BioMath APPLIED STATISTICS AND INFORMATICS IN LIFE SCIENCES

Post Market Monitoring of insect protected Bt maize MON 810[1] in Europe

Biometrical annual Report on the 2018 growing season

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[1] The commercial name for MON 810 being YieldGard®corn borer maize. YieldGard®corn borer is a registered trademark of Monsanto Technology LLC.

Contents

Summary

Monitoring of a genetically modified organism (GMO) that has been placed on the market is regulated in Annex VII of Directive 2001/18/EC [OJEC, 2001]. Monitoring efforts were supposed to detect the alleged occurrence and impact of adverse effects of the GMO or its use as related to human health, animal health or the environment not anticipated in the ERA. Monsanto has implemented monitoring of *Bt* maize containing event MON 810 through different tools, the main one being a farm questionnaire implemented since 2006.

This biometrical report presents the outcomes of the statistical analysis of the farm questionnaires collected in Europe's MON 810 cultivating countries Spain and Portugal in 2018. The questionnaires have been completed between February and March 2019. In the 2018 growing season 250 farmers have been surveyed.

2018 data indicate that in comparison to conventional maize plants, MON 810 plants

- had less incidence of stalk/root lodging caused by the inherent protection against certain lepidopteran pests,
- gave a higher yield caused by the better fitness of the plant.

The identified deviations were expected due to the knowledge of the MON 810 characteristics. The observed significant effects are not adverse. They mostly relate to the increased fitness of MON 810 plants resulting from the inherent protection against certain lepidopteran pests. Overall, the monitoring results substantiate the results from scientific research.

In this year of data collection, no adverse effects have been identified by MON 810 cultivating farmers.

1 Introduction

According to Annex VII of Directive 2001/18/EC [OJEC, 2001] of the European Parliament and of the Council on the deliberate release into the environment of genetically modified plants (GMP), the objective of the monitoring is to:

- identify the occurrence of adverse effects of the GMO or its use on human or animal health, or the environment, which were not anticipated in the ERA.

Upon approval of MON 810 (Commission Decision 98/294/EC [OJEC, 1998]), Bayer has established a management strategy in order to minimize the development of insect resistance and offered to inform the Commission and/or the Competent Authorities about the results. These results on insect resistance monitoring, however, are not part of the current report.

The risk assessment for MON 810 showed that the placing of MON 810 on the market poses negligible risk to human and animal health and the environment. Potential adverse effects of MON 810 on human and animal health and the environment, which were not anticipated in the ERA, can be addressed under General Surveillance (GS). An important element of the GS, applied by Bayer on a voluntary basis, is a farm questionnaire.

The objective of this biometrical report is to present the rationale behind the farm questionnaire approach and the analysis of the farm questionnaire results from the 2018 planting season. The questionnaire approach was applied for the first time in 2006. The format of the questionnaire is reviewed on a yearly basis based on the outcome of the latest survey.

2 Methodology

2.1 Tool for General Surveillance: the farm questionnaire

2.1.1 Structure of the farm questionnaire

Based on commonly defined protection goals, such as soil function, plant health and sustainable agriculture together with derived areas of potential impact on these protection goals, a range of relevant monitoring characters for MON 810 GS has been identified (Table 1). These monitoring characters might be influenced by the cultivation of MON 810, but in an agricultural landscape other influencing factors (Table 3) exist which need to be taken into account and they are therefore monitored as well.

For that purpose, a farm questionnaire was designed to obtain data on monitoring characters and influencing factors (see Appendix B). Deviating observations in monitoring characters would lead to an assessment of the collected information in order to determine whether the unusal observation is attributable to changes in influencing factors or the genetic modification. Farmers record a range of agronomic information and are the most frequent and consistent observers of crops and fields (*e.g.* by collection of field-specific records of seeds, tilling methods, physical and chemical soil analysis, fertilizer application, crop protection measures, biotic and abiotic damage, yields and quality). Additionally, farmers hold in "farm files", which are historical records of their agricultural land and its management. These provide background knowledge and experience that can be used as a baseline for assessing deviations from what is normal for their cultivation areas.

