



COCERAL MYCOTOXINS SURVEY: SYNTHESIS REPORT 2015

**Results of the Mycotoxins management survey
carried out among COCERAL members**

October 2019

EXECUTIVE SUMMARY

COCERAL has first carried out a survey among its members regarding mycotoxin management in 2007. The survey was repeated in 2009, 2011, 2013 and latest in 2015. Over the time, some questions have been adapted or added to the survey but essentially with the continuing objective to gain an overview on of mycotoxins management carried out by COCERAL members.

COCERAL members are on the one hand grain collectors and international traders of cereals, rice, feedstuffs, oilseeds and others but also agrosupply distributors, who often advise farmers all along the production cycle - on the choice of seed varieties and the of use of fertilisers and plant protection products.

The first part of the survey focuses specifically on agrosupply distributors' contribution to prevention of mycotoxins risk in the field. Almost all agrosupply distributors participating in the 2015 survey that advise farmers inform about practices aimed at minimising mycotoxin development on cropland, for example by recommending fusarium resistant seeds or adapted fungicides treatments or generally advising on agricultural practices. Further to the advice provided, mycotoxin risk management of farmers normally improves.

The second section of the survey aims at sampling and testing practices pursued by grain collectors and international traders. They intervene after the grain is harvested. Collectors mainly test at harvest or in store but also at loading before transport. When importing, testing tends to take place at delivery but also at loading before transport whereas in intra EU-trade, testing is done mostly in store or at loading before transport.

With almost 100% of survey participants indicating that they sample their lots to monitor mycotoxins, this highlights an increasing awareness of mycotoxin issues. This trend was confirmed also in the report 2013. Survey participants were also asked which crops they sample on which mycotoxins. From the 2015 results, wheat appears to be the most tested crop, but also maize undergoes several testing. Some change in the testing patterns could be observed when comparing the replies with the 2013 survey: in general, barley seem to have been tested less back then; also, for example T2+HT2 toxins testing was done at a higher level on wheat than on maize, different to 2015 survey findings. Compared to 2013, the 2015 survey suggests a reverse trend from internal methods or the use of official control regulation sampling plans towards contractual methods, such as GAFTA 124.

When carrying out mycotoxin analysis internally, operators use both bandage kits and quantitative methods of analysis. When rapid analysis is required, all collectors and traders also use external analysis. However, external analysis is also used to validate analysis carried out internally, or to complement for missing data, for example when internal testing equipment is not available.

According to the 2015 survey, less than 18 % of the participants have had to recall a product lot due to exceedance of regulatory limits (this value was twice in the 2013 report). While most of the product recalls in 2013 were predominantly due to official control, in 2015 it is entirely due to commercial complaints.

REGULATORY SITUATION

Foodstuffs

The Commission Regulation (EC) No 1881/2006 of 19 December 2006 sets maximum levels for certain contaminants in foodstuffs, amongst others for mycotoxins.

Feedingstuffs

Recommended guidance values for different mycotoxins in animal feed, feed materials and feedingstuffs are available through Commission Recommendation 2006/576/EC from 17 August 2006 on the presence of deoxynivalenol, zearalenone, ochratoxin A, T-2 and HT-2 and fumonisins in products intended for animal feeding. Commission Directive 2002/32/EC on undesirable substance in animal feed foresees maximum levels for aflatoxin B1 and rye ergot (*Claviceps purpurea*) in feed materials.

Recommendation regarding presence of T-2 and HT-2 toxins

Discussions on T-2 and HT-2 toxins have been going on for several years. In March 2013, the Commission published a recommendation regarding the presence of T-2 and HT-2 toxin in cereals and cereal products. Member States are asked to perform, with the active involvement of feed and food business operators, a monitoring for the presence of T-2 and HT-2 toxin in cereals and cereal products. In the case of repetitive findings of levels above the indicative level within a certain time, investigations on the effects of feed and food processing on the presence of T-2 and HT-2 toxins shall be performed.

The recommendation includes indicative levels for the sum of T-2 and HT-2 ($\mu\text{g}/\text{kg}$) for unprocessed cereals, cereal grains for direct human consumption but also for cereal products for feed and compound feed (rice and rice products are not included).

Maximum levels for mycotoxins in food and feed

The table here below summarizes the limits and guidance values for food and feed.

Table 1: Summary of current limits for mycotoxins (data from COMMISSION REGULATION (EC) No 1881/2006 – consolidated version April 2016)

Mycotoxins		Foodstuffs Regulated maximum levels	Feedingstuffs levels
STORAGE MYCOTOXINS	Aflatoxins	<ul style="list-style-type: none"> - <u>Sum of B₁, B₂, G₁, and G₂:</u> - 4 ppb for cereals and products derived from cereals (excluded maize, rice and processed cereal products, baby foods and dietary foods for infants) - 10 ppb and 5 ppb (B₁) for maize and rice - <u>Aflatoxin B₁:</u> - 2 ppb for cereals and products derived from cereals (excluded maize, rice and processed cereal products, baby foods and dietary foods for infants) - 5 ppb for maize and rice - 0.1 ppb for processed cereal-based foods and baby foods for infants and young children 	<u>Regulated levels for Aflatoxin B₁:</u> 20 ppb for feed materials
	OTA (Ochratoxin A)	<ul style="list-style-type: none"> - 5 ppb for unprocessed cereals - 3 ppb for all products derived from unprocessed cereals including processed cereal products except if for infants and young children (0.5 ppb) 	<u>Recommended guidance values:</u> 250 ppb
FIELD MYCOTOXINS	DON (Deoxynivalenol)	<ul style="list-style-type: none"> - 1250 ppb for unprocessed cereals other than durum wheat, oats and maize - 1750 ppb for unprocessed durum wheat and oats - 1750 ppb for unprocessed maize with the exception of unprocessed maize intended to be processed by wet milling (starch production) - (rice is excluded from “unprocessed cereals”); 	<u>Recommended guidance values:</u> 8 000 ppb for cereals and cereal products (12 000 ppb for maize by-products)
	ZEA (Zearalenone)	<ul style="list-style-type: none"> - 100 ppb for unprocessed cereals other than maize - 350 ppb for unprocessed maize with the exception of unprocessed maize intended to be processed by wet milling (starch production) - (rice is excluded from “unprocessed cereals”); 	<u>Recommended guidance values:</u> 2 000 ppb for cereals and cereal (3 000 ppb for maize by-products)
	FUMONISINS B ₁ +B ₂	<ul style="list-style-type: none"> - 4000 ppb for unprocessed maize with the exception of unprocessed maize intended to be processed by wet milling (starch production). 	<u>Recommended guidance values:</u> 60 000 ppb for maize and maize products
	Ergot sclerotia	<ul style="list-style-type: none"> - 0.5 g/kg for unprocessed cereals with the exception of maize and rice 	
	Sum of T-2 and HT-2 toxin indicative levels from which in case of repetitive findings, onwards investigations should be performed (Commission recommendation)	<ul style="list-style-type: none"> - Unprocessed cereals: - 200 ppb for barley (including malting barley) and maize - 1000 ppb for oats (with husk) - 100 ppb for wheat, rye and other cereals 	<u>Recommended guidance values:</u> 500 ppb for other cereal products (2000 ppb for oat milling products (husks))

INTRODUCTION

This report aims to show the results of a biannual survey on the management of mycotoxins carried out by COCERAL members.

COCERAL is considered as the voice representing the European cereals, rice, feedstuffs, oilseeds, olive oil, oils and fats and agrosupply trade. COCERAL members act in the food and feed supply chain, both at the level of agrosupply distributors and grain traders (Figure 1).

Agrosupply distributors often advise farmers all along the production cycle - on the choice of seed varieties and the use of fertilisers and plant protection products - also considering the local conditions (environmental, pedo-climatic, economics, etc.). Many agrosupply distributors also provide information about the time of intervention on the crop, the role of meteorological conditions, or the correct dosage for the chosen product.

Grain collectors and international traders intervene after the grain is harvested. Collectors sample and analyse the crops at reception. Then they dry, clean and protect the grain from insect infestations in order to adapt the crops to both the regulatory requirements and the commercial contracts.

Agrosupply distributors and grain trading operators contribute to the management and control of mycotoxins in the batches traded within European Member States.

This report will highlight which tools and actions are put in place to manage the risk of mycotoxins by agrosupply distributors and grain collectors and traders.



Figure 1 Composition of the food and feed supply chain. COCERAL members act before and after the farmers as agrosupply distributors, grain collectors and international traders.

