Farm(er) characteristics driving the adoption of pre-harvest mycotoxin management measures

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Background

Farmers apply various pre-harvest measures to reduce fungal infection and mycotoxins in wheat, such as selection of a resistant wheat variety, fungicide use, soil cultivation and crop rotation. Since farmers play a key role in the prevention and control of *Fusarium* infection and mycotoxin contamination, it is important to understand their behaviour regarding the adoption of mycotoxin management to get a better insight in how to stimulate a future change in behaviour.

Objective

The aim of this study was to i) identify the (sets of) pre-harvest measures against *Fusarium* infection that Dutch wheat farmers currently apply and ii) to understand the farm(er) characteristics that drive the adoption of these measures.

Method

Data: questionnaire 105 Dutch wheat farmers
- Pre-harvest measures against *Fusarium* infection (see Table 1)
- Farm and farmer characteristics (see Table 3)

Analysis:
- Bivariate probit model to identify the correlation between the use of different measures (Table 2)
- Univariate probit model to identify the farm(er) characteristics that drive the use of certain pre-harvest measures (Table 3).

Conclusions

- The use of a certain pre-harvest measure is interrelated with at least one other measure.

- Farm(er) characteristics that drive the adoption of pre-harvest measures are: the use of wheat as main crop, use of a decision support system, farmers education level, mycotoxin knowledge and their relative risk attitude.

Results

Pre-harvest measures

Table 1. Adoption rate of pre-harvest measures by Dutch wheat farmers (n=105)

Code	Pre-harvest measure	% of farmers
Var_res	Selection of resistant wheat variety (resistance >7)	85%
Var_log	Lower the risk of lodging by selection of wheat variety	88%
Fun_all	Fungicide use during whole cultivation period	84%
Fun_flo	Fungicide use around flowering	65%
Plough	Ploughing after grain harvest	77%
Rot	Crop rotation: no grains as pre-crop	73%
Decont	Use of decontaminated seeds	92%
Bio	Biological control	20%

Table 2. Correlation coefficients between different pre-harvest measures taking into account farm and farmer characteristics, i.e. rho of bivariate probit models

	[a]Var_res	Var_log	Fun_all	Fun_flo	Plough	Rot	Decont	Bio
Var_res		0.03	**0.77****	**0.79****	0.28	-0.27	-0.37	**0.99****
Var_log	0.03		-0.12	-0.12	0.62	**0.54****	0.31	0.27
Fun_all	**0.77****	-0.12		**0.68****	0.42	-0.11	0.37	0.14
Fun_flo	**0.79****	-0.12	**0.68***		0.30	-0.30	0.43	0.17
Plough	0.28	0.62	0.42	0.30		0.36*	**0.76****	0.37
Rot	-0.27	**0.54****	-0.11	-0.30	0.36*		0.25	**-0.49****
Decont	-0.37	0.31	0.37	0.43	**0.76****	0.25		0.11
Bio	**0.99****	0.27	0.14	0.17	0.37	**-0.49****	0.11	

[a] see Table 1 for the full name of the pre-harvest measures abbreviation; *significant at 10% level; ** significant at 5% level

- Most of the Dutch farmers take multiple pre-harvest measures against *Fusarium* infection (Table 1) usually in sets of 5-7 different measures (data not shown).

- The choice for a certain measure is related to the choice of other measures (Table 2), e.g. farmers using a *Fusarium* resistant wheat variety are more likely to use fungicides, and farmers that do not have grains as pre-crop are less likely to adopt biological control.

Results

Farm(er) characteristics

Table 3. Marginal effects of farm(er) characteristics on the use of pre-harvest measures.

	[a]Var_res	Var_log	Fun_all	Fun_flo	Plough	Rot	Decont	Bio
Total arable land	0.001	0.000	0.001	-0.001	**-0.002***	0.001	0.000	0.000
Wheat as main crop	0.019	0.001	0.011	**0.359****	0.073	**-0.340****	0.026	0.025
Wheat for food	-0.050	0.078	0.008	**-0.147***	-0.047	0.041	-0.115	-0.040
Past Fusarium infections	0.072	-0.078	0.054	-0.034	0.074	-0.008	0.052	-0.016
Use of a decision support program	0.133	-0.081	-0.050	**0.306****	-0.158	0.143	-0.108	-0.033
Age over 55 years	-0.101	-0.037	-0.062	-0.011	0.098	0.011	0.014	**-0.160***
Higher educated	**0.174****	0.036	0.007	-0.034	**0.250****	-0.079	0.008	-0.005
Mycotoxin knowledge	0.031	0.042	**0.102****	-0.005	0.030	0.018	0.022	0.012
Risk Perception	0.008	0.001	**0.020***	**0.019***	-0.007	-0.008	0.014	**0.020***
Low relative risk attitude	0.110	0.062	0.048	**0.362****	0.139*	0.040	0.007	0.125

[a] see Table 1 for the full name of the pre-harvest measures abbreviation; *significant at 10% level; ** significant at 5% level

- Farmers with wheat as main crop are 36% more likely to adopt fungicide use during flowering and 34% less likely to adopt a rotation scheme with no grains as a pre-crop.

- The use of a decision support system increases the probability that a farmer uses fungicides during flowering, indicating a more targeted fungicide use.

- Higher educated farmers are 17% more likely to use *Fusarium* resistant wheat varieties and 25% more likely to plough after a grain harvest compared to farmers with lower education levels, whereas having specific *Fusarium* and mycotoxin knowledge only increased the probability of fungicide use by 10%.