Applied methods for insect management in stored grain and oilseeds

Results of the storage insecticides survey carried out by COCERAL, EUROMAISIERS, EUROMALT and UNISTOCK

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COCERAL – EUROMALT – EUROMAISIERS – UNISTOCK

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Report Highlights:

This report describes insect management as it is applied by European grain and oilseeds storage operators.

The risk of pest infestations is a reality of the grain storage process. Under worldwide trading standards, the grain industry is committed to maintain the "nil tolerance" for live insects. Currently there are only a limited number of storage insecticides available due to legislative restrictions,

As a result, this report shows that European operators face difficulties to combine the available management technique. Therefore we stress the need for legislative development together with an increase in research and development of new active substances. In addition, flexibility should be given to producers willing to submit a product composed with a generic active substance.

Main findings

- The favored option to manage insect infestation seems to be air circulation throughout the grain mass (up to 67% of the respondents apply this method in their own silos, 30% at farm level and 16% in port silos). The use of storage insecticides is considered the best alternative option: 49% of the respondents apply storage insecticides in their own silos, 23% at farm level and 14% in port silos.
- On the crop 2006/2007, the most applied active substances were dichlorvos, malathion, pyrimiphos methyl and deltamethrine. After the phasing out of dicholrovs and malathion in 2007, the use of deltamethrine, pirimiphos methyl and chlorpiryphos increased significantly.
- Fumigation is used at all levels of the grain and oilseeds supply chain. The data collected shows that the use of fumigation has increased in more recent years (crops 2009/2010 and 2010/2011).

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Introduction

The European grain industry constantly works to ensure products of consistently high quality that are compliant with all food and feed safety requirements. Absence of insect infestation ('nil tolerance') and contamination have become an important consideration.

This report focuses particularly on insect management of stored grain at different level of the supply chain. Infestations can lead to extensive losses of stored grains resulting in:

- Deterioration and contamination from the presence of insects results in downgrading of grain and market value due to insect parts, odours, moulds and heat damage.
- Damaged grain is a favoured environment for the development of mould and mycotoxins. Therefore, food safety is also at stake.
- Deterioration of crop quality as a result of insect activity, such as loss of weight, nutritional value, germination and decrease of market value

The ongoing review process of active substances in the European legislative framework has consequences for grain storage at any operating level. Most of the active compounds used for knockdown treatments (showing rapid effect on insect populations) were phased out in the review process under Regulation (EC) No 1107/2009, repealing Directive EC 91/414. Equivalent treatments applied as an alternative are scarce. Any further loss of active substances would reduce the ability of the operators to manage infestations. Therefore, our associations have carried out a survey to get an accurate understanding of insect management as it is applied by the grain storage operators.

The scope of this report is to present the main findings from the Insect Management Survey.

A. Scientific review

1. Pest management

Once a cereal crop is harvested, it may be stored for a period of time before it is marketed or used as food, feed or seed. The length of time during which the cereals can be safely stored will depend on the harvest condition, the post-harvest treatment (such as drying and cleaning) and the type of storage facility being used. Grain placed into store at lower temperatures and moisture contents can be kept in storage for longer periods of time before its quality deteriorates. The presence and build-up of insects, mites, moulds and fungi – all of them influenced by grain temperature and moisture content – will affect grain quality and duration of grain storage.

Rapid deterioration of the crop quality might occur with combined attacks by insects, acaroids and larvae. For cereals, a rise in temperature is expected due to respiration; it might also occur due to insect or fungal activity. Heating leads to moisture condensation in cool areas within the grain mass. This in turn encourages insect infestation (see Appert, 1987; Imura & Sinha, 1989).

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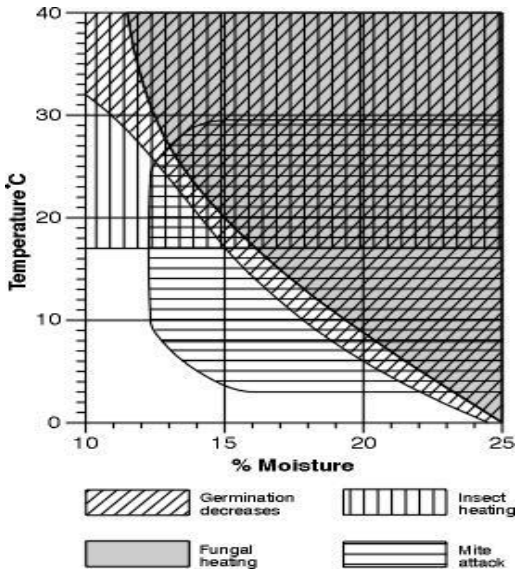

As insects cannot control their body temperature, they are inactive at low temperatures (below 8°C for insects and 3°C for mites). Moisture content of grain below 13% stops the growth of most moulds and mites. Moisture content below 10% limits the development of most stored grain insects and pests. In addition to actual moisture content of the grain, the volume of stored grain also affects the rate of cooling. Practical storage conditions are summarized in Figure 1.

Figure 1: *Practical storage conditions.* Adapted *from Appert, 1987.*

2. Resistance to grain protectants and fumigants

Storage insecticides and fumigants are used extensively in the grain industry. Resistance to organophosphates, fenitrothion, pirimiphos-methyl and chlorpyrifos-methyl is widespread. In addition, resistance to one or more of these products has occurred in most major pest species. Since there is no single compound that will control all species attacking stored products, a combination of two products must be applied.

Resistance to phosphine had been detected in China, India, the Dominican Republic and Australia (Collins, 2001). Heavy reliance on phosphine for insect control, however, means that there is enormous selection pressure for insects to evolve resistance. Besides, options for managing resistance to phosphine are limited because at present, there are few ready alternatives.

