Inspection system for in use pesticide application equiupment in Greece. First three years of application

G. Bourodimos[1,2], A. T. Balafoutis[3], M. Giamouri[1], S. Fountas[2]

[1] Hellenic Agricultural Organisation - DEMETER, Agricultural Engineering Department, Dimokratias Avenue 61, Ag. Anargiri, Athens, Greece
[2] Agricultural University of Athens, Department of Natural Resources & Agricultural Engineering, Iera Odos 75, 11855, Athens, Greece
[3] Centre of Research & Technology Hellas, Institute for Bio-Economy & Agro-Technology, 6th km of Charilaou-Thermi Road, Thessaloniki, Greece

Abstract

According to Directive 2009/128/EC, all member states should have inspected all in-use Pesticide Application Equipment (PAE) by November 2016. In Greece, Law 4036/2012 embodied the provisions of this Directive into Greek legislation, but unfortunately due to various reasons, the inspections were significantly delayed. Aim of the current study is to briefly present the inspection system of in-use PAE that was developed due to the aforementioned law and then provide the statistical results of the inspections until February 2018. The progress of the last two years was significant, but a lot of work remains to make the inspection system functional and unproblematic.

Introduction

Directive 2009/128/EC, which establishes the regular inspection of in-use Pesticide Application Equipment (PAE), was incorporated into Greek law in 2012 with Law 4036. However, the system of mandatory periodic inspection of in-use PAE, which leads to the granting of certificate of inspection and sticker label, was actually introduced in Greece in 2015 by the Decision of the Deputy Minister of Production Reconstruction, Environment and Energy, numbered E8 1831/39763 and published in FEK 671/B/21-04-2015.

Until 2015 the controls of both new and in-use PAE were optional and the only body that carried out testing of these machines was the Department of Agricultural Engineering of the Hellenic Agricultural Organization - DEMETER, which in the period between 2000 and 2015 had carried out 17 tests of new machinery according to EN 12761 and 33 tests of in-use PAE according to EN 13790 under the program LIFE07 - EcoPest.

With the above Ministerial Decision, the Directorate of Land Reclamation and Mechanical Equipment of the Ministry of Rural Development and Food was designated as the Competent Authority for the regular inspection of PAE in Greece and the Department of Agricultural Engineering of the Hellenic Agricultural Organization - DEMETER as the Inspection Reference Laboratory.

In our country, the first Pesticide Application Equipment Inspection Stations (PAEIS) was established in September 2015 and the first inspections were made in early 2016. PAE inspected in 2016 will be re-tested in 2020 and then every three years, while PAE to be tested for the first time since 2017 and then will be re-tested every 3 years.

Inspection system for pesticide application equipment in use

The parties involved in the Inspection System are as follows (Figure 1):

The Inspection Reference Laboratory is responsible for the preparation of the PAE Inspection Manual and the Control of the PAEIS.

The Regional Agricultural Equipment Inventory Services (RAEIS) is responsible for the maintenance, updating and management of the Registry of PAE (RPAE).

The PAEIS that may be fixed or mobile and may be state and/or private entities owned by natural or legal persons. PAEIS must have the appropriate equipment and personnel to perform the inspections and are required to conduct inspections in accordance with the Inspection Manual.

The owner of the in-use PAE is responsible for (i) the registration of the PAE in the RPAE, (ii) the inspection of the PAE at a PAEIS of his/her choice, during which he/she must be present and (iii) the remediation of any deficiencies of the PAE identified during the inspection.