SURVEY DESIGN

- **Population of concern**
 - European agrosupply distributors and grain trading companies;
 - The survey includes replies from France, Germany, Greece, Hungary, Italy, Netherlands, Poland, Spain, and the UK.
 - The operators from the member states who replied to the survey are members of national associations of COCERAL.

- **Enquiry setting**
 - Operators have been consulted via a questionnaire (see Annex 1) sent to them by email.
 - The enquiry was launched on 7th March and closed on 31st March 2016. A second round of enquiry was launched on 1st April and closed on 29th April 2016. A third and last round of enquiry was launched on 26th July and closed on 18th August 2016.
 - The COCERAL Secretariat received 33 replies, covering a total volume of traded grains of 51 million tonnes (equivalent to more than 20% of total EU market share).

The description of the method for processing the replies can be found in Annex 2.

STARTING DATA

- The survey starting data was collected through the questionnaire. The participants were asked to specify the volume of grain traded on a yearly basis and the number of farmers the operator is dealing with.
 - All data received from operators from the same Member State were aggregated.
-
- **Volume of traded grains**
 - The volume of traded grains is composed of the volume collected from European farmers and of grains imported into the European Union.
 - The results of the questionnaire are expressed proportionally to the total volume of grains traded within each member state.
 - The external data on EU imports and intra-EU trade is sourced from Eurostat.

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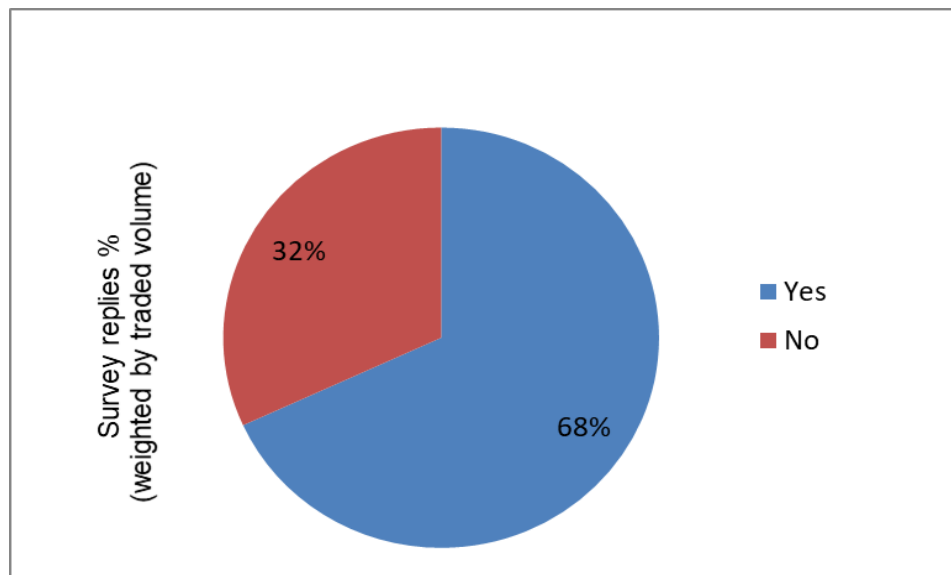
1 Prevention of mycotoxins risk in field

This section refers to the agrosupply section members of COCERAL.



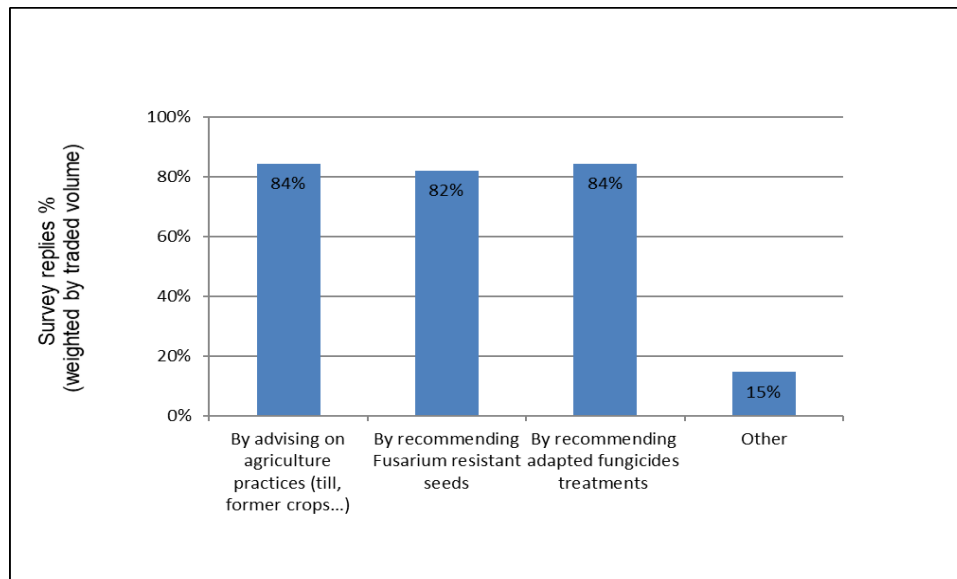
Agrosupply distributors often advise farmers all along the production cycle - on the choice of seed varieties and the use of fertilisers and plant protection products - also considering the local conditions (environmental, pedo-climatic, economics, etc.). Many agrosupply distributors also provide information about the time of intervention on the crop, the role of meteorological conditions, or the correct dosage for the chosen product.

1.1 Do you specifically advise farmers with regard to mycotoxins?



68% of the agrosupply distributors indicated that they advise farmers on practices aimed at minimising the risk of mycotoxin development on cropland. This highlights that mycotoxin management is still a key concern for COCERAL agrosupply members, and that operators use their role to contribute to the management of mycotoxins in field. Nevertheless, there was a decrease in advice provided from agrosupply distributors to farmers since the last survey in 2013 (93%).

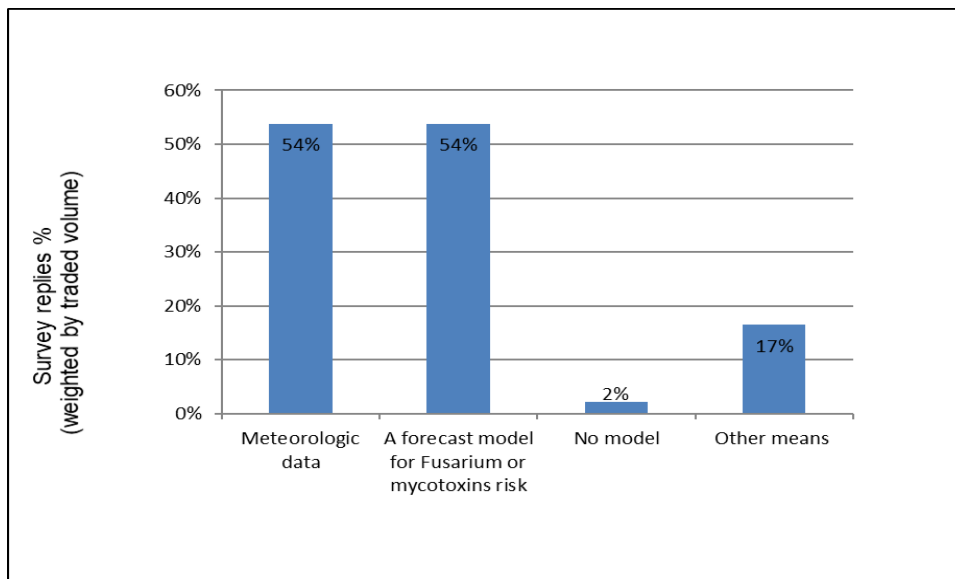
1.2 How do you manage field mycotoxins risks? (multiple answers possible)



As in 2013, when advising farmers about mycotoxins, agrosupply distributors put their emphasis on recommending fusarium resistant seeds and specific fungicide treatments. As in 2013, they also provided advice on agricultural practices. Another approach pursued in one country is through industry agreed best practice approaches, detailing risk and strategies for minimizing risk.

Furthermore, agrosupply distributors generally also sell the seeds and fungicides they recommend (replies to question 1.3 Do you sell the recommended seeds or fungicides?).