B. Legislative background

Two legal texts have an impact on the pest management methods. Regulation (EC) No 1107/2009 repealing Directive 91/414 has a direct effect on the availability of active substances on the market by regulating the authorization process. Secondly, the regulation on Maximum Residue Levels of pesticides has also an influence on the way operators manage pest infestations.

1. Regulation (EC) No 1107/2009

Plant protection products (PPPs) are mainly regulated by Regulation (EC) No 1107/2009 concerning the placing of plant protection products on the market. The Regulation lays down approval criteria for active substances. An active substance shall be approved if it fulfills the criteria detailed in its Annex II. Therefore, chemical substances or micro-organisms in PPPs are only approved for use once they have undergone a scientific risk assessment, and safe use has been demonstrated through a peer-reviewed safety

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assessment. The Regulation came into force in December 2009 and is directly applicable in all Member States, harmonizing the rules applied in governing the authorization of PPP use.

Regulation (EC) No 1107/2009 repeals Council Directive 91/414/EEC of 15 July 1991 concerning the placing of plant protection products on the market. The implementation of Directive 91/414 led to a rapid decline in the number of AS available on the EU market since 1993. The number of AS available to EU operators continues to decline under Regulation No 1107/2209, which includes hazard-based cut-off criteria.

Table I: *Current state of play of authorized active substances*

AS	No. ASs	Approved	Not approved	Pending
Insecticides	276	88	169	19
PPP	1277	432	781	64

Further details on compounds used as a storage insecticide are found in Table II.

2. Regulation 396/2005 on Maximum Residue Levels

Regulation (EC) No 396/2005 of 23 February 2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin seeks to provide a pan-EU range of maximum pesticide residue levels (MRLs) in plant products, including grain and oilseeds. Harmonised MRLs eliminate barriers to trade and increase market transparency. MRLs are set for individual PPPs in combination with pesticides. The regulation applies to both EU and imported goods placed on the EU market.

Fumigants fall under the scope of this regulation. Certain substances listed by the Commission (Annex VII, Reg. EC 260/2008) may be authorised by the member states even if a post-harvest treatment with a fumigant on their own territory results in a temporary MRL exceedance, under the following conditions:

- the products concerned are not intended for immediate consumption;
- controls are in place to ensure that these products are not made available to the consumer;
- the other Member States and the Commission are informed of the measures.

The reason of such an exemption is that most phosphine is lost within few days from fumigations in ordinary, unsealed storages.

Hydrogen-phosphide, Aluminium-phosphide, Magnesium-phosphide and Sulfuryl fluoride are covered by this regulation. All are applicable on cereals and oilseeds, with the exception of Sulfuryl fluoride authorized only for cereals.

C. Legislative developments for storage insecticides

Notwithstanding their legal status, effective storage insecticides are the following ones:

- Malathion,
- Dichlorvos,

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- Fenitrothion,
- Chlorpyriphos-methyl,
- Pirimiphos-methyl,
- Deltamethrin,
- Cypermethrin
- Bifenthrin,
- Permethrin,
- Endosulfan,
- Pyrethrins combined with Piperonil butoxyde.

For each of these active substances, the Table II hereunder reports the EU and Codex MRLs for oilseeds and cereals, the status of revision under Annex 1 of EC 91/414 and the opinion of EFSA.

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Table II: Legislative state of play for storage insecticdes

Substance	Approval holder	Oilseeds		Cereals		Inclusion 91-414-EC Annex 1	EFSA opinion
		EU MRL mg/kg	CODEX MRL mg/kg	EU MRL mg/kg	CODEX MRL mg/kg		
Pirimiphos-methyl (F)	Syngenta	0.05*	-	5	7	IN Link: Decision 2007/52/EC Regulation (EU) No 540/2011	Link to the opinion
Chlorpyrifos-methyl	Dow AgroSciences Ltd	0.05 *	-	3	10 Wheat 0.1Rice	IN Link : Dir. 2005/72/EC Regulation (EU) No 540/2011	
Deltamethrin cis-Deltamethrin	Bayer	0.1 Rape, 0.05 Others 1 Olives for oil crushing	0.05 Sunflower	2	2	IN Link : Dir 2003/5/EC Regulation (EU) No 540/2011	Link to the opinion 9 Jan 2009
Zeta-Cypermethrin	FMC	0.2* linseed, sesame, poppy, sunflower, cotton, rape seeds 0.05 soya bean	0.1	2 barley, oats, rice rye, wheat. 0.03 maize, millet, sorghum	0.3 cereal grains 2 barley, oats, rice rye and wheat	IN Link: Dir 2009/37/EC	
Cypermethrin	FMC					IN Link: Decision 2005/53/EC	
Pyrethrins 1 and 2	generic 11 applicants	3 all oilseeds	-	3 cereal grains	0.3 cereal grains	IN Link: Decision 2008/127/EC	AS of no concerns. EFSA will deliver an assessment later.
Kieselguhr (diatomaceous earth, *TSS, diatomite, silica)*	generic 5 applicants	No MRL required		No MRL required		IN Link: Decision 2008/127/EC Regulation (EU) No 540/2011	