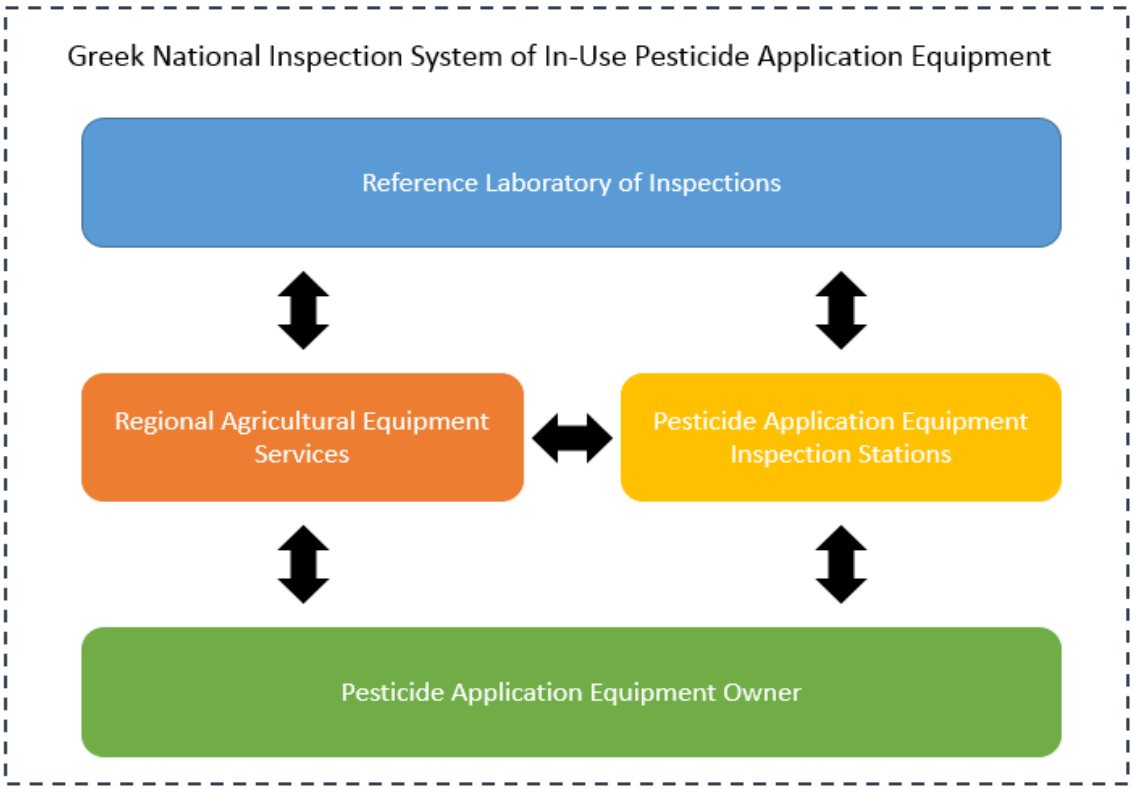

Figure 1. Interactions between the stakeholders of the national inspection

The Reference Laboratory's Inspection Manual sets out the requirements for the inspection of in-use PAE and has been prepared in accordance to the European Standards EN 13790-1: 2003 and EN 13790-2: 2003. A new version of the manual, based on the EN ISO 16122 series of standards, is in progress. To date, the types of machines that are under inspection in Greece are (i) air assisted tree and bush sprayers, (ii) boom sprayers and (iii) lance sprayers. At the moment, the inspections of knapsack sprayers and portable PAE are excluded from the law, but an amendment to the Ministerial Decision is expected with which fixed and semi-fixed sprayers will be included.

Number and Distribution of Pesticide Application Equipment Inspection Stations

The PAEIS approved in Greece from September 2015 to February 2018 are 149. The distribution of PAEIS by Geographical Province and Prefecture is presented in Table 1 (DEMETER, 2018).

Table 1. Allocation of PAEIS in different Geographical Province and Prefecture

Geographical District	*Prefecture*	*Number of PAEIS*	*Geographical Province*	*Prefecture*	*Number of PAEIS*
Thrace (16)	Evros	7	Epirus (2)	Ioannina	1
	Rodopi	5		Arta	1
	Xanthi	4	Sterea Hellas	Etoloacarnaria	1

Macedonia (65)	Drama	3	(12)	Fthiotida	2
	Kavala	3		Viotia	7
	Serres	10		Evia	1
	Kilkis	2		Attiki	1
	Thessaloniki	7	Peloponnese (25)	Korinthia	2
	Halkidiki	3		Achaia	4
	Pella	17		Argolida	3
	Imathia	10		Arkadia	3
	Pieria	1		Ilia	5
	Florina	1		Messinia	3
	Kastoria	1		Lakonia	5
	Kozani	6	Crete (10)	Chania	3
	Grevena	1		Rethimno	3
Thessaly (19)	Larisa	14		Iraklio	2
	Magnisia	1		Lasithi	2
	Trikala	2	Aegean Islands		0
	Karditsa	2	Ionian Islands		0
Total			*149*		