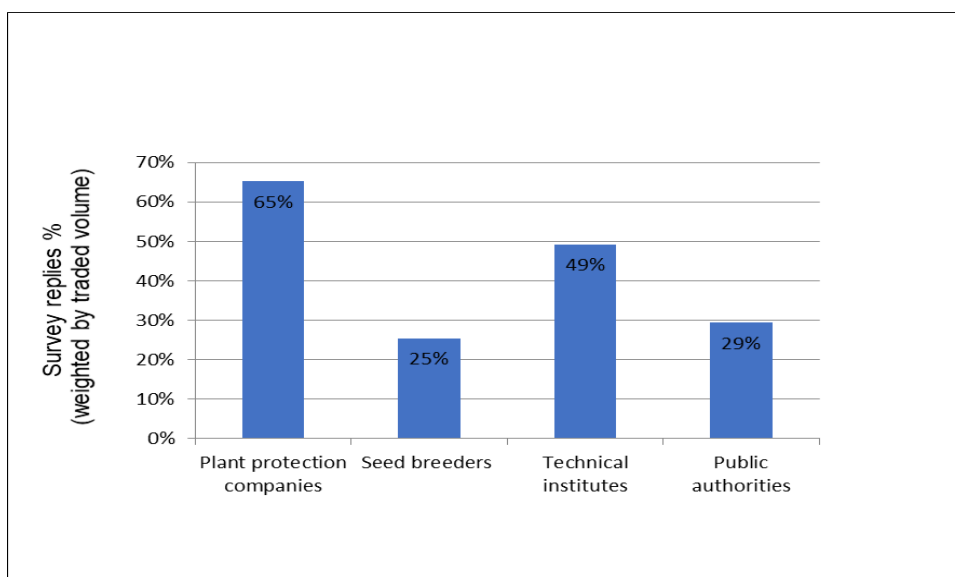
1.3 When advising the farmers, which models do you use? (multiple answers possible)



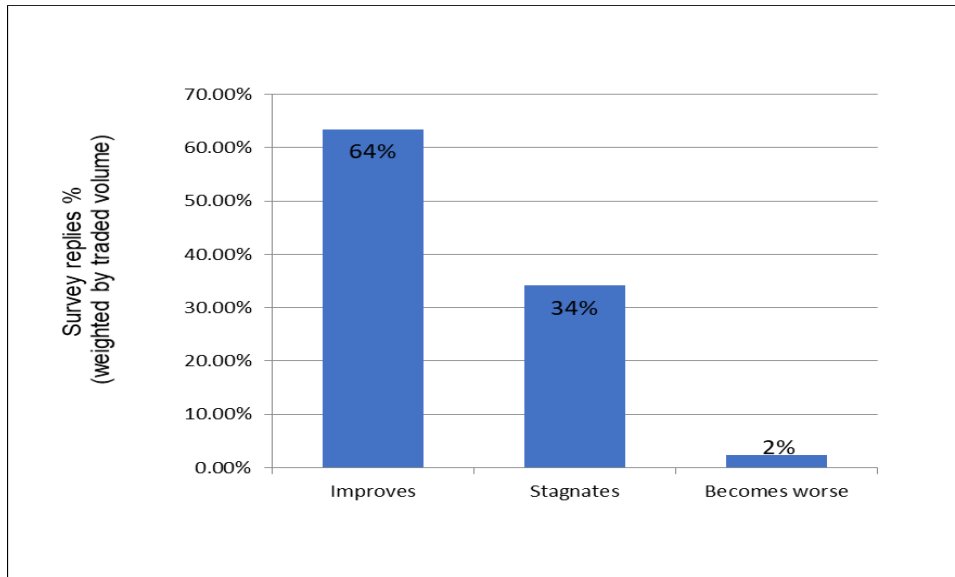
The dominant models agrosupply distributors use when advising farmers seem to be forecast models for fusarium or mycotoxin risk. The percentage has though decrease from 84% to 54% from the last survey in 2013 among agrosupply distributors. Meteorological data is still used by a large part (trend unchanged since 2013). Some also use other means such as observation, or provide online tools (slight increase since 2013, from 7% to 17%). Fewer respondents than in 2013 indicated that they use no model (2% in 2015 against 10% in 2013).

If the forecast model is used, this is still normally proposed by plant protection companies or technical institutes (see graph below). However, compared to the 2013 survey results, the role of plant protection companies and Technical institutes' input has decreased, while the role of Public authorities has slightly increased (20% in 2015 against 11% in 2013).

1.3.1 If you use the Forecast Model, by who is it proposed?



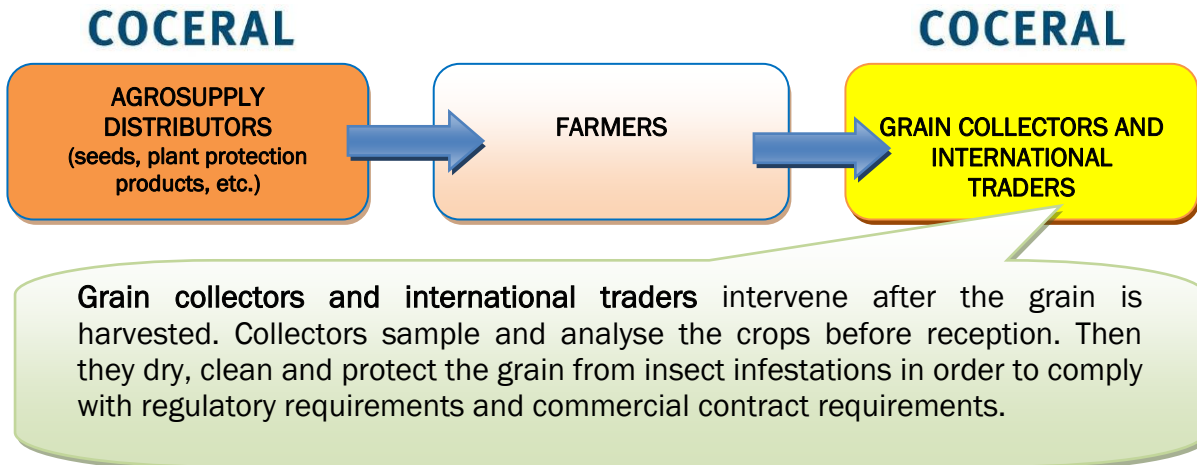
1.4 Further to the advice to farmers the mycotoxins risk management improves, stagnates or becomes worse?



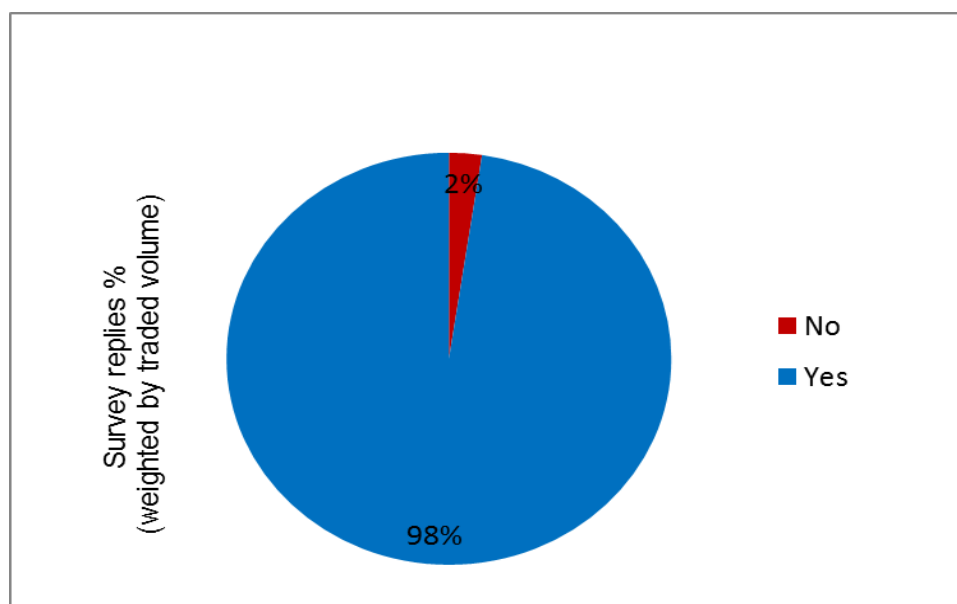
The agrosupply distributors advising farmers on agricultural practices normally observe an improvement of the mycotoxin risk management of farmers (almost 65%). The level seems to be stable when compared to 2013. More members indicated though a stagnation in mycotoxins risk management of farmers (34% in 2015 against 17% in 2013). By further enhancing the collaboration between the principal actors involved and gathering more knowledge concerning the mycotoxins and their prevention, distributors continuously aim to improve the situation.

2 Sampling, detection and analysis

This section refers to grain collectors and international traders members of COCERAL.