Spinosad (F) sum of SA and SD, expressed as S	Dow AgroSciences Ltd	0.02*	0.01* Cotton seeds	1	1 cereal grains	IN Link: Decision 2007/6/EC	
Malathion	Cheminova A/S (DK)	0.02*	20 cotton seeds	8	10 wheat 3 sorghum 0.05 maize	IN Link: Commission Directive 2010/17/EC	Link to the review report
Sulfuryl fluoride	Dow AgroSciences Ltd	0.01 (Fluoride ion = 2)		0.05 (Fluoride ion = 2)	0.05	IN Link: Commission Directive 2010/38/EU	
Bifenthrin	FMC Chemical s.p.r.l	0.5 cotton seed 0.1 other oilseeds	0.05 rape seed 0.5 cotton seeds	0.5 wheat, barley, oats, 0.05 *other cereals	0.5 Wheat 0.05 barley, maize	IN Link: Regulation (EU) No 582/2012	Link to the opinion
Dichlorvos	Denka International (NL)	0.01*	-	0.01*	5	OUT Link : Decision 2007/387/EC	Link to the opinion
Fenitrothion	Sumitomo Chemical Agro Europe initial applicant But AS fell into the public domain	0.02*	-	0.05*	6	OUT Link: Decision 2007/379/EC	Link to the opinion
Endosulfan	Bayer Crop Science	0.5 Soybean 0.3 cotton seed 0.1* other oilseeds	1 soybean dry 2 soybean crude oil	0.05*		OUT Link: Decision 2005/864/EC	Link to the opinion
Piperonyl butoxide		Not applicable	-	Not applicable	30 in cereal grains (accommodates post-harvest treatment)	Not applicable	

The pesticides EU – autorisation and MRLs database: http://ec.europa.eu/sanco_pesticides/public/index.cfm
Codex Alimentarius website: http://www.codexalimentarius.net/pestres/data/pesticides/search.html

Note: * lower limit of analytical determination - SCFC: Standing Committee of the Food Chain (Phytopharmaceuticals) - JMPR: FAO/WHO joint meeting on pesticides residues ADI: Acceptable Daily Intake ARfD: Acute Reference Dose

As opposed to Dichlorvos and Phosphine, insecticides like Deltamethrine or Bifenthrin have a long term effect on insect populations. Data for active substances like Permethrin or Pyrethrin are not protected anymore. Therefore, knowing that data protection will not be ensured, there is no incentive for any companies to carry out any submission file to the European Commission.

Both pyrethroids and pyrethrins are often formulated with oils or petroleum distillates and packaged in combination with synergists, such as piperonyl butoxide. Synergists are added to increase the effectiveness of the compound. The synergist is not considered a plant protection product and it has been authorized under the EU law, but member states can regulate it separately at national level.

Pursuant to the approval of Pyrimiphos methyl a revision of its MRL was carried out. However, the revision process proved to be lengthy and difficult to carry on: studies demonstrating the residues cross-contamination were submitted to the Commission and were acknowledged by EFSA. While the revision process is still on going, the applicable MRL for Pyrimiphos-methyl is 5ppm.

D. Scope and method of investigation

1. A network of four European associations

Four European associations - Coceral, Euromalt, Euromaisiers and Unistock – have participated in this inquiry

- **COCERAL** is the European association representing the trade in cereals, rice, feedstuffs, oilseeds, olive oil, oils and fats and agrosupply. Its Food and Feed Safety and Environment section gathers specific expertise to meet a growing demand by the industry faced with continuous flow of legislation in these areas.
- **Unistock** is the European association of professional storekeepers for agribulk commodities.
- **Euromaisiers** is the representative organisation for the European dry maize milling sector. The industry mills about 1.5 million tonnes of maize each year to produce around 900.000 tonnes of "grits" and flour.
- **Euromalt** represents the European malting industry. Around 18 million tonnes of malt are produced annually around the world, of which around half is produced within the EU. Of the total malt production 94% is used for beer production, 4% for whisky production while the remaining 2% is destined for other food uses.

2. The inquiry and main characteristics of respondents

Two survey rounds were carried out (round 1: March-June 2008, round 2: November 2012-April 2013), with the questionnaire being revised for the second round (2012-2013). The inquiry was designed in such a way that the respondents have to give short answers to precise questions (Annex 1). The file, initially drafted in English, was sent out to the member companies.

In 2008 replies were obtained from operators from France, Germany, Hungary, Italy, the Netherlands, Poland, Spain and the United Kingdom. Operators from Austria, Belgium, Finland, France, Germany, Greece, Hungary, Italy, the Netherlands, Poland, Spain, Sweden and the United Kingdom participated in the 2012-2013 survey.
All data was encoded. For reasons of confidentiality, the raw data are not published in this report.

The first series of questions cover the volume of marketed grain, oilseeds and pulses by the responding companies. In the first round (2008), operators were asked for the volumes of grain marketed. Overall, responding companies accounted for around fourteen million tonnes of agri-products (see breakdown in Table III). In the second round (2012-2013), operators were given ranges of volumes to choose from, to facilitate their participation in the survey. The majority of respondents market between 0-200 KT of cereals, oilseeds and pulses (see table IV). The amount of grain covered by the inquiry is a mix of grain stored in port silos, warehouses, silos and farm silos. This grain might be coming in or going out, it is only relevant to consider it as the "grain capacity managed by respondents".

Table III: *Volumes marketed by the respondents*

	Cereals	Oilseeds	Pulses
Total (metric tons)	11,115,936	2,256,629	131,526

Data: 2008

Table IV: Volume of grain marketed by participating companies

	0-200KT	200-500KT	500KT-1MT	>1MT
Cereals	42%	33%	12%	12%
Oilseeds	53%	5%	7%	0%
Pulses	30%	5%	0%	0%

Data 2012/2013

Paragraph 2 of the form refers in a broad sense to the management options applied by the operators. Furthermore, items 3, 4 and 5 cover much more detailed technical options. They deal respectively with ventilation techniques and chemical applications.

