevant.
11. Blower (for equipment distributing pesticides by air assistance).
    The blower must be in good condition and must ensure a stable and reliable air stream.

Italy
Note: As indicated in the Italian NAP (National Action Plan) the inspection of sprayers in use is coordinated by ENAMA as technical support of the Italian Agricultural Ministry and Regions.

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Authors, date, title, translation in English of the title, language.
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- SPISE (Standardized Procedure for the Inspection of Sprayers in Europe) – 01/2016 – SPISE ADVICE : Advice for bush and tree crop sprayer adjustment (ENG).
- SPISE- 02/2016 – SPISE ADVICE : Advice for functional inspection of special spraying trains and other vehicles for chemical weed control on railways and public roads (ENG).
- SPISE- 05/2015 – SPISE ADVICE : Advice for field crop sprayer adjustments
- SPISE 13 – 15, 09/2015 Presentation: Status Quo of inspection in Europe: The results of a SPISE enquiry.
- SPISE Presentation: "Classificazione irorratrici per colture arboree" (Classification of air assisted sprayer machines) (ITA)
- SPISE Presentation: "I componenti delle macchine irroratrici" (the sprayer machines components) (ITA)

TURKEY

In Turkey there is not an inspection activity of sprayer machines in use.

4 - Current training or information activity

Is there any document or activity you carried out to divulge and inform users, technicians, etc. on the correct and safe use of sprayer machines?

ITALY

YES:
1) Training courses for technicians and trainers involved in the inspection activity;
2) During agricultural exhibitions (with test and demonstration on the sprayer machine, posters, leaflets, meetings, info points);
3) Documents on the institutional website.

SPAIN

YES:
1) Training courses for technicians responsible of these activities;
2) Training for trainers involved in these activities;
3) Training for farmers.

TURKEY

YES:
1) The International Agricultural Training Center (UTEM) of The Ministry of Food, Agriculture and Livestock conducts trainings on different topics to improve the knowledge and skills of the personnel serving both public and non-governmental organizations within the in-service training plan. Some of these training topics are related to the topic of this project. These are; safety usage of farm machinery, technical features of agricultural equipment and machinery, safe tractor usage, health and safety in agriculture and agriculture machinery management. These trainings are carried out at regular intervals every year according to the demand. The trainings are conducted in the central directorate in Ankara, as well as in different provinces and districts according to the requests.
2) It is being checked whether equipment and machines are provided with instructions for use and maintenance. It is also controlled whether or not maintenance and usage training for equipment and machine are given during the inspections of enterprises and dealers in accordance with the provisions of the "Veterinary Services, Plant Health, Food and Feed Law" numbered as 5996 in Turkey and the "Regulation on Plant Protection Machines".
3) Trainings are given every year at different dates and in different provinces according to the "Regulation on Usage Principles of Biocidal Products" by the Ministry of Health Turkish Public Health Authority. It is compulsory for the personnel who will apply biocidal products to the environment and public health to participate and obtain certificates in these trainings. Machines are introduced and described to the user in terms of adjustments and calibrations as well as

explanation are given on how to take precautions in terms of occupational health and safety in these trainings.
4) Information is provided with brochures and meetings as well as with the tests and demonstrations conducted by some companies and manufacturers in the fairs and exhibitions related to agricultural equipment and machinery.
5) Documents for the introduction and use of equipment and machinery can be found in some companies and institutions web page that produce agricultural plant protection equipment and machinery.
6) In the scope of Regulation Issue No 29194, professional users are participating a course organized by The Ministry of Food, Agriculture and Livestock and be certificated.

References:

Authors, date, title (translation in English of the title), language.

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5 – Plant Protection Products (PPP) and typology of Pesticide Application Equipment (PAE)

What is the situation of PPP usage and PAE (number in use, typology) in the Partner Countries?