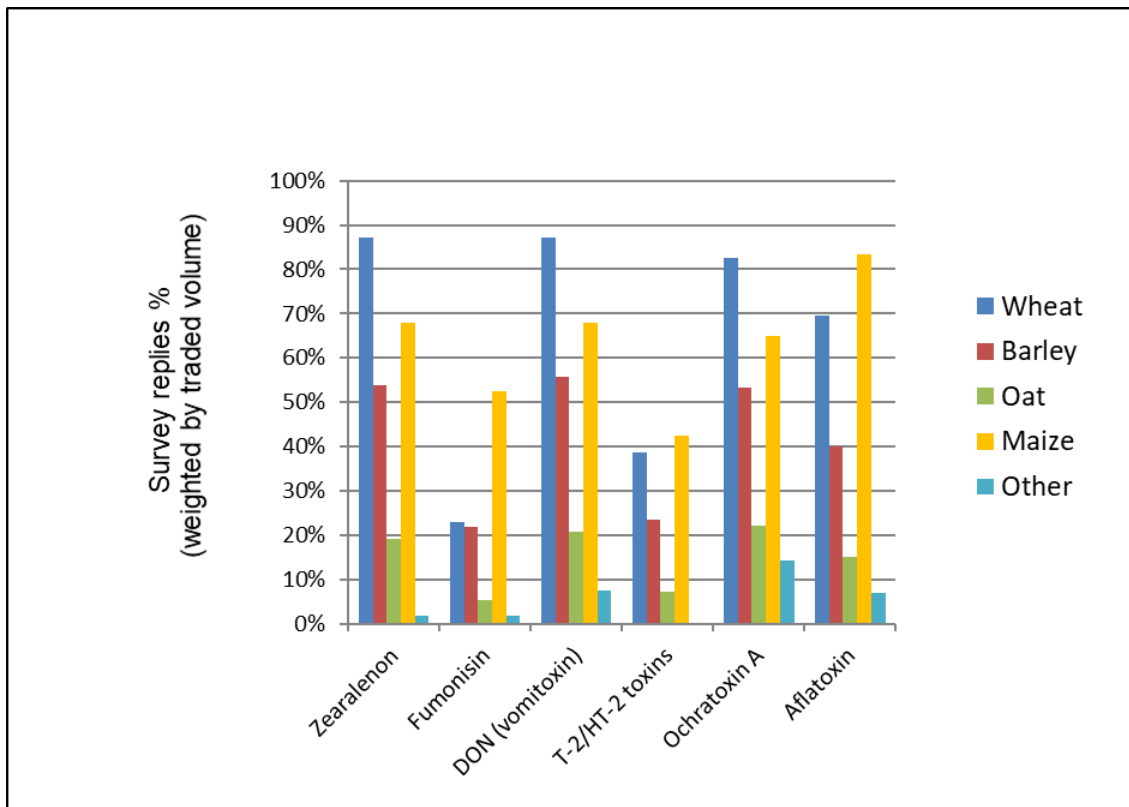


2.1 Do you sample your lots to monitor mycotoxins?



This graph confirms the trend in growing awareness and extent of the level of monitoring that operators put in place for mycotoxin detection: almost 100% of the respondents to the survey indicated that they carry out mycotoxin sampling operations on their lots, as in 2013.

2.1.1 If you sample your lots to monitor mycotoxins, which mycotoxin do you test for? (multiple answers possible)



This chart indicates the level of testing of different crops regarding the different mycotoxins.

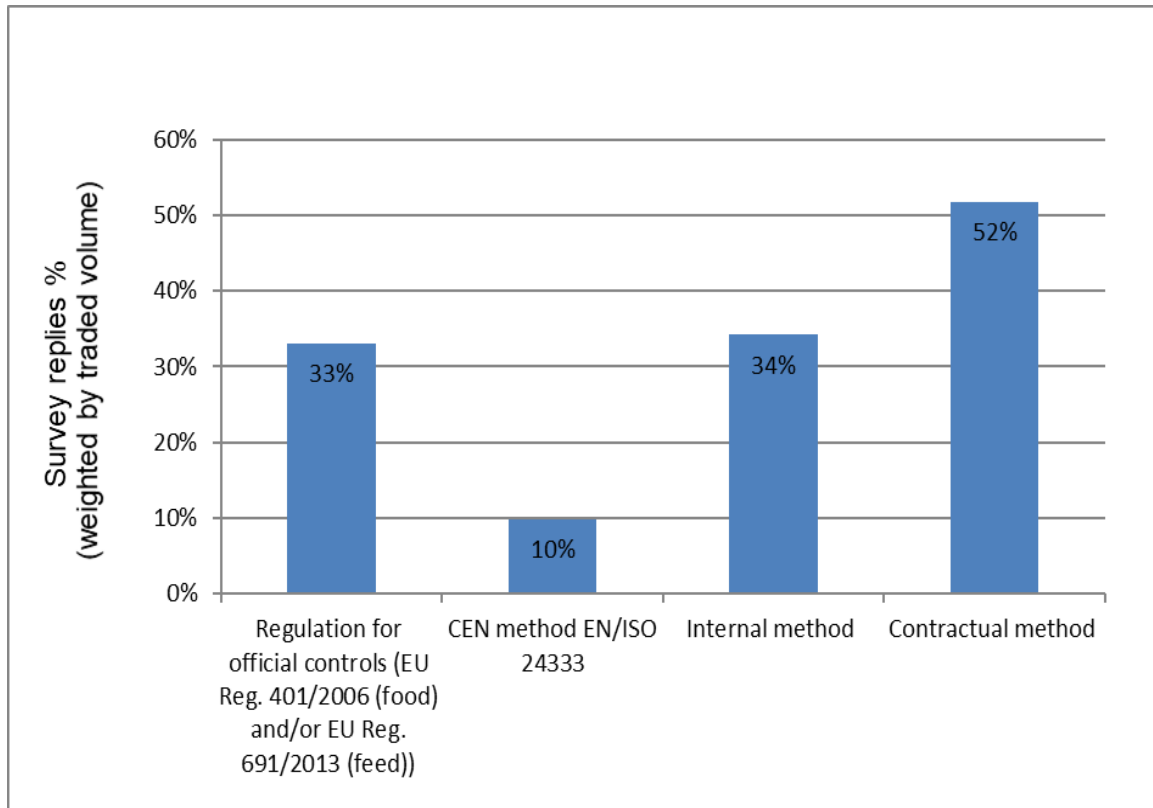
Wheat appears to be the most tested crop, with zearalenone and DON being the mycotoxins tested by the largest number of operators. At least 80% of the participating operators tested wheat also on ochratoxin A. **Maize** also undergoes several tests with about two thirds of the respondents testing samples on zearalenone, DON, ochratoxin A and aflatoxin; the data also indicates that fumonisin testing is performed more on maize than on wheat.

The survey findings suggest that oat and barley or other crops are less frequently tested on mycotoxins than wheat and maize.

In comparison to survey replies in 2013, some changes in testing patterns can be observed:

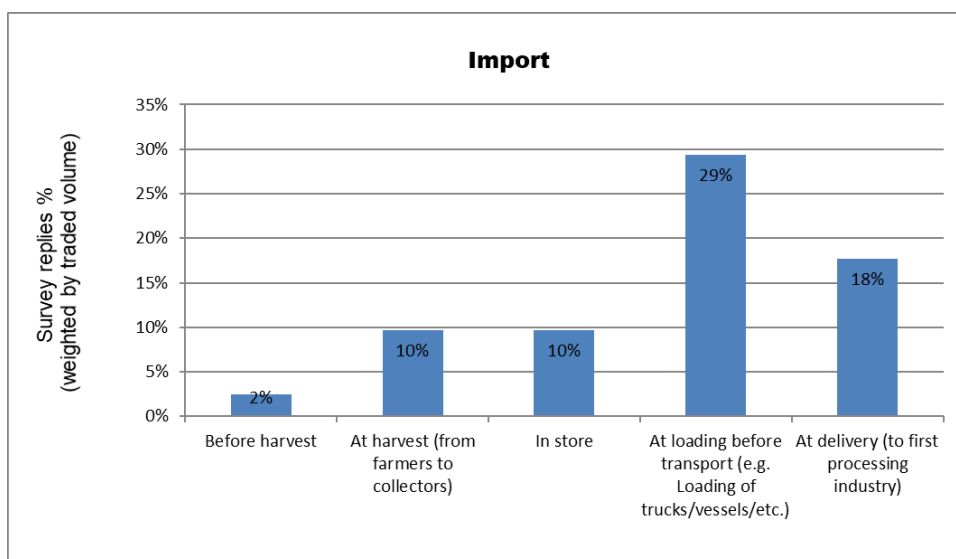
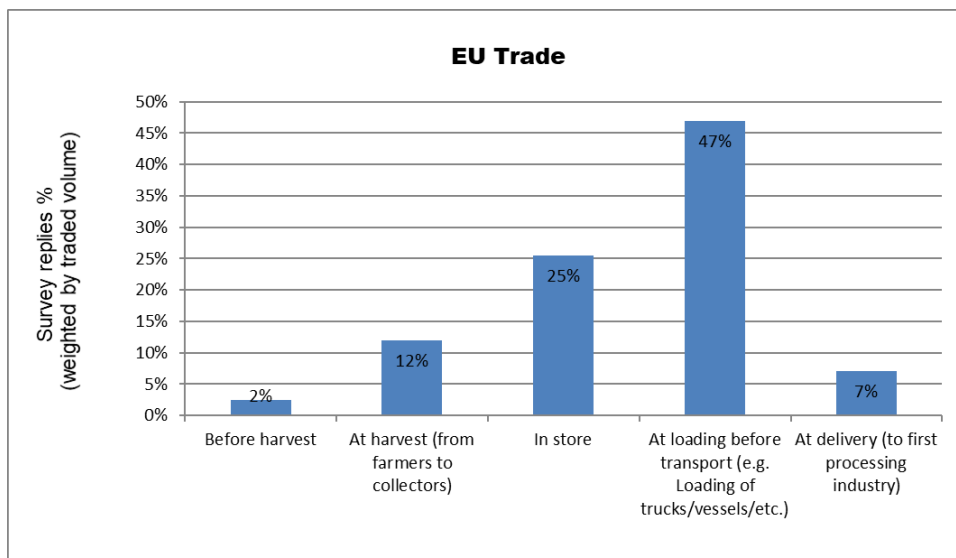
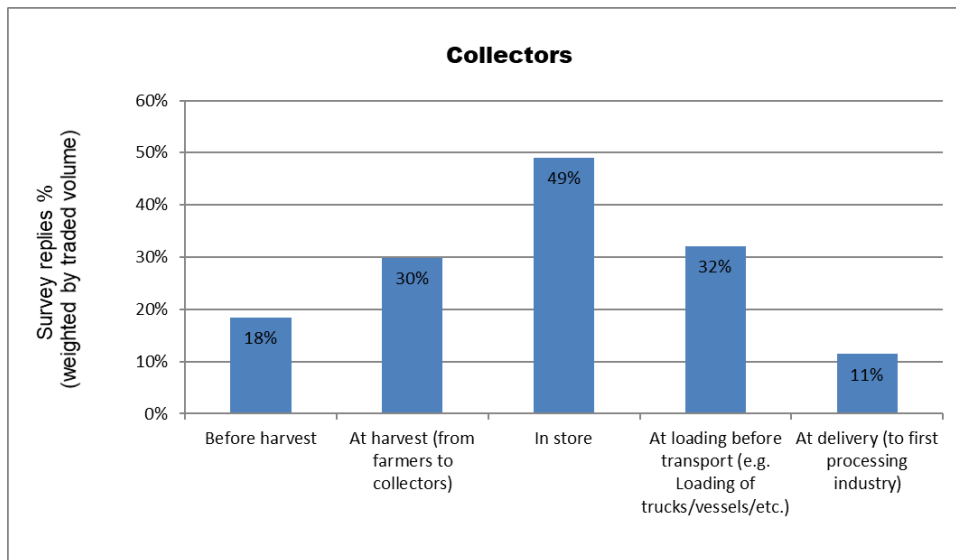
On **zearalenon**, a higher level of testing was done on wheat, barley and other crops; **fumonisin** was also tested more often, that is also on barley and oat, with test on wheat remaining at the same level of 2013. Many more operators indicated that they tested barley and oat on **DON** more than they did in 2013. **T-2 and HT-2 toxins** testing has considerably increased on maize (four times higher than in 2013), doubled on oat and slightly increased on wheat. For ochratoxin A, there was generally more testing on all crops in 2015 than indicated in the 2013 survey. Regarding **aflatoxin**, 2015 survey results shows a considerable increase of testing on wheat and maize and barley, with a slight increase on oat and a considerable reduction on the other crops.

2.2 Which sampling method is currently used by your business for the mycotoxin analysis?

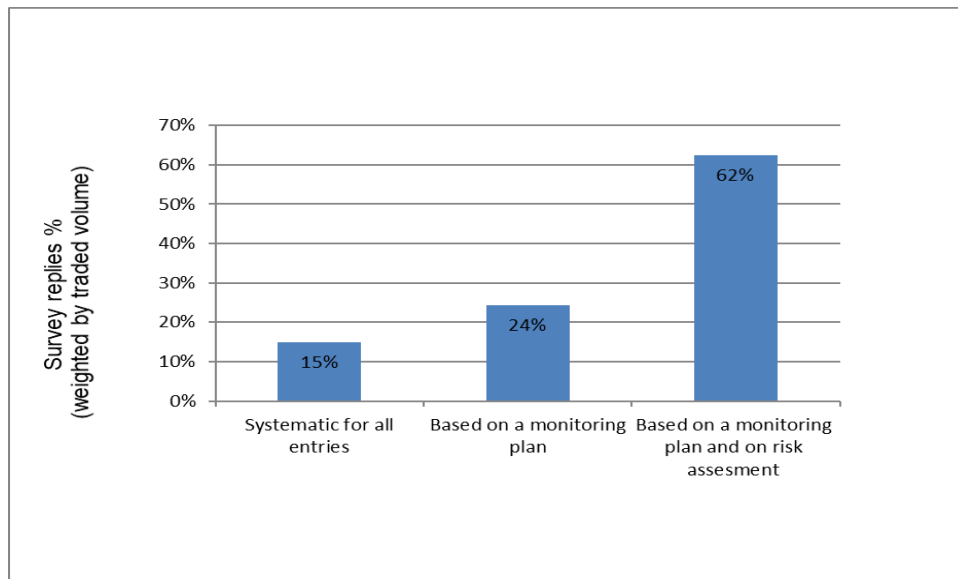


Compared to 2013, the results of the survey suggest a reverse trend from internal methods or CEN/ISO standards towards official control sampling plans and to a larger extent to contractual methods of sampling. Since 2009, the use of contractual methods has undergone an unsteady development; from an insignificant level in 2009 it increased in 2011 and decreased again according to the 2013 survey results. Contractual sampling requirements seem to often demand the application of GAFTA 124.