E. Findings

1. Applied methods to cool down cereals and oilseeds

Insect management consists of three main methods: cleaning, air circulation/ventilation and chemical treatments. Ventilation is the process of forcing the movement of ambient (or conditioned) air of suitable quality (T°, moisture). If cold air is available (during fall or winter seasons, on cold nights), introducing and moving this air throughout the grain mass gradually lower the temperature.

The options selected by operators vary widely. However, operators are equally likely to use one of these methods. Additionally, the following trends emerge from our investigation and confirm the results of the 2008 survey:

- The favoured option to prevent insect infestation seems to be air circulation throughout the grain mass (Figure 2). The use of storage insecticides is considered the best alternative option. It can be justified with the Figure 1 (page 2) showing that, even at a grain temperature and moisture levels respectively below 10°C and 15%, infestation is still likely to occur. Operators also rely on fumigation in both silos and port silos.
- In port silos both fumigation and insecticide spraying are applied. Intensity of treatment is lower in the ports than in the silo because of higher turnover of grain mass in the bins.

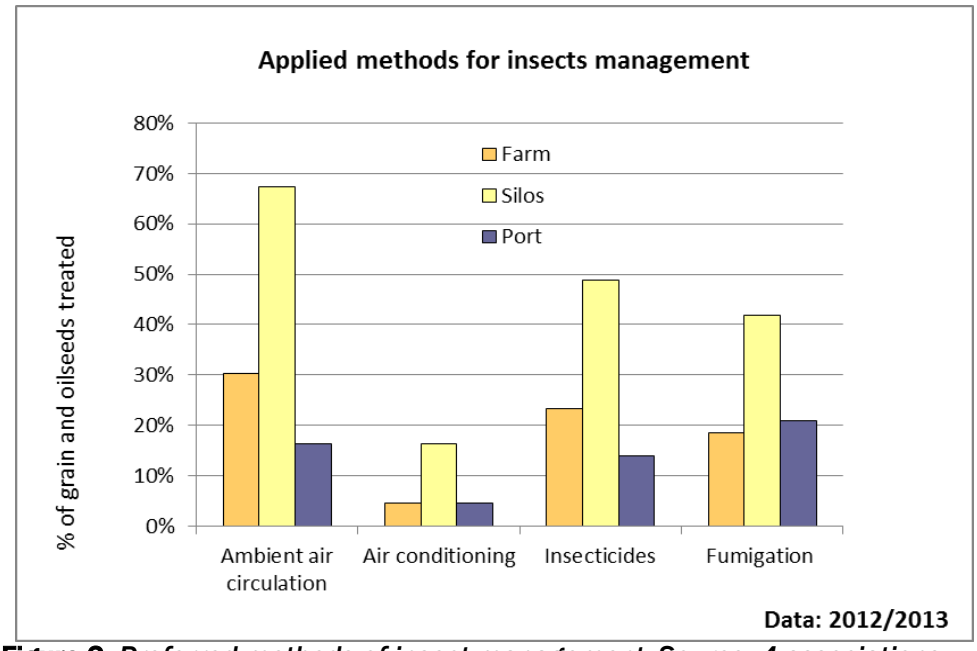

Figure 2: *Preferred methods of insect management.* Source*: 4 associations*

To implement these methods, operators need to have specific equipment in place. According to the replies received, two general patterns are significant. First, a large majority of the surveyed companies are equipped with a system to monitor the temperature in the premises. Second, ventilation system goes along with the temperature monitoring system in the silos. (Figure 3)

It is to be observed that all respondents have at least one of the three mentioned devices. These trends confirm also the 2007-2008 data (see figure 4).

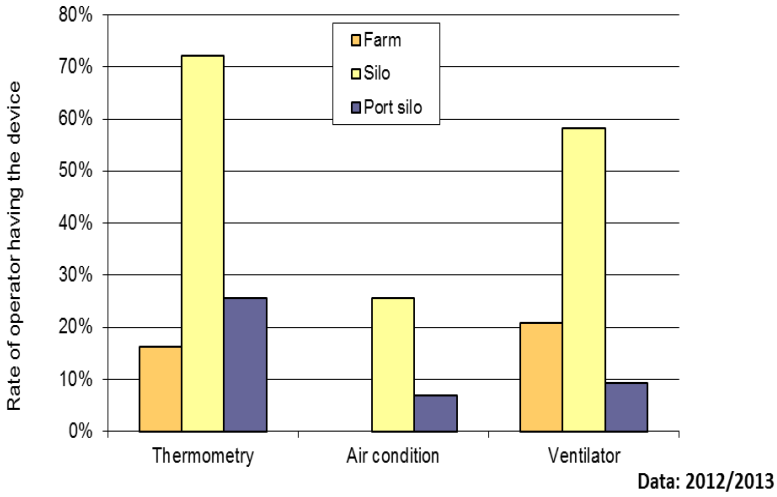

Figure 3 *Level of equipment of the respondents.* Source*: 4 associations Data 2012/2013*

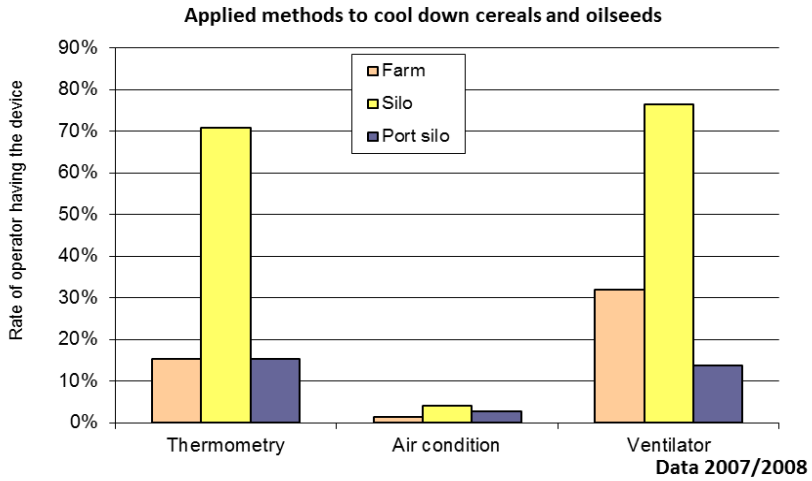

Figure 4: *Level of equipment of the respondents*
Source*: 4 associations Data: 2008*

At silo level (Table V), the most used methods to cool down the stored grain in case of emergency are either augering grain from one bin to another or piling up grain outdoor. It does imply that a free silo or a free ground floor is permanently available and that there are some cold weather periods.

