



PPS-jaarrapportage 2017

De PPS-en die van start zijn gegaan onder aansturing van de topsectoren dienen jaarlijks te rapporteren over de inhoudelijke en financiële voortgang. Voor de inhoudelijke voortgang dient dit format gebruikt te worden. Voor PPS-en die in 2017 zijn afgerond is een apart format "PPS-eindrapportage" beschikbaar.

De jaarrapportages worden integraal gepubliceerd op de websites van de TKI's/ topsector. Zorg er svp voor dat er geen vertrouwelijke zaken in de rapportage staat.

De PPS-jaarrapportages dienen voor 1 maart 2018 te worden aangeleverd bij de TKI's bij info@tkitu.nl of info@tki-agrifood.nl. Voor Wageningen Research loopt de aanlevering via een centraal punt.

Algemene gegevens	
PPS-nummer	TKI-AF-14225
Titel	Forecasting mycotoxins in grains See more information online: https://www.wur.nl/nl/Onderzoek-Resultaten/Onderzoeksprojecten-LNV/Expertisegebieden/kennisonline/Voorspellen-mycotoxinen-in-granen-1.htm
Thema	
Uitvoerende kennisinstelling(en)	RIKILT Wageningen University & Research BU Toxicology, Novel food & AgriChains
Projectleider onderzoek (naam + emailadres)	HJ van der Fels-Klerx (RIKILT), Ine.vanderfels@wur.nl
Penvoerder (namens private partijen)	F. Gort (SecureFeed)
Contactpersoon overheid	Marjan van Creij (LNV)
Startdatum	2015
Einddatum	2018

Goedkeuring penvoerder / consortium

De jaarrapportage dient te worden besproken met de penvoerder/het consortium. De TKI's nemen graag kennis van evt. opmerkingen over de jaarrapportage.

De penvoerder heeft namens het consortium de jaarrapportage goedgekeurd
 niet goedgekeurd

Evt. opmerkingen over de jaarrapportage: **Geen opmerkingen.**

Korte omschrijving inhoud/doel PPS

This project aims to develop various forecasting models for mycotoxins in grains. These models aim to provide a prediction, during the growing season, of the contamination of the grain at harvest. Models will be developed for the most important mycotoxins, for various grains and at various scale levels (field, region, country, Europe).

Resultaten

Wat is er aan de hand?

The presence of mycotoxins in cereals can result into economic losses for the feed and food supply chain and the Dutch government, decrease sustainability and the safety of feed and food products. Mycotoxin contamination can be limited but not fully eliminated by good agricultural practices. Forecasting systems that can predict the presence of mycotoxin in an early stage of cereal cultivation can be helpful for mycotoxin management.

Wat doet het project daaraan?

This project aims to develop forecasting model for the regulated mycotoxins in cereals, at different scale levels (region, country, Europe) for different groups of end-users (farmers, buyers, government etc).

Wat levert het project op?

The project will result into:

- More insights into the factors that affect mycotoxin contamination in cereals, effects of these factors and their interrelationships, for various combinations of mycotoxins- cereals: DON in wheat, T2/HT-2 in barley and aflatoxins in maize.
- Forecasting models for prediction of:
 - o DON in wheat for the grower (field level) and the buyer (region level) as well as for the entire country;
 - o DON, T-2/HT-2 in barley for buyers (region level) in the Netherlands;
 - o DON and ZEA in maize for the buyer (per country) in Europe
- Applications of the models for end-users, e.g. an internet application for growers.
- Scientific publications and several contributions to conferences
- Publication in popular magazine and on websites

Wat is het effect hiervan?

The deliverables of the project are aimed to help various groups of end-users in daily decision making on mycotoxin management. Decision entail the application of agronomical practices, e.g. the use of fungicides, monitoring, and routing in the supply chain. Ultimately the results of this project will contribute to reducing economic losses, increase food safety and increase sustainability of cereal production.

Highlights 2017

- Literature Review:

The literature review on *Fusarium* infection and the factors influencing *Fusarium* infection and mycotoxin production in barley has been finalized. The review has been written in both a draft report and a scientific paper. The paper has been submitted for scientific publication to *World Mycotoxin Journal* by end of 2017. The review results have served as the basis for the decision on what type of model to develop for mycotoxins in barley.