Pesticides play a sensitive role in food systems: they are applied in order to protect crops, but they can have negative impacts on environment and human health. While global pesticide use has grown in the last years, a significant portion of the chemicals applied has proved to be excessive, uneconomic or unnecessary both in industrialized and developing countries. For society as a whole it would be desirable to gradually reduce pesticide use to a level where negative impacts – externalities like health hazards, biodiversity loss or water pollution – at least do not outweigh the value added in terms of yields or cost savings in production. Today there is a consensus among a wide range of stakeholders that pesticide use needs to be gradually reduced to a level that is effectively required to ensure crop production, and those risks of pesticide application need to be reduced as far as possible. Experience across the world shows that pesticide use can be reduced considerably without unduly reducing yields or increasing costs of production. A step-wise reduction of pesticide use is feasible already within the current production systems and with the knowledge, technologies and alternatives available today.

5.1 - Amount of pesticide usage in each country

ITALY

The last statistics (*source: ISTAT 2015*) concerning the PPP quantity in Italy, contain data of 2013 and is approx. of 118 000 tons (-11.9% compared to 2012).

In 2013 the PPPs have had a decrease compared to 2012: fungicides -14.6%, insecticides and acaricides -15.0%, herbicides -3.1% and others -9.6%. Compared to 2002, the decrease was of 29.2%.
In the same period, the active ingredients contained in the compound decreased of 10.1%; the 59.0% of these products are fungicides, the 11.0% are insecticides and acaricides, the 13.9% are herbicides, the 15.6% are other products and the 0.4% are biocides.
The 53.1% of PPP is distributed in the North of Italy , the 12.3% in the Centre, the 34.6 % in the South.

References:

https://www.istat.it/it/archivio/145664;
Frank Eyhorn, Tina Roner, Heiko Specking – September 2015, *Reducing pesticide use and risks - What action is needed?* – Helvetas – Swiss Intercooperation;

SPAIN

According to the information provide in the official web page from the **Ministry of Agriculture** below it can be check the figures in amount of pesticides use in Spain from 2013 to 2015. We still have no date from 2016. As it can be notices the evolution is clear.

MAIN GROUPS OF SUBSTANCES			
	2015	**2014**	**2013**
Fungicides and Bactericides	**36.437**	**38.393**	**32.400**
Herbicides	**15.586**	**14.909**	**14.719**
Insecticides and Acaricides	**6.758**	**7.609**	**6.909**
Growth regulators and others	**18.517**	**18.015**	**17.519**
TOTAL TONNES	**79313**	**80940**	**73560**

References;
Ministry of Agriculture. http://www.mapama.gob.es/es/estadistica/temas/estadisticas-agrarias/agricultura/estadisticas-medios-produccion/fitosanitarios.aspx

TURKEY

In Turkey it is used approximately 40 000 tons pesticides and consumption per hectare varies from 0.1 to 0.2 kg according to year by year. More than 60% of total pesticide consumption is in the Mediterranean (27%), Aegean (17%) and Marmara (18%) regions that they have large agricultural areas and advanced mechanization in agriculture. Pesticide use rate in Central Anatolia region is 18%, 14% in Southeast Anatolia and 5% in Black Sea Region (Burçak, 2013). Generally speaking, Turkey, ranked third after China and India in terms of unsuitable agricultural products due to pesticide residues of plant products sent to EU countries, uses some unconscious and uncontrollable substances of toxic chemicals. Reason of this situation is used uncontrolled and unconscious of pesticides (Delen, 2009, 2014; Delen et al, 2005, 2015).

The pesticide consumption of the Mediterranean, Aegean and Marmara regions of Turkey are level of developed countries as USA or France. In addition, the problems caused by the use of pesticides may be more serious than those countries due to unconscious and uncontrollable use (Delen, 2014; Delen et al, 2005).

The consumption rates of pesticides in Turkey is 33.5% fungicide, 32.04% herbicide, 15% insecticide and 19.43% other applications. Today, about 2 000 agrochemical formulations contain 386 pesticides effective substances 300 of them are actively used in agricultural pesticides.

Insecticide sales, which are the most important part of the agricultural chemicals sector in Turkey, are done in vegetables, cereals 40% and 20% fruit markets. Tobacco pesticide use has a share of 3%. More than 60% of the pesticides used are applied in cereals and vegetables planting areas.