Table V: *Available devices to transfer the grain.*

	Free silo	Free area
Farm	9.3%	2.3%
Silo	55.8%	23.3%
Port silo	14.0%	2.3%

Data: 2012/2013

2. Applied active substances

On the crop 2006/2007, the most applied active substances are Dichlorvos, Malathion, Pyrimiphos methyl and Deltamethrin. At silo level, the use of pyrethrins combined with a synergizant seems to be an attractive alternative. It is however demonstrated that there are no residual activities of the active substance. This implies that the operators further down the supply chain might have to treat the grain again.

The publication of Commission Decision C(2007) 2338 of 6 June 2007[1] withdrawing the authorization of dichlorvos and the phasing out of malathion lead to changes in the use of active substances for the succeeding crops.

For the crop 2007/2008, increases in the use of Deltamethrine, Pirimiphos methyl and Chlorpiryphos methyl were observed. These trends are maintained also for the crops 2009/2010 and 2010/2011.

[1] Commission Decision C(2007) 2338 of 6 June 2007[1] concerning the non-inclusion of dichlorvos in Annex I to Council Directive 91/414/EEC and the withdrawal of authorisations for plant protection products containing that substance

The combination of butoxyde piperonyl with pyrethrins is used increasingly for the crops 2009/2010 and 2010/2011. This increase is visible for both uses in silos and port silos.

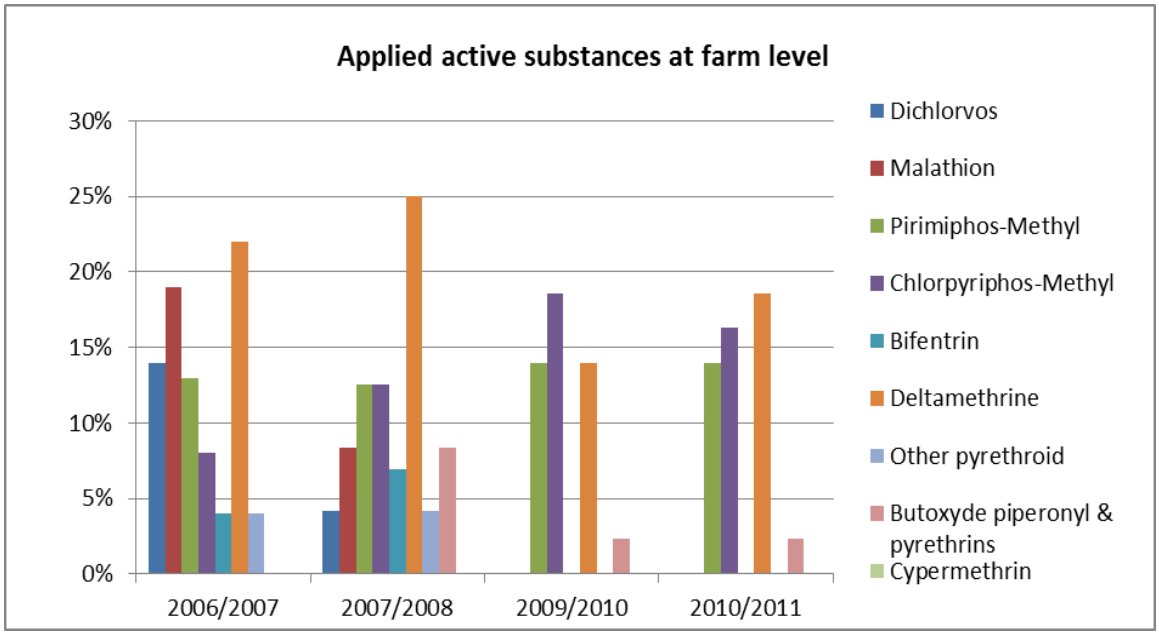

Figure 5: *Use of active substances at farm level as a % of total of respondents*