PAEIS has been established in 38 prefectures in the country. Specifically, there are PAEIS in all the prefectures of Thrace, Macedonia, Thessaly, Peloponnese and Crete. PAEIS has not been authorized in the prefectures of Thesprotia and Preveza in Epirus, in the prefectures of Fokida and Evritania in Sterea Hellas, as well as in the Aegean and Ionian islands. Most PAEIS are located in the prefectures of Pella (17), Larissa (14), Imathia (10) and Serres (10). Figure 2 shows the PAEIS per geographical compartment as a percentage of the total number. The majority of PAEIS (43.6%) are located in the Province of Macedonia.

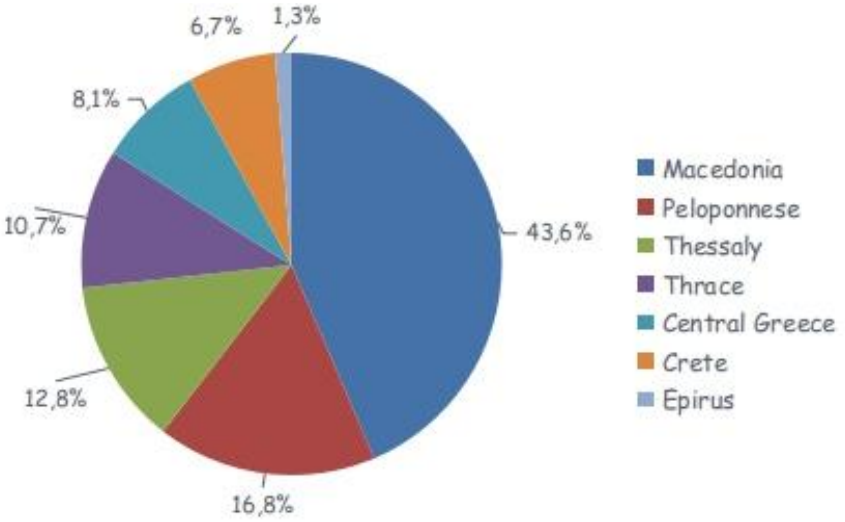

Figure 2. Allocation of PAEIS in different Geographical Province

Type of PAEIS
All PAEIS (100%) are mobile.

Equipment of PAEIS
The great majority of PAEIS (98%) use equipment of the least possible cost, avoiding high-tech devices.

Ownership of PAEIS

The ownership of PAEIS in Greece is divided in the next categories (Figure 3):

- 136 PAEIS are private entities (71 are manufacturers-retailers of agricultural machinery).
- 11 PAEIS are owned by Agricultural Cooperatives.
- 2 PAEIS are under Universities command.

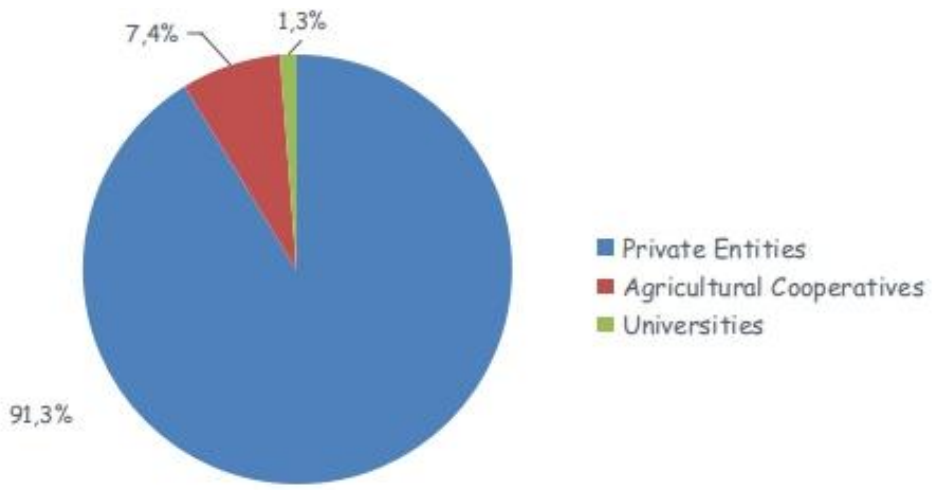

Figure 3. Ownership of PAEIS

Inspectors of PAEIS

The majority of inspectors (60,4%) are Agricultural Engineers or Agricultural Engineers (Tech), but Mechanical engineers of both types are also active in this sector. (Table 2, Figure 4).