Amount of pesticide usage in Turkey (Tons)

	Insecticides	Fungicides	Herbicides	Acaricides	Rodenticides	Other	Total
2006	7 628	19 900	6 956	902	3	9 987	45 376
2007	21 046	16 707	6 669	966	51	3 277	48 716
2008	9 251	17 863	6 177	737	351	5 613	39 992
2009	9 914	17 396	5 961	1 533	78	2 302	37 184
2010	7 176	17 546	7 452	1 040	147	5 344	38 705
2011	6 120	18 124	7 407	1 062	421	6 978	40 112
2012	7 264	15 525	7 351	859	247	8 766	40 012
2013	7 741	16 248	7 336	858	129	7 128	39 439
2014	7 586	16 674	7 794	1 513	149	6 007	39 722
2015	8 117	15 984	7 825	1 576	197	5 327	39 026

Source: Ministry of Food, Agriculture and Livestock

References:

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5.2 – PAE data and types in use (models, type etc)

ITALY

In Italy there are approx. 600 000 Sprayers in use:

- 200 000 Field Crop Sprayers;
- 350 000 Vineyard and orchard sprayers;
- 50 000 Hand held sprayers.

This numbers of PAE in use are estimated because of in Italy it doesn't exist a specific census.

The more diffuse typologies in Italy, are:

- Sprayers for bush and tree crops: Air-assisted Sprayers, Pressure Sprayers, Pneumatic sprayers, Cannon Spraying units, Tunnels With recycling, Tunnels without recycling, Equipment with automatic nozzles movement, knapsack sprayers, dusters;

- Sprayers for arable crops: Boom sprayers, cannons, equipment with automatic nozzles movement, boom sprayers mounted on sowing equipment and rippers;

- Sprayers used in covered structures: boom sprayers, cannon, self propelled sprayers, handheld sprayers, knapsack sprayers, foggers.

SPAIN

In Spain, at different international platforms, and based on experience, a general data of about 300.000 sprayers has been managed. But unfortunately this is a not official data. For this reason, on July 2009 the Spanish government published a mandatory law (RD 1103/2009) with the purpose to create an official register of all sprayers in use in Spain. This requirement has been established as a mandatory prior to attend the inspection procedure.

References:
Emilio Gil – 2012 - *The official procedure for mandatory inspection of sprayers in use in Spain. How to deal with regional autonomous authorities – Universitdad Politécnica de Catalunya - Barcelona*

TURKEY

Type	Plant protection machinery data and types in use					
	2011	**2012**	**2013**	**2014**	**2015**	**2016**
Atomizer	113 641	114 435	116 789	115 995	116 883	120 402
Engine driven sprayer	75 905	78 151	80 457	84 093	85 974	87486
PTO driven sprayer	291 505	305 295	312 651	322 174	329 768	338625
Barrow duster and combine sprayer	14 020	14 303	14 325	13 811	12 731	12 802
Knapsack sprayer	597 460	606 366	612 626	623 190	628 059	633 598
Duster	21 543	19 509	19 307	17 827	17 855	17 749
Aircraft Sprayer and Duster	-	10	8	8	8	5

Reference: www.tuik.gov.tr

Other Best Practices

Authors, date, title, translation in English of the title, language

- *TOPPS* - Train Operators to Prevent water pollution from Point Sources: Information and Training presentation (ENG).
- *TOPPS* - Flyer (ENG)
- *TOPPS* - Prevent water contamination through point sources - Cleaning of sprayers (ENG)
- *TOPPS* - Prevent water contamination through point sources BEST MANAGEMENT PRACTICES (ENG)
- *TOPPS – 2015* - Sprayer components and devices able to reduce/eliminate point sources contamination during sprayer filling and cleaning (ENG)

DRIFT

- *TOPPS* - Short course on how to reduce spray drift (ENG)
- *TOPPS* - Best Management Practice - to reduce spray drift Information & Training Course (ENG)

REMNANTS

- *TOPPS* - Bio purification systems for spray remnants on farm (ENG)

RUN OFF

- *TOPPS* - Best Management Practices to mitigate risk of runoff (a quick start) (ENG)