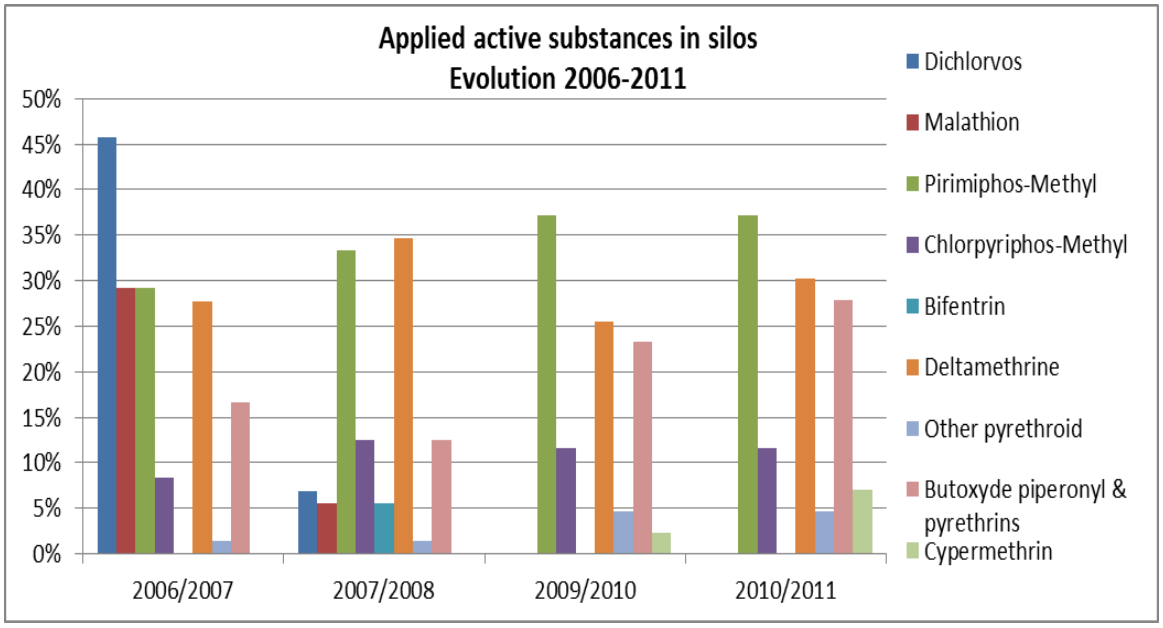

Figure 6: *Use of active substances in own silos as a % of total stored agri-product treated*

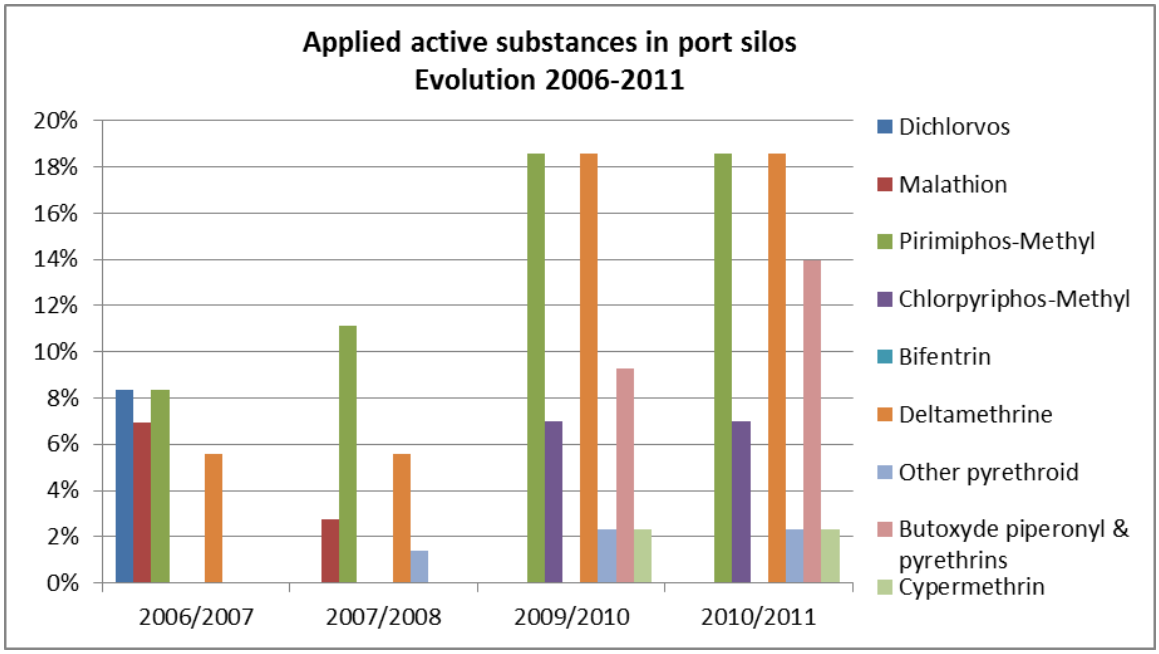

Figure 7: *Use of active substances in port silos as a % of total grain and oilseeds treated*

The changes observed reflect the need for a sufficient range of plant protection products to prevent the development of pest resistance. It is rather manifest that all of the substances available are used by the operators.

3. Fumigation

Hydrogen Phosphide has become the predominant fumigant used for the treatment of bulk-stored oilseeds and grain throughout the world (Harain, 2002). It is available in solid formulations of aluminum phosphide or magnesium phosphide. When exposed to heat and moisture the formulations release phosphine, a highly toxic gas to humans and other warm blood animals. The time required for the release of phosphine varies depending on temperature, grain moisture and formulation. Residues of the fumigants compound in the grain decline to below the MRL after overnight aeration. However, the grain should be left undisturbed for at least 72 hours (FAO, 2000). The usual practice is to leave the grain for a much longer period so that the fumigant vapours are gradually dissipated by leakage from the structure.

The inquiry shows that fumigation is used at all levels of the grain and oilseeds supply chain. The data collected shows that the use of fumigation has increased in more recent years (crops 2009/2010 and 2010/2011) – see table VI and VII.

Fumigation requires a cautious approach for its application and its technical implementation is often strictly legislated at national level. Consequently, only specially trained personnel or external operators are applying this treatment. The surveys shows that outsourcing the treatment to specialized agencies is becoming more frequent in the recent years (crops 2009/2010 and 2010/2011) – see table VI and VII.