Table 2. PAEIS Inspectors

Inspectors	*Number*
Agricultural Engineers	68
Mechanical Engineers	42
Agricultural Engineers (Tech)	22
Mechanical Engineers (Tech)	17
Total	*149*

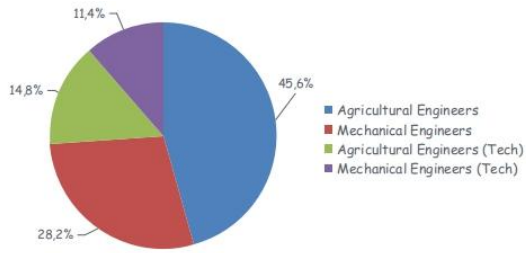

Figure 4. PAEIS Inspectors

Number and distribution of Pesticide Application Equipment

The difficulty in determining the number of PAE in Greece makes it tough to properly implement the inspection system. Data provided by various bodies such as the Hellenic Statistical Authority (ELSTAT), the Ministry of Rural Development & Food, manufacturers, etc., differ considerably from one another. According to ELSTAT (2014), the total number of spraying equipment to be inspected in Greece is 151,437, of which air assisted tree and bush sprayers are 105,380 (69,6%) and boom sprayers are 46,057 (30,4%). Table 3 gives the number and distribution by geographical province of the sprayers according to ELSTAT. The bulk number of them is in Macedonia.

Table 3. Number and distribution of PAE (Source ELSTAT 2014)

Geographical Province	*Number of PAE*	*Percentage (%) of the total number*
Thrace	13.227	8,7
Macedonia	53.346	35,2
Epirus	3.520	2,3
Thessaly	11.146	7,4
Central Greece	13.932	9,2
Peloponnese	31.027	20,5
Crete	20.698	13,7
Aegean Islands	2.239	1,5
Ionian Islands	2.302	1,5
Total	*151.437*	*100*

The registered PAE In the RPAE are 139,283 by February 2018. Table 4 and Figure 5 show the distribution of PAE by Geographic Province.

Table 4. Number and Allocation of PAE
(Source PAE Registry 2/2018)

Geographical Province	Number of PAE
Thrace	21.070
Macedonia	43.252
Epirus	1.075
Thessaly	26.133
Central Greece	13.635
Peloponnese	24.574
Crete	8.093
Aegean Islands	1.441
Ionian Islands	10
Total	**139.283**

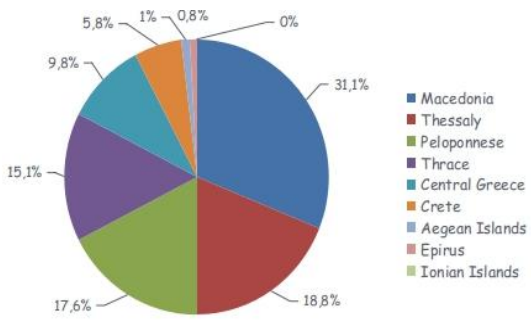

Figure 5. Allocation of PAE
(Source PAE Registry 2/2018)

Number and distribution of inspected PAE

From the equipment registered in the RPAE, the machinery to be inspected are 127,274, as portable equipment is currently exempted from inspections. Table 5 shows the types of PAE recorded in the Registry by February 2018.

Table 5. PAE Type (Πηγή PAE Registry 2/2018)

Type of PAE	*Number*	*PAE for Inspection*
Air assisted tree and bush Sprayers	27.736	127.274
Boom Sprayers	76.993	
Sprayers with Lance	22.545	
Knapsack sprayers	11.921	
Fixed/semi-fixed sprayers	88	
Total	*139.283*	

The total number of the inspected PAE by February 2018 is 23,583 machines, i.e. 18.53% of the total PAE (Bourodimos et al., 2018). The distribution of the inspected PAE by geographical province is given in Table 6 and Figure 6.