The experimental questionnaire was developed by the German Federal Biological Research Centre for Agriculture and Forestry (BBA, now JKI), maize breeders and statisticians in Germany [Wilhelm, 2004]. Its questions were developed in order to be to be easily understood, not to be too burdensome and to be sufficiently pragmatic to take into account real commercial situations.

The questionnaire approach was tested in a pilot survey in 2005. Based on that survey an adapted version of the questionnaire was created and applied for the first time in 2006. The format of the questionnaire is reviewed on a yearly basis based on the outcome of the latest survey. As appropriate, adjustments are made to improve the statistical relevance of the collected data. In 2009, the questionnaire was adapted according to DG Environment feedback (13 March 2009) and discussions within EuropaBio (see Appendix B).

The questionnaire is organized around collecting data in four specific areas:

Part 1: Maize grown area

Part 2: Typical agronomic practices to grow maize on the farm

Part 3: Observations of MON 810

Part 4: Implementation of *Bt* maize specific measures

Part 1 records general, basic data on maize cultivation, cultivation area and local pest and disease pressure (independent from GM or non-GM cultivation background and possible influencing factors). The objectives of **Part 2** are to establish what the usual practices of conventional cultivation are. It therefore establishes a baseline to which information generated in *Bt* areas can be compared. **Part 3** collects data on MON 810 practices and observations.

The aim of the survey is to identify potential adverse effects that might be related to MON 810 plants and their cultivation. Therefore, most questions are formulated to identify deviation from the situation with conventional maize. Farmers are asked to assess the situation in comparison to conventional cultivation. If a farmer assesses the situation to be different, he is additionally asked to specify the direction of the difference; hence the category $Different$ is divided into two subcategories. To simplify this two-stage procedure in the questionnaire for most questions, three possible categories of answers are given: $As\ usual$, $Plus$ (*e.g.* later, higher, more) and $Minus$ (*e.g.* earlier, lower or less). Thus, a rather high frequency (> 10 %) of $Plus$- or $Minus$- answers would indicate possible effects (see Section 2.4).

Moreover, Bayer uses this questionnaire to monitor whether farmers are in compliance with the MON 810 cultivation recommendations. For that purpose, the answers and free remarks in **Part 4** were evaluated.

2.1.2 Coding of personal data

For both confidentiality and identification reasons, each questionnaire was assigned a unique code where personal data were coded according to the following format:

2	0	1	8	-	0	1	-	M	A	R	-	E	S	-	0	1	-	0	0	0	0	1

Year | Event Code | Partner Code | Country Code | Interviewer Code | Farmer ID

Codes:

Event:	01	MON 810
	02	...
Partner:	MON	Monsanto
	MAR	Markin
	AGR	Agro.Ges
	...	...
Country:	ES	Spain
	PT	Portugal
	...	...
Interviewer:	01	A
	02	B
	03	...
Farmer:	five-digit number identifying a single farmer	

(*e.g.* 2018-01-MAR-ES-01-30003).

The data were stored and handled in accordance with the Data Protection Directive 95/46/EC [OJEC, 1995]. This is in order to ensure an honest response and to avoid competitive intelligence.

Within the data base, each questionnaire got a consecutive number (starting in 2006).

Furthermore, within the database each farmer has his/her own ID so that multiple participitations of the same farmer in the MON 810 monitoring can be tracked.

2.1.3 Training of interviewers

To assist the interviewers in filling out the questionnaires with the farmers, a 'user's manual' was developed. While questions have been carefully phrased to obtain accurate observations from farmers, preceding experience with the questionnaire may increase awareness.

Additionally, like in previous years, all interviewers have been trained to understand the background of the questions. Here also experience gained during previous years surveys (uncertainties, misinterpretation of questions) could be shared.

2.2 Definition of monitoring characters

The main focus of the questionnaire was the survey of several monitoring characters that were derived from protection goals like soil function, plant health and sustainable agriculture. Table 1 provides an overview on the monitored characters and the protection goals that are addressed by them.