Table VI: *The use of fumigation technique and the choice of operators crops 2009/2010 and 2010/2011*

	Crop 2009/2010			Crop 2010/2011		
% of respondents	At farm	Own silos	Port silos	At farm	Own silos	Port silos
Hydrogen Phosphide (PH_3)	14%	44%	23%	16%	14%	44%
Sulfurylfluoride	0%	5%	0%	0%	0%	5%
Other:	0%	2%	0%	0%	0%	2%
Your skilled staff	2%	19%	5%	0%	2%	21%
External operators	12%	49%	16%	16%	12%	44%

Table VII: *The use of fumigation technique and the choice of operators crops 2006/2007 and 2007/2008*

	Crop 2006/2007			Crop 2007/2008		
% of respondents	At farm	Own silos	Port silos	At farm	Own silos	Port silos
Hydrogen Phosphide (PH_3)	1%	14%	11%	1%	14%	13%
Sulfurylfluoride	1%	7%	4%	1%	7%	4%
Other:	0%	3%	0%	0%	3%	0%
Your skilled staff	1%	13%	4%	1%	10%	3%
External operators	1%	10%	8%	1%	10%	11%

F. Conclusions and discussions

The distinction must be made between ASs used to knock-down the adult insects and other ASs used as protectants or insecticides. Fumigating with phosphine is a good knockdown option but most eggs, larvae and pupae will survive and will begin breeding after phosphine gas concentration has dropped to low level. The other ASs mentioned in Table II are storage insecticides. It does not always kill adult insects present at the time of treatment (Bullin, 2007). These treatments are intended to control developing immature insect stages (ie, larvae), rather than existing mature adult stages. It affects the population development rather than each adult insect.

The development of pest resistance to widely used compounds could occur even faster than before.

As a consequence, operators struggle to comply with the nil tolerance for live insect for following reasons:

- The knockdown effect ASs are removed from the market
- The fumigation, when safe and feasible, doesn't kill premature insects stages
- The remaining storage insecticides have a long terms efficacy.

- Pyrethroids are highly soluble in fat (*eg* Deltamethrin). Therefore, the number of storage insecticides for oilseeds is even more limited.
- Fewer available ASs implies higher residues of the remaining ones and likely development of strain resistance.

Pest problems may not be uniformly distributed within the European countries as temperature and moisture play an important role in their development In the case of northern countries, efficient ventilation devices are usually enough to keep the grain temperature below 10°C. In this respect, the Figure 2 is rather explicit. On the other hand, in many climatic zones, cool air is not sufficiently available after the harvest. And higher air flow may be required for timely aeration. However, this is often considered as economically unfeasible. In this particular case, insecticides or fumigation may have to be applied.

Under the current legislative constraints, the prospects for development and improvements are low. The trends are increasing bans on molecules. It could have dire consequences on the ability of operators to ensure 11 month of storage that, on a yearly basis, start right after a short period of harvesting throughout Europe. Agricultural prices are market sensitive enough to be impacted by few percents of grain loss that would be due to a poor insect management. We therefore stress the need for the legislation to take into account both the current volatility of the agri-product markets and the legislative constraints operators are faced with. In particular, both review process of MRLs and of existing substance should grasp the technical constraints of managing grain & oilseeds storage.

To conclude, this report shows that the tool box available for grain storage is not large enough. In addition, there are few chances that new storage insecticides are being developed. Even though producers continue research and development of new active substances, interest in research gets weaker and weaker due to legislative pressure. The PPPs producers usually focus on the field sciences and consider the next steps of the supply chain as negligible (minor use). Consequently, the grain industry, together with the grain traders urge the industry to focus more research effort on storage insecticides in order to obtain effective and less hazardous formulations.

Annex 1: Questionnaire used for the 2008 enquiry

STORAGE INSECTICIDE ENQUIRY
- OPERATORS –

kindly reply by 7th March 2011

Member state:
.....

1. YOUR COMPANY

Volume of grain marketed by your company	
Products	Volume (thousand Tons)
Cereals	
Oilseeds	
Pulses	
Others (which ones)	

2. APPLIED METHODS FOR INSECTS CONTROL

	At farm (%)	In your own silos (%)	In port silos (%)
Cooling down silos			
Ambient air circulation			
Air conditioning			
Chemical treatment			
Insecticides (crop dusting, powdering, nebulisation)			
Fumigation			
Others techniques (which ones)			
.....			

3. COOLING DOWN THE SILOS: THE METHODS YOU APPLY

	Grain temperature (°C)	Ambient moisture level (%)
Trigger parameters for cooling down the silos		

Method for triggering the cooling down system:

☐ Manual

☐ Thermostat

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IMPLEMENTED ACTIONS TO COOL DOWN THE SILO:

If YES [X]
If NO [ ]

A. **Ventilation**

Devices for temperature management	At farm	In your own silos	In port silos
Thermometry			
Air condition			
Ventilator			
Other			

B. **Grain transfer**

Devices for grain transfer	At farm	In your own silos	In port silos
Permanent free silo			
Permanent free unloading area			
Other			

4. CHEMICAL TREATMENTS: APPLIED ACTIVE SUBSTANCES & METHODS

*APPLIED ACTIVE SUBSTANCE**	Crop 2008/2009			Crop 2009/2010		
	At farm	Own silos	Port silos	At farm	Own silos	Port silos
Pyrimiphos-Methyl						
Chlorpyriphos-Methyl						
Deltamethrine						
Cypermethrin						
Other pyrethroid						
Pyrethrins + Butoxide piperonyl						
Other:						

** If the active substances are unknown please replace them with brand names in the table*

APPLIED METHODS OF TREATMENT	Crop 2008/2009			Crop 2009/2010		
	At farm	Own silos	Port silos	At farm	Own silos	Port silos
On grain						
On premises						
On both						

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5. Fumigation: applied active substances & operators