2.3 When do you test for mycotoxins? (multiple answers possible)

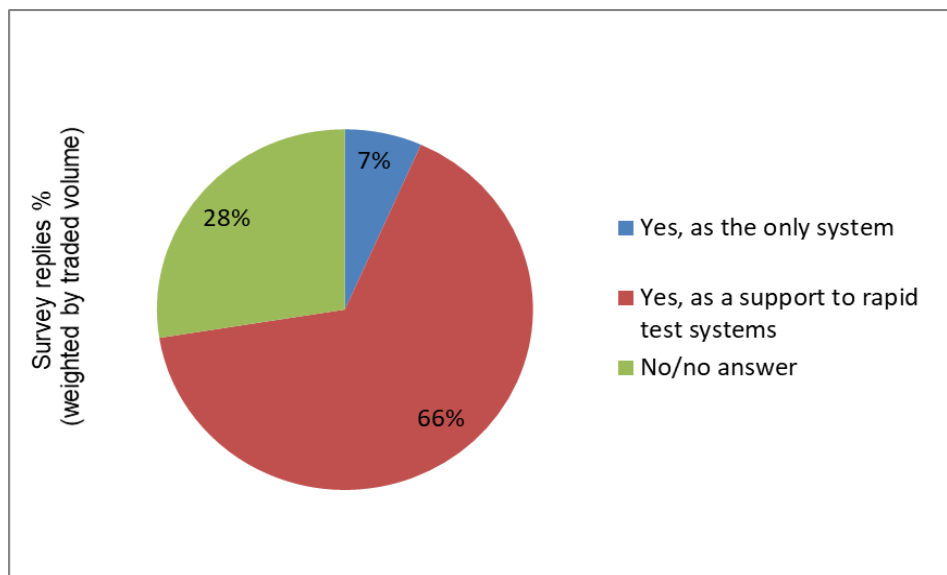


2.4 Which frequency of testing are you applying? (multiple answers possible)



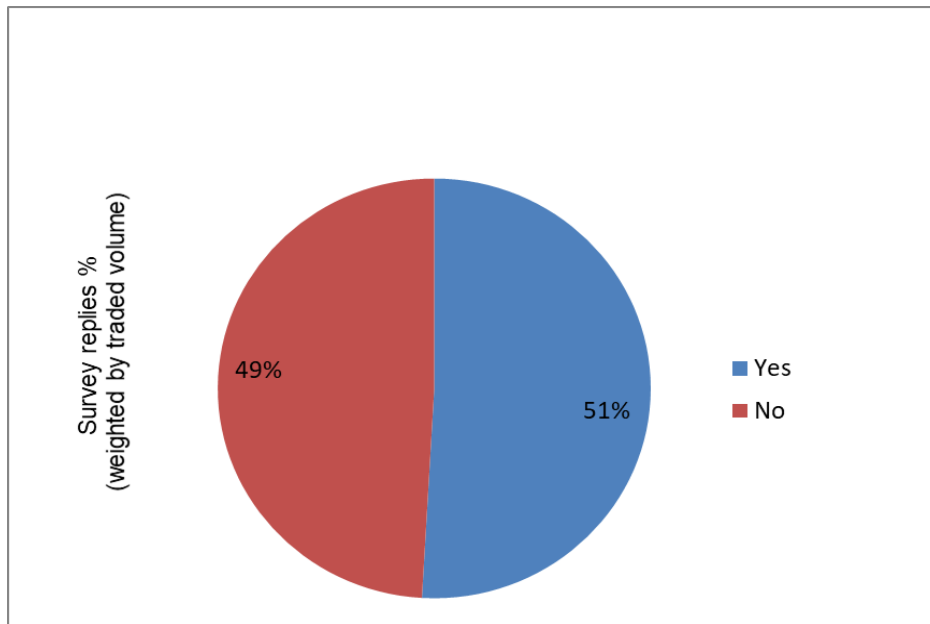
Those operators that perform mycotoxin testing normally follow a monitoring plan and a risk assessment (62%), while 24% follow simply a monitoring plan without a risk assessment. 15% of the operators even perform systematic testing for all entries.

2.5 Do you carry out visual tests?



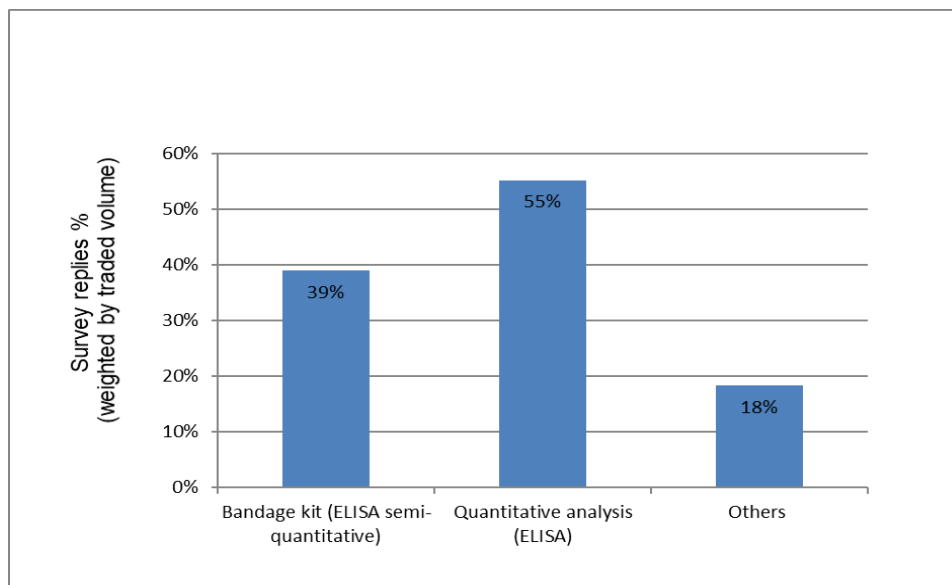
About 66% of operators carry out visual tests as a support to rapid test systems. Such practice seems to be increasingly common; in the 2013 survey, only 46 % indicated that they would do so.

2.6 Do you carry out mycotoxin analysis internally?



The level of internal testing of mycotoxins increased to almost 51% from a level of 48% in the 2013 survey.

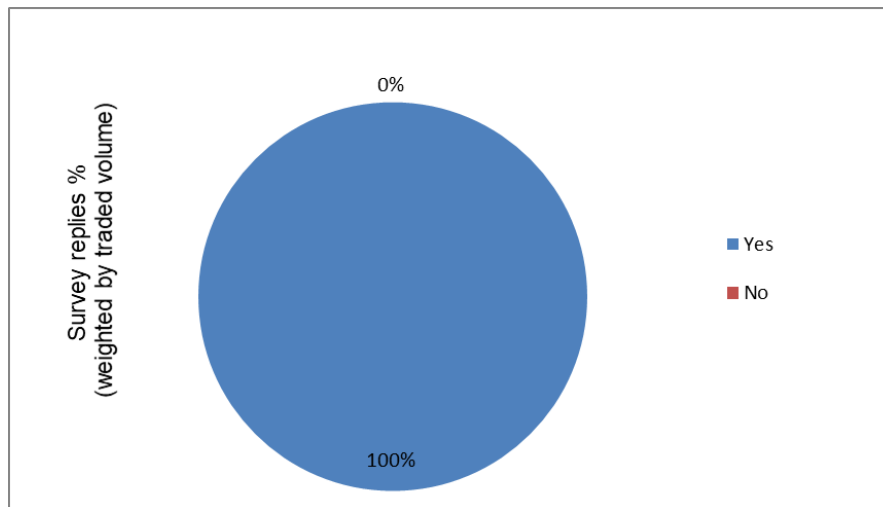
2.6.1 If you carry out mycotoxin analysis at your company, which kind of method of analysis do you use in your company? (multiple answers possible)



The graph at page 17 indicates a balanced use of bandage kits and quantitative analysis. This trend was also confirmed in the 2013 report.

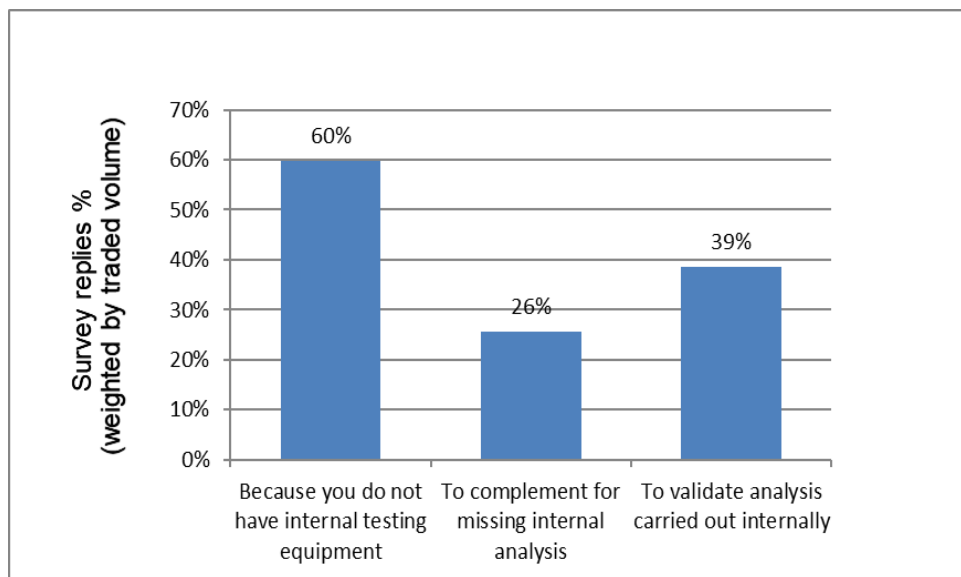
Operators declared that supplier of (ELISA semi-quantitative) bandage kits are Neogen (76% of replies) and R-Biopharm (24% of replies), while the suppliers for (ELISA) quantitative test kits are Neogen (40% of replies), Charm (8% of replies) and R-Biopharm (8% of replies).