Table 1: Monitoring characters and corresponding protection goals

Monitoring characters	Protection goals
Crop rotation	Sustainable agriculture, plant health
Time of planting	Sustainable agriculture
Tillage and planting technique	Sustainable agriculture
Insect control practices	Sustainable agriculture
Weed control practices	Sustainable agriculture
Fungal control practices	Sustainable agriculture
Fertiliser application	Sustainable agriculture, soil function
Irrigation practices	Sustainable agriculture
Time of harvest	Sustainable agriculture, plant health
Germination vigour	Plant health
Time to emergence	Plant health
Time to male flowering	Plant health
Plant growth and development	Plant health, soil function
Incidence of stalk/ root lodging	Plant health
Time to maturity	Sustainable agriculture, plant health
Yield	Plant health, soil function
Occurrence of MON 810 volunteers	Sustainable agriculture
Disease susceptibility	Plant health, sustainable agriculture, biodiversity
Insect pest control (*Ostrinia nubilalis*)	Plant health, sustainable agriculture
Insect pest control (*Sesamia* spp.)	Plant health, sustainable agriculture
Pest susceptibility	Sustainable agriculture, plant health, biodiversity
Weed pressure	Sustainable agriculture, soil function, biodiversity
Occurrence of insects	Biodiversity
Occurrence of birds	Biodiversity
Occurrence of mammals	Biodiversity
Performance of fed animals	Animal health
Additional observations	All

Note: only the main corresponding protection goals are listed. However, each of the monitoring characters is addressing most of the protection goals, *e.g.*: all the characters that concur to demonstrate the agronomic equivalence of MON 810 to conventional maize are addressing impact on biodiversity.

The data for the monitoring characters were surveyed on a qualitative scale by asking farmers for their assessment of the situation compared to conventional cultivation. The farmer is asked to specify the conventional variety/ies he/she is cultivating on his/her farm to then use it/them as comparator(s). The farmers additionally use their general experience of cultivating conventional maize, thereby especially assessing the seasonal specifics. Farmers usually know whether observed differences are based on *e.g.* different varieties' maturity groups. For most questions, the possible categories of answers $As\ usual$ and $Different$, with the latter category subdivided into $Plus$ (*e.g.* later, higher, more) or $Minus$ (*e.g.* earlier, lower or less) were given (see Table 2).

Table 2: Monitoring characters and their categories

	Monitoring characters – observations of MON 810	*As usual*	*Different Minus*	*Different Plus*
Agronomic practices	Crop rotation	as usual	-	changed
	Time of planting	as usual	earlier	later
	Tillage and planting technique	as usual	-	changed
	Insect control practices	as usual	-	changed
	Weed control practices	as usual	-	changed
	Fungal control practices	as usual	-	changed
	Fertiliser application	as usual	-	changed
	Irrigation practices	as usual	-	changed
	Time of harvest	as usual	earlier	later
Characteristics in the field	Germination vigour	as usual	less	more
	Time to emergence	as usual	accelerated	delayed
	Time to male flowering	as usual	accelerated	delayed
	Plant growth and development	as usual	accelerated	delayed
	Incidence of stalk/root lodging	as usual	less	more
	Time to maturity	as usual	accelerated	delayed
	Yield	as usual	lower	higher
	Occurrence of MON 810 volunteers	as usual	less	more
Einvironment and wildlife	Disease susceptibility	as usual	less	more
	Insect pest control (*Ostrinia nubilalis*)	good	weak	very good
	Insect pest control (*Sesamia* spp.)	good	weak	very good
	Pest susceptibility	as usual	less	more
	Weed pressure	as usual	less	more
	Occurrence of insects	as usual	less	more
	Occurrence of birds	as usual	less	more
	Occurrence of mammals	as usual	less	more
	Performance of fed animals	as usual	-	changed

2.3 Definition of influencing factors

Besides named monitoring characters, several potentially influencing factors were surveyed to assess the local conditions and to determine the cause of potential effects in the monitoring characters (Table 3).

Table 3: Monitored influencing factors

Type	Factor
Site	Soil characteristics Soil quality Humus content
Cultivation	Crop rotation Soil tillage Planting technique Weed and pest control practices Application of fertilizer Irrigation Time of sowing Time of harvest
Environment	Local pest pressure Local disease pressure Local occurrence of weeds

2.4 Definition of baselines, effects and statistical test procedure

Usually – given that there is no effect of MON 810 cultivation or other influencing factors, and the question is well formulated and unambiguous - one would expect a predominant part of the farmers assessing the situation to be $As\ usual$. Small frequencies of differing answers result for example from uncertainty or environmental impacts and are expected to be balanced in both $Plus$ and $Minus$ direction and to run up to approximately 5 % (Figure 1). Therefore, the ***baseline*** for the analysis of monitoring characters with categories $As\ usual$ and $Different$ is 90 % - 10 %, where $Plus$- and $Minus$- answers are balanced and both about 5 %.