Table 6. Allocation of Inspected ΕΕΓΦ in each Geographical province

Geographical Province	*Number of inspected PAE*
Thrace	4.962
Macedonia	11.660
Epirus	88
Thessaly	2.756
Central Greece	507
Peloponnese	3.455
Crete	155
Aegean Islands	0
Total	*23.583*

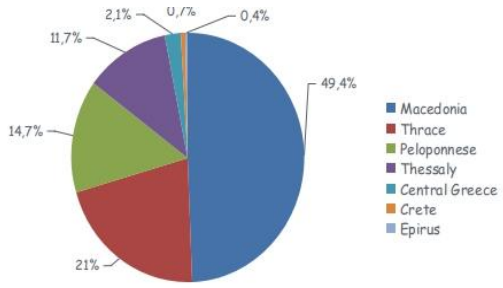

Figure 6. Allocation of Inspected PAE

The average tested PAE per PAEIS is 158.3. Table 7 shows the average of inspections per PAEIS and per geographical province. The data is precarious, because many PAEIS are also active outside the geographic province they belong to.

Table 7. Mean of inspected PAE per RAEIS in each Geographical Province

Geographical Province	*Mean Inspections per PAEIS*	*Geographical Province*	*Mean Inspections per PAEIS*
Thrace	310,1	Central Greece	42,3
Macedonia	179,4	Peloponnese	138,2
Epirus	44,0	Crete	15,5
Thessaly	145,1	Aegean/Ionian Islands	0

Types of Inspected PAE

The inspected PAE was divided into 3 groups (Figure 7):

- Boom sprayers, which accounted for 48.2% of the sample.
- Air assisted tree and bush sprayers, which accounted for 41.2% of the sample.
- Sprayers with Lance, which accounted for 10.6% of the sample.

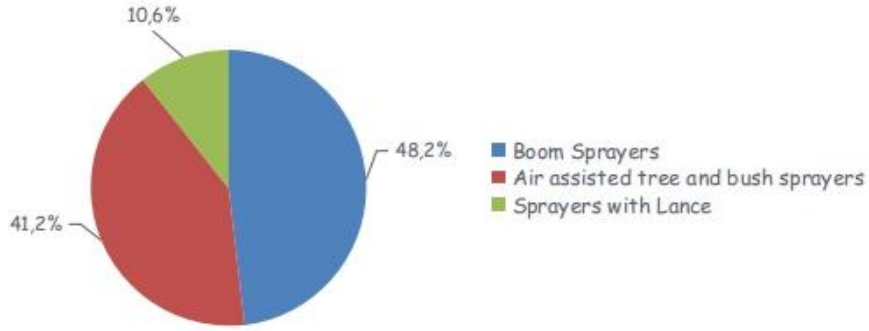

Figure 7. Type of Inspected PAE

Classification of Inspected PAE

Upon completion of the inspection of the PAE, the inspected equipment is classified in one of four categories:

- CATEGORY I: Equipment meeting the requirements of Law 4036/2012. A Certificate of Inspection and a sticker of compliance are issued.
- CATEGORY II: Equipment with minor deviations to be corrected until the next inspection. A Certificate of Inspection and a sticker of compliance are issued.
- CATEGORY III: Equipment that presents significant deviations from the requirements of Law 4036/2012. No sticker of compliance is issued and the PAE use until its successful inspection is forbidden.
- CATEGORY IV: Equipment included in Category III that its owner with a statement affirms that he wishes to delete it from the RPAE.

The 23.583 inspected PAE were classified in the four categories as follows (Bourodimos et al., 2018):

- Category I, 17.06% of the sample.
- Category II, 80.61% of the sample.
- Category III, 2.31% of the sample.
- Category IV, 0.02% of the sample (Figure 7).