2.7 Do you carry out external analysis for the mycotoxin monitoring?



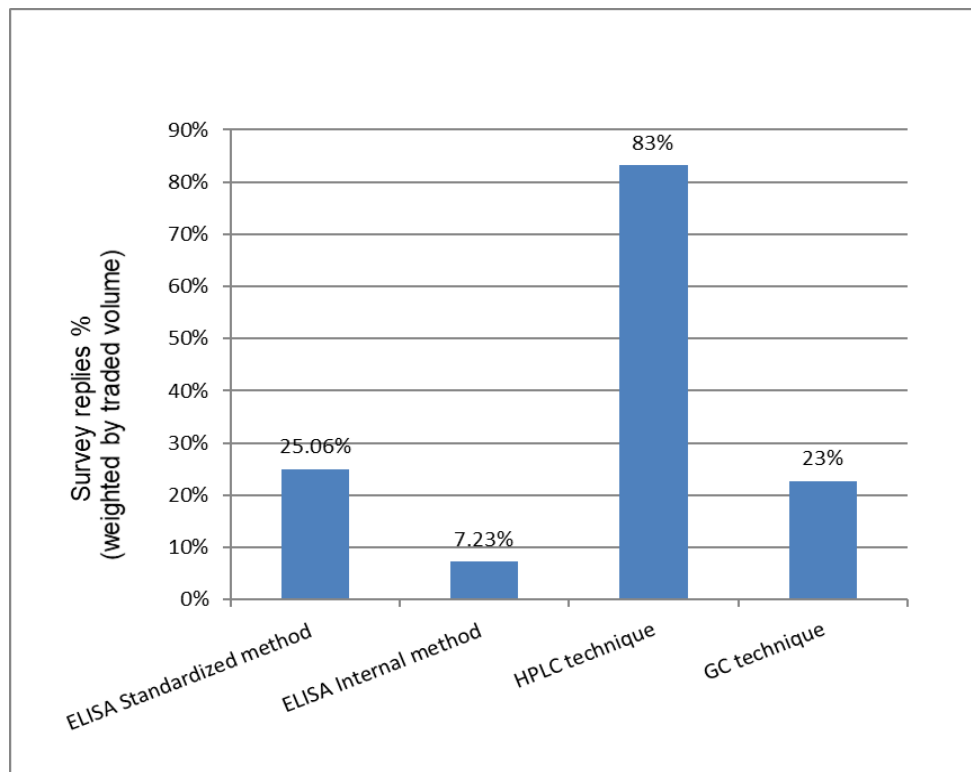
Rapid analysis is required when a lot is received at a silo or warehouse and therefore rapid tests to support on-site decisions of lot acceptance are frequently used. Compared to 2013, there seems to have been a drastic decrease in the level of carrying out internal analysis, from 28% in 2013 to 0% in 2015.

2.7.1 If you carry out external analysis for the mycotoxin monitoring, what is the purpose? (multiple answers possible)?



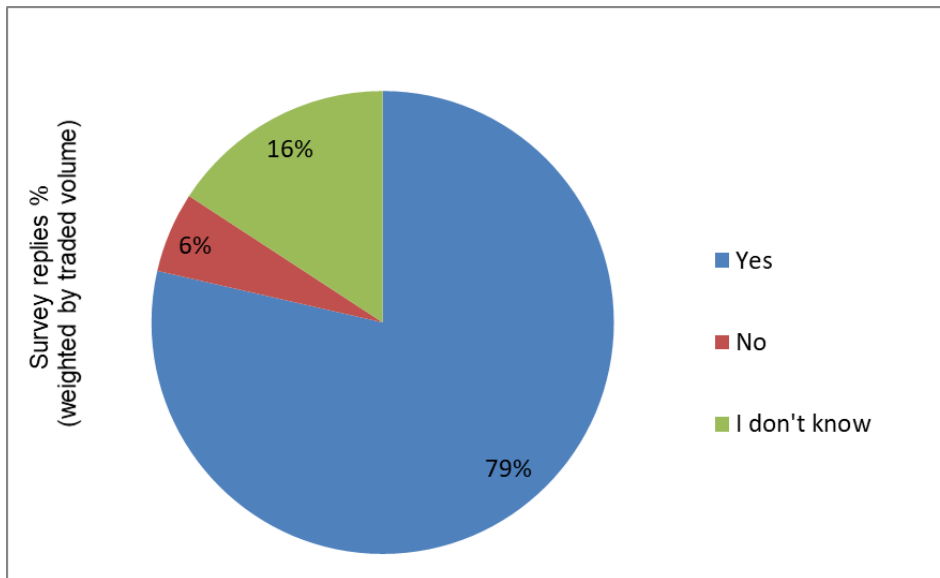
External analysis is also used to confirm the results of internal testing and/or to provide for missing data. While in the survey from 2013, validating internal data was the main rationale indicated for carrying out external analysis (64%), in the 2015 survey the reason mentioned most often was mostly the lack of internal testing equipment.

2.7.2 If you carry out external analysis for the mycotoxin monitoring, what is the methodology used by the laboratory? (multiple answers possible)?



Compared to the 2013 survey, the use of ELISA methodologies (standardized method and internal method) in external laboratories has slightly increased (from 26% to 32%). HPLC seems to remain still the most used technique for external analysis since 2007 (although this value was 90% in 2013); the use of GC technique has increased from 7% (2013 data) to almost 23%.

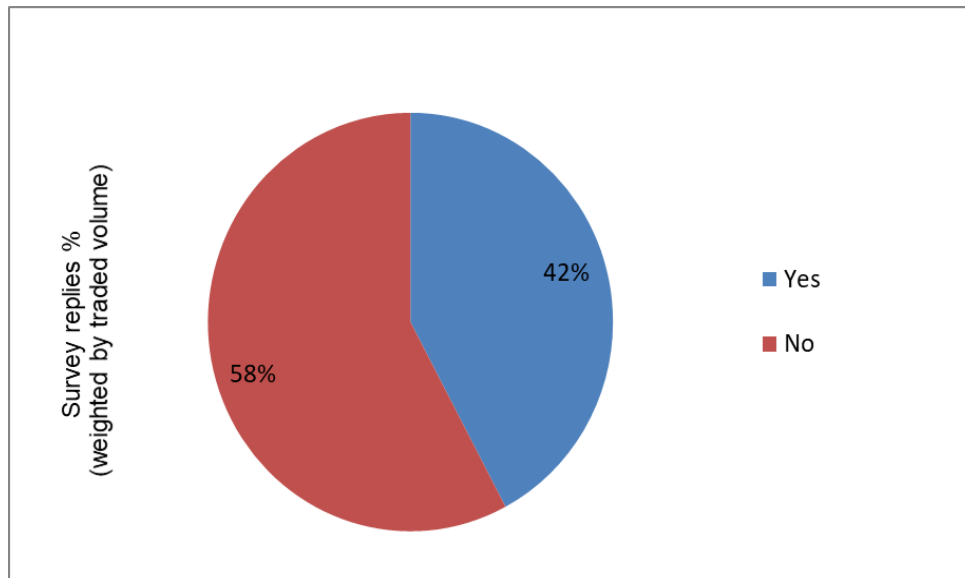
2.8 Is your testing laboratory accredited in accordance with the international standard ISO/IEC 17025:2005?



Since 2007, the number of laboratories used that are accredited with EN17025 seems to have significantly increased. This is a positive development as accredited laboratories must publish the level of uncertainty linked to the analysis they perform which enhances the level of transparency and the comparability of analysis results. The number of accredited laboratories increased from 61% from 2013 to 79%.