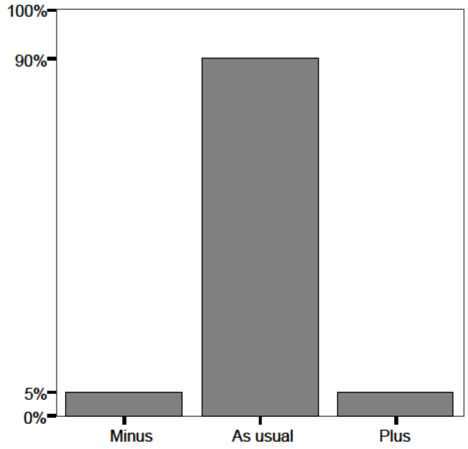

Figure 1: Balanced (expected) baseline distribution of the farmers' answers (no effect)

An effect of the cultivation of MON 810 or any other influencing factor would arise in a greater percentage of $Different$ (*i.e.* $Plus$- or $Minus$-) answers, where "greater" or an ***effect***, was quantitatively defined by exceeding a threshold of 10 % (Figure 2(a) and (b)). Graphically, an effect would be expressed by an unbalanced distribution (Figure 3(a) and (b)).

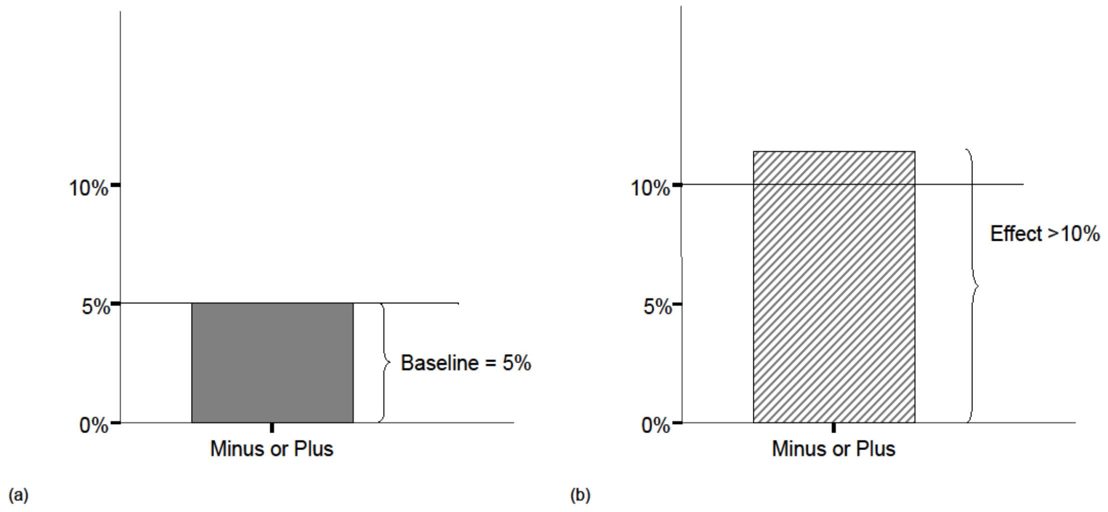

Figure 2: Definition of (a) baseline and (b) effect

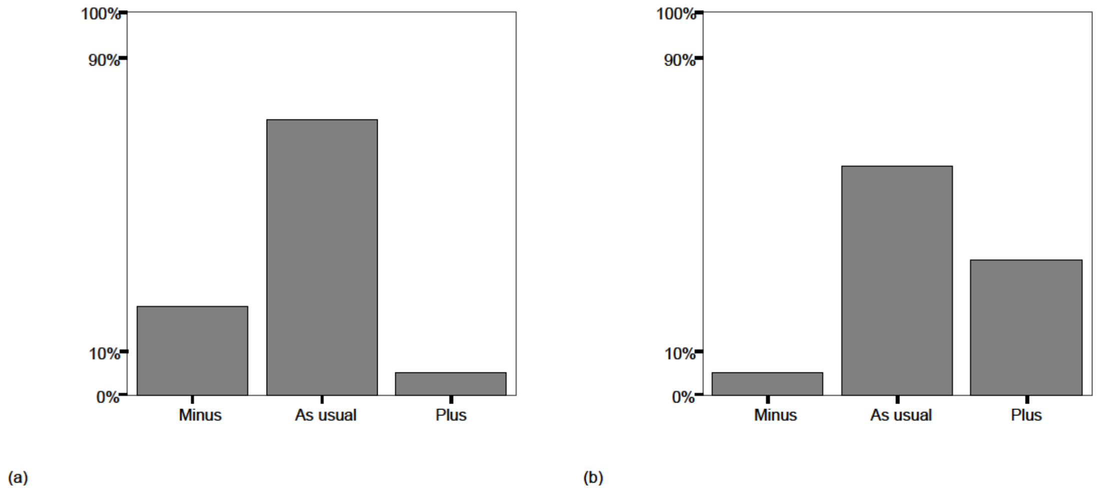

Figure 3: Examples for distributions of farmers' answers indicating an effect (a) > 10 % in category $Minus$ → effect, (b) > 10 % in category $Plus$ → effect

To detect an effect the proportions of $Different$ (*i.e.* $Plus$- or $Minus$-) answers have to be compared with the threshold of 10 % by a statistical test (one-sided, comparison of a probability with a constant). Since the $As\ usual$-, and $Different$- (*i.e.* $Plus$- or $Minus$-) answers complement each other, a closed test procedure is applied: first the $As\ usual$- proportion is compared with the threshold of 90%. If the $As\ usual$- proportion exceeds this threshold, the $Different$- (*i.e.* $Plus$- or $Minus$-) proportions cannot exceed the 10% and no effect is indicated. Otherwise, the $Different$- (*i.e.* $Plus$- or $Minus$-) proportions are to be compared with the 10% threshold and an effect is indicated if the threshold is exceeded by a $Different$- (*i.e.* $Plus$- or $Minus$-) proportion.