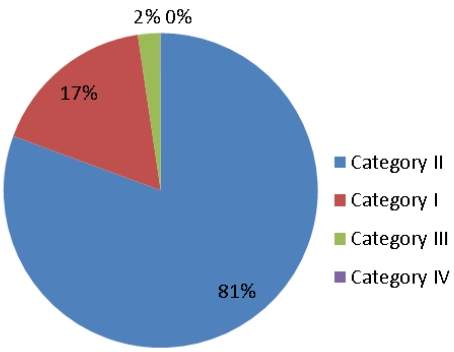

Figure 8. Classification of inspected PAE

Discussion-Conclusions

The number of PAEIS established is satisfactory, and so is the distribution by geographical province. Lack of PAEIS is mainly observed in areas with a small number of PAE, mostly islands, and this obviously discourages people from investing. It is possible to cover these areas from existing PAEIS, since everyone is mobile and for this purpose the Reference Laboratory is trying to reach an agreement between the existing PAEIS.
The majority of PAEIS were established with low cost equipment, which affects the time and quality of inspections.
There are PAEIS with very high number of inspections, resulting in their controversial quality. Allegations for PAEIS that carry out inadequate inspections have already been filed to the Reference Laboratory and the Directorate of Land Reclamation and Mechanical Equipment of the Ministry of Rural Development and Food. The Reference Laboratory has begun sampling inspections at different PAEIS and on PAE that have been inspected and are labeled with a sticker.
A particularly high proportion of machinery (97.7%) is considered suitable for use in Categories I and II. The most possible reason for this percentage is the fact that any shortcoming is repaired immediately in order for the PAE to be classified in these categories without the Technical Inspection Reports of the original - before the repair - inspection being sent to the Reference Laboratory. Another possible reason would be the inadequate controls of PAE by some PAEIS.
The number of machines inspected is particularly small, bearing in mind that all PAE should have been audited by 26 November 2016. The Ministry of Rural Development & Food is trying to address this situation by linking the plant protection product purchases with the PAE inspection certificates and the user certificates for the rational use of plant protection products. However, it must be stressed that there is a need for systematically dissemination to the farmers about the periodic mandatory PAE inspections and the consequences of PAE misuse.

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The inspection quality assurance: present situation and needs

Jan Langenakens

AAMS-Salvarani, Belgium

Opinion

Inspections started in the seventies as being voluntary and having the goal to help farmers to spray better and more efficiently. After some success in this missionary work in several countries, inspections of sprayers in use became mandatory to help agriculture to safeguard the use of crop protection products in their production process to optimize yield, minimize/reduce the use of chemicals and to prevent high residues in the marketed products.

Mandatory inspections have started in the 90's in European countries. The European Commission has captured that idea and integrated it as one of the actions in the European Directive 2009/128, establishing a framework for Community action to achieve the sustainable use of pesticides. In the directive a transition period has been foreseen but all sprayers on European territory should have had a 1st inspection before end of 2016.

Today, as being active in about all European member states, we observe, regardless statistics handed to the Spise secretariat, that not half of all member states has an inspection system installed. Even worse is that countries that have started an inspection system/schedule, are having issues to organise a practical follow-up of inspections in the field. This lack of supervision is causing multiple irregularities in the field, each reinforcing the other.

- **Lack of checking on farms/in the field if sprayers are inspected** (with no penalty applied to growers that are not inspected as required by law) causing farmers not to inspect their sprayer or all of their sprayers, especially smaller farmers or farmers in a secondary occupation, causing a too low number of sprayers available for inspections to make it viable for inspection stations.
- The lack of numbers of sprayers to inspect is putting an economical pressure on inspection stations that reduce the inspection cost in an economic struggle to be able to amortise their inspection tools and make no losses. **The lack of supervision on the activities of inspection stations**, not performing inspections as prescribed to reduce time and efforts, to reduce costs, to be able to lower the price of the inspection service to be the best on the market, going that far to just selling an approval certificate/sticker of inspections, causing the good and faithful growers to loose their trust in the inspection systems and seeing it just as a tax, just choosing the cheapest solution.
- **The lack of practical and precision of inspection stations**, where inspection stations use not validated/certified measuring tools in inspections and in many cases tools that are less precise (at the best identical) than the tools and parts installed on sprayers, where farmers loose trust in the results of the inspections after being rejected or require repair.
- **The lack of proper training and advisory stations for inspectors**, where inspectors have a major experience in inspections and trainers never did any inspection. This is especially an issue in completion and refreshment courses.

Is it all bad? No, but it becomes time that serious actions are undertaken in multiple countries and regions to avoid that more inspections systems that just have been initiated will implode. Nobody gains anything with bad executed inspections or even the vanishing of inspections, with the whole agricultural sector and the environment as being first effected. Let's all work together to get the process of inspections of sprayers in use back on the right track to help agriculture and environment to sustain hand-in-hand.

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