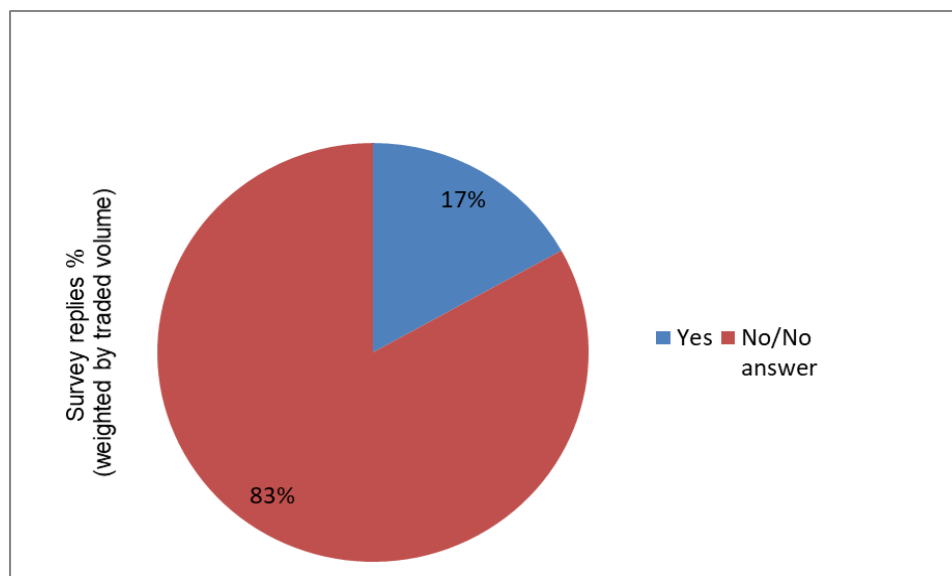
3 Regulation enforcement and controls

3.1 Have you already been controlled within the framework of the official regulation on mycotoxins?



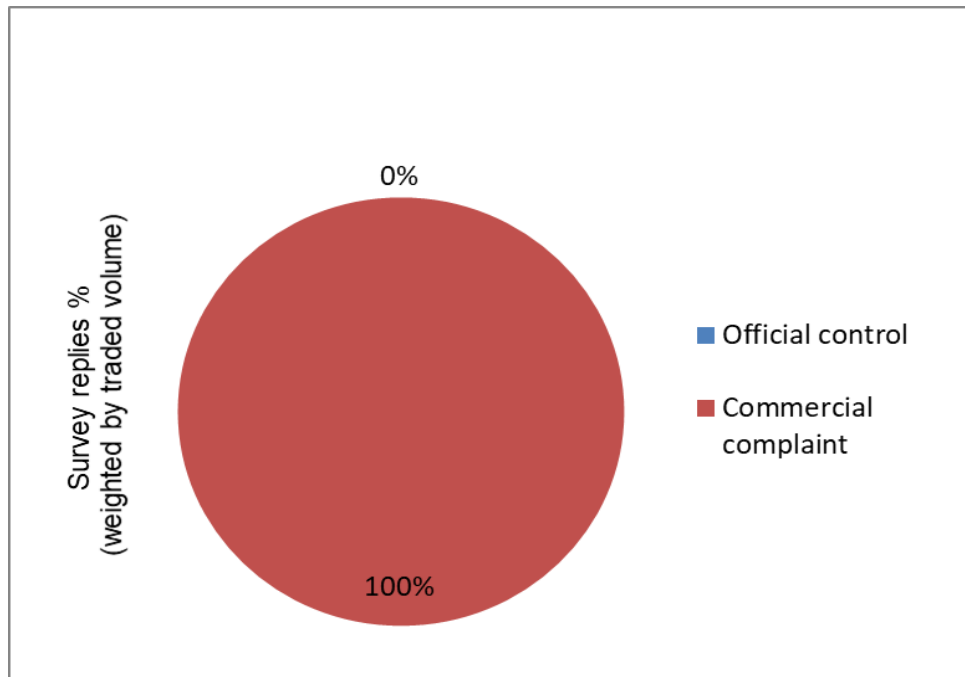
According to the survey replies, 42% of operators have been controlled within the framework of the official controls regulation on mycotoxins. This percentage was higher in the 2013 report (62%).

3.2 Further to exceeded regulatory limits, did you have to recall a product lot?



In the case that there was an exceedance of regulatory limits, 17% had to recall a lot. In the replies to the 2013 survey, this percentage was double (35%).

3.3 If you had to recall a product lot, was it a consequence of an official control or of a commercial complaint?



The reason why operators had to recall a product lot has experienced a complete turnaround: While in the 2013 survey, recalls were due mostly to official controls (80% of the cases), the only reason for recall is now commercial complaints.

ANNEX 1: QUESTIONNAIRE “MYCOTOXIN MANAGEMENT” 2015

YOUR COMPANY (several possibilities)

- Advises and sells seeds and Plant Protection Products (PPPs)** (see Part 1)
↳ To how many farmers:
- Collects from farmers** (see Parts 2 and 3)
↳ Collected volume (2014/2015): tons
- Traded volumes in the EU** (see Parts 2 and 3)
↳ Volumes purchased from collectors (2014/2015): tons
- Imports grains into the EU** (see Parts 2 and 3)
↳ Imported volume (2014/2015): tons

1. PREVENTION OF FIELDS MYCOTOXINS RISKS

1.1 Do you specifically advise farmers with regard to mycotoxins?

- YES
 NO (if no, please go to part 2)

1.2 How do you manage field mycotoxins risks?

- By advising on agriculture practices (till, former crops...)
 By recommending Fusarium resistant seeds
 By recommending adapted fungicides treatments
 Other (please specify):

1.3 Do you sell the recommended seeds or fungicides?

- Yes
 No

1.4 When advising, do you use:

- Meteorologic data
 A forecast model for Fusarium or mycotoxins risk
 No model
 Others means (please describe)

1.4.1 If you use the Forecast Model, by who is proposed?

- Plant protection companies
 Seed breeders
 Technical institutes
 Public authorities

1.5 Further to the advice to the farmers, the mycotoxin risk management:

- Improves
- Stagnates
- Becomes worse

2 SAMPLING, DETECTION AND ANALYSIS

2.1. Do you sample your lots in order to monitor mycotoxins?

- NO: please go to part 3
- YES:

2.1.1 If Yes, which ones? Please tick the cells of the table below for each crop/toxins combination

	Wheat	Barley	Oat	Maize	Other (please specify)
Zearalenon	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fumonisin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DON (vomitoxin)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
T2/HT2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ochratoxin A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aflatoxin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2.2. Which sampling method is currently used by your business?

- Regulation for official controls (EU Reg. 401/2006 (food) and/or Regulation 691/2013 (feed))
- CEN method EN/ISO 24333
- Internal method – please specify
- Contractual method (for example GAFTA 124) – please specify

2.3. When do you test, according to your activities?

	Before harvest	At harvest (from farmers to collectors)	In store	At loading before transport (e.g. loading of trucks/vessels/ etc.)	At delivery (to first processing industry)
Collector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EU trade	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Import	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2.4. Which frequency of testing are you applying?

- Systematic for all entries
- Based on a monitoring plan
- Based on a monitoring plan and on risk assessment (please specify)

2.5. Are you certified under any food and/or feed safety management schemes (for example GTP Code, GMP+FSA, GMP of OVOCOM, FEMAS, UFAS, TASCC, Q&S, CSA-GTP, GTAS, ISO 22000)

- Yes
- No

2.5.1 If YES, please specify under which certification scheme you are accredited.

2.6 Do you carry out visual tests?

- Yes, as the only system
- Yes, as a support to rapid test systems
- No

2.7 Do you carry out analysis internally in your own company?

- Yes
- No

2.7.1 If YES, which kind of method of analysis do you use in your company?

- Bandage kit (Elisa semi-quantitative)
- Quantitative analysis (Elisa)
- others (please specify)

2.7.2 Who is/are your supplier(s) of the quick tests?

	Bandage kit (Elisa semi-quantitative)	Elisa (quantitative)
Charm	<input type="checkbox"/>	<input type="checkbox"/>
Neogen	<input type="checkbox"/>	<input type="checkbox"/>
R-Biopharm	<input type="checkbox"/>	<input type="checkbox"/>
Other (please indicate)	<input type="checkbox"/>	<input type="checkbox"/>

2.8 Do you carry out analysis externally?

- Yes
- No

2.8.1 If YES, what is the purpose of the external analysis?

- Because you do not have internal testing equipment
- To complement for missing internal analysis
- To validate analysis carried out internally

2.8.2 If YES, what is the kind and methodology used by the lab?

- Elisa method
 - Standardized method (please specify):
 - Internal method (please specify):
- HPLC technique
- GC technique

2.9 Is the laboratory you use accredited EN 17025 for the mycotoxins you tested for?

- Yes
- No
- I don't know

3. REGULATION ENFORCEMENT AND CONTROLS

3.1. Have you been already controlled within the framework of the official regulation on mycotoxins?

- Yes
- No

3.1.2 If YES, by whom? (Please, indicate by which public service)

3.2. Further to exceeded regulatory limits, did you have to recall a lot?

- Yes
- No

3.3 If yes, was it a consequence of an official control or of a commercial complaint?

- Official control
- Commercial complaint

4. Other comments on mycotoxin management

ANNEX 2: METHOD FOR REPLIES PROCESSING

- **Method design**

- The replies sent by the operators are assumed to be representative for the whole country they represent.
- Each participant specified the volume of cereals traded; the total volumes mentioned representing 20% of the total volume of cereals traded in those countries.

- **Calculation steps and formula**

- The reply to each question was weighted by the total contributions received for that country thus returning the country's-dependent mean reply: R_C (%)
- The volume of grains traded within each country was divided by the volume of grains traded within all the countries participating in the survey, thus obtaining W_C .
- The overall result, R (%), was obtained as the average of all member states-dependant mean (R_C) weighted by W_{MS} (weight of the member state).

$$R = \sum_{MST} R_C * W_C$$

Where R (%) = overall result

R_C = mean reply for member state (%)

$W_C = \frac{V_C}{V_{All}}$; where V_C = Volume traded in the participant country

V_{All} = Total volume of countries participating to the survey