*Applied active substance**	Crop 2008/2009			Crop 2009/2010		
	At farm	Own silos	Port silos	At farm	Own silos	Port silos
Hydrogen Phosphide (PH_3)						
Sulfurylfluoride (SO_2F_2)						
Other:						

** If the active substances are unknown please replace them with brand names in the table*

Operator	Crop 2008/2009			Crop 2009/2010		
	At farm	Own silos	Port silos	At farm	Own silos	Port silos
Your skilled staff						
External operators						

6. Chemical treatment traceability

	Crop 2008/2009	Crop 2009/2010
Treatment are registered		
Information are provided:		
- by your suppliers		
- to your buyers		

7. Legislation and spot-check controls

	Yes	No
Have you ever been controlled by authorities in the framework of MRL? *		
Did you experienced problems or sanctions about MRL? *		
Did you face any misunderstanding of the regulation like: - Does the MRL applies the grain or to the processed grain (flour...)? - Other:		

* If yes, please specify:

.....

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Storage Insecticide Enquiry

- Association –

kindly reply by 7th March 2011

Member state:
.....

Name of the association		
Number of members		
Quantity of marketed cereals in your country (thousand Tons)		
National storage capacity (thousand Tons)		
Average distribution of cereals oilseeds and pulse storage in the country (%)	At farm	
	Trader	
	Port silo	
Are there contradictions between then national authorizations and Annex 1 of the directive 91/414?		

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Annex 2: Questionnaire used for the 2012-2013 enquiry

STORAGE INSECTICIDE ENQUIRY

- OPERATORS –

Member state: .....

kindly reply by 7 December 2012

1. YOUR COMPANY

If YES X
If NO ☐

The volumes of grain marketed by your company are marketed at:				
National level				
EU level				
Worldwide				
Products marketed	Volume in thousand Tons (KT)			
	Between 0 - 200 KT	Between 200-500 KT	Between 500KT-1MT	More than 1MT
Cereals				
Oilseeds				
Pulses				
Others (which ones)				

2. APPLIED METHODS FOR INSECTS CONTROL

	At farm (%)	In your own silos (%)	In port silos (%)	Barges or Ships (%)
Cooling down silos				
Ambient air circulation				
Air conditioning				
Chemical treatment				
Insecticides (crop dusting, powdering, nebulisation)				
Fumigation				
Others techniques (which ones)				
.....				

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3. COOLING DOWN THE SILOS: THE METHODS YOU APPLY

	Grain temperature (°C)	Ambient moisture level (%)
Trigger parameters for cooling down the silos		

Method for triggering the cooling down system:

☐ Manual
☐ Thermostat

IMPLEMENTED ACTIONS TO COOL DOWN THE SILO:

If YES X
If NO ☐

A. **Ventilation**

Devices for temperature management	At farm	In your own silos	In port silos
Thermometry			
Air condition			
Ventilator			
Other			

B. **Grain transfer**

Devices for grain transfer	At farm	In your own silos	In port silos
Permanent free silo			
Permanent free unloading area			
Other			

4. CHEMICAL TREATMENTS: APPLIED ACTIVE SUBSTANCES & METHODS

*APPLIED ACTIVE SUBSTANCE**	Crop 2009/2010				Crop 2010/2011			
	At farm	Own silos	Port silos	On barges or ships	At farm	Own silos	Port silos	On barges or ships
Pyrimiphos-Methyl								
Chlorpyriphos-Methyl								
Deltamethrine								
Cypermethrin								
Other pyrethroid								
Pyrethrins + Butoxide piperonyl								
Other:								

** If the active substances are unknown please replace them with brand names in the table*

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Applied methods of treatment	Crop 2009/2010				Crop 2010/2011			
	At farm	Own silos	Port silos	On barges or ships	At farm	Own silos	Port silos	On barges or ships
On grain								
On premises								
On both								

Why do you apply the treatment?	
It is a standard treatment	
Because insects are present	
At client demand	
Other.....	

5. Fumigation: applied active substances & operators

*Applied active substance**	Crop 2009/2010				Crop 2010/2011			
	At farm	Own silos	Port silos	On barges or ships	At farm	Own silos	Port silos	On barges or ships
Hydrogen Phosphide (PH_3)								
Sulfurylfluoride (SO_2F_2)								
Other:								

** If the active substances are unknown please replace them with brand names in the table*

Operator	Crop 2009/2010				Crop 2010/2011			
	At farm	Own silos	Port silos	On barges or ships	At farm	Own silos	Port silos	On barges or ships
Your skilled staff								
External operators								

Does your national law require that operators and/or their staff have to be certified/trained for the application and use of plant protection products?

☐ Yes

☐ No

6. Chemical treatment traceability

	Crop 2009/2010	Crop 2010/2011	Crop 2011/2012
Treatment are registered			
Information are provided:			
- by your suppliers			
- to your buyers			

7. Legislation and spot-check controls

	Yes	No
Have you ever been controlled by authorities in the framework of MRL? *		
Did you experienced problems or sanctions about MRL? *		
When controlling processed products, how do your local authorities apply EC Regulation 396/2005? **- do they take into account processing factors?** or** **- do they keep only the whole grain MRLs?**		

* If yes, please specify:

.....

** If yes, who provides the information on the processing factors?

.....

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STORAGE INSECTICIDE ENQUIRY

- ASSOCIATION –

kindly reply by 7 December 2012

Member state:
.....

Name of the association		
Number of members		
Quantity of marketed cereals in your country (thousand Tons)		
National storage capacity (thousand Tons)		
Average distribution of cereals oilseeds and pulse storage in the country (%)	At farm	
	Countryside collector silos	
	Port silo	
Are there contradictions between then national authorizations and Annex 1 of the directive 91/414?		

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