- Field survey:

In 2017, 593 questionnaires have been sent out to arable farmers in the Netherlands, via cooperation with partners within the project (Agrifirm, CZAV and Agrovisision). In total, 24 wheat samples, 10 barley samples and no maize samples were received. The response rate was about 6%.

Wheat

24 wheat samples were analysed.

18 out of the total of 24 wheat harvest samples contained DON in levels above 50 ppb.

None of them were above the EC guidance level for feed or the legal limit for food.

1 sample was contaminated with HT-2 toxins above 20 ppb.

2 samples were contaminated with Zearalenone (ZEA) above 50 ppb.

Other mycotoxins detected in several samples were: Nivalenol, Enniatins, Mycophenolic Acid.

Barley

10 barley samples were analysed.

Among all the barley samples, 6 out of 10 were contaminated with DON above 50 ppb.

None of them were above the EC guidance level for feed or the legal limit for food.

5 samples were contaminated with T2/HT2 toxins above 50 ppb.

2 samples were contaminated with ZON above 50 ppb. One of them (270 ppb) contained ZON in levels above the guidance level for food.

Other mycotoxins detected in several samples were: Nivalenol, Enniatins, Beauvericin, Alternariol-methylether, Moniliform, Mycophenolic acid.

Maize

No maize samples were received in 2017.

- **Modelling:**

Wheat:

The Bayesian network model to estimate the probability of a feed ingredient being contaminated with a specific mycotoxin. The model showed very high accuracy (ca 97%) however, most of the data concerned values below the LOQ and ML. Therefore, in 2018, efforts will be done to increase the applicability of the model, by including weather data as predictors.

Three modelling approaches has been set up to predict DON contamination levels in wheat in the Netherlands:

1. The existing empirical model (van der Fels-Klerx et al., 2010) was updated with new monitoring data (2011-2016) and different statistical method to improve the model performance.
2. A Bayesian network model was developed.
3. Via collaboration with Unicatt and HORTA in Italy, we make use of the mechanistic model developed by this group. The model has been adapted to make it suitable for farmers in the Netherlands.

The three modelling types will be combined in a modelling envelope.

A scientific paper has been written on the three different modelling approaches to forecast DON in winter wheat in the Netherlands. This paper will be submitted for publication in the scientific journal *Toxins* early 2018.

Barley:

Based on the (limited) available barley data, a first attempt has been made to develop a forecast model for DON in barley using machine learning techniques. The model performance was not enough for use in practice. In 2018, additional data will be acquired in attempts to improve the model. T2/HT2 in barley was not considered since this toxin does not seem to a major problem (based on the literature review) and available data is too limited.

Maize:

As part of the Europe H2020 MyToolbox project, a forecasting model for aflatoxins and fumonisins in maize in Europe will be developed. Therefore, in the course of this national project we will focus on DON/ZEA in maize in Europe. A mechanistic model has been developed to calculate a risk factor for DON and ZEA in maize in Europe. In 2018, these risk factors will be linked with actual mycotoxin levels to predict DON and ZEA contamination (low, medium or high) at harvest.

• **Meetings:**

In 2017, two project meetings have been held with the entire consortium, one in spring and one in December 2017. At the meetings, the progress of the project was presented and discussed and future activities were discussed.

One separate meeting was held between Agrovision and Wageningen Research to discuss implementation of the forecasting models.

Aantal opgeleverde producten in 2017 (geef in een bijlage de titels en/of omschrijving van de producten of een link naar de producten op openbare websites)

Wetenschappelijke artikelen	Rapporten	Artikelen in vakbladen	Inleidingen/ workshops
1			1

Bijlage: Titels van de producten of een link naar de producten op een openbare website

Janssen EM, Liu C, and HJ Van der Fels-Klerx. 2018. *Fusarium* infection and trichothecenes in barley and its comparison with wheat. World Mycotoxin Journal 11(1): 33-46. DOI: <https://doi.org/10.3920/WMJ2017.2255>.

Liu C. 2017. Three modelling approaches to predict deoxynivalenol contamination levels in winter wheat in the Netherlands. 1st MycoKey conference, held 11-14 September 2017, Ghent, Belgium. Oral presentation.