The frequencies of $As\ usual$-, and $Different$- (*i.e.* $Plus$- or $Minus$-) answers are statistically tested according to the closed principle test procedure (in case of questions that allow for only two answers like *e.g. Crop Rotation's* "as usual"/"changed", only $As\ usual$- and $Plus$-answer frequencies are tested accordingly).

The categories $As\ usual$, $Plus$ and $Minus$ form a vector with a multinomial distribution

$$(Minus, As\ usual, Plus) \sim Mult(n; p_{Minus}, p_{Asusual}, p_{Plus})$$

Therefore, each component of this vector is binomially distributed

$$Minus \sim B(n, p_{Minus}, k),\ As\ usual \sim B(n, p_{Asusual}, k),\ Plus \sim B(n, p_{Plus}, k)$$

To detect an effect of MON810 cultivation, the following statistical hypothesis are formulated:

$$H_0^1: p_{As\ usual} \leq 0.9 \quad \text{vs.} \quad H_A^1: p_{As\ usual} > 0.9$$
$$H_0^2: p_{Minus} \geq 0.1 \quad \text{vs.} \quad H_A^2: p_{Minus} < 0.1$$
$$H_0^3: p_{Plus} \geq 0.1 \quad \text{vs.} \quad H_A^3: p_{Plus} < 0.1$$

The set of null hypothesis $\{H_0^1, H_0^2, H_0^3\}$ is <u>closed under intersection</u> because

$$H_0^1 \cap H_0^2 = [0{,}0.9] \cap [0.1{,}1] = [0.1{,}0.9] \in [0{,}1] = \{H_0^1, H_0^2, H_0^3\} \text{ and}$$

$$H_0^1 \cap H_0^3 = [0{,}0.9] \cap [0.1{,}1] = [0.1{,}0.9] \in [0{,}1] = \{H_0^1, H_0^2, H_0^3\} \text{ and}$$

$$H_0^2 \cap H_0^3 = [0.1,1] \cap [0.1,1] = [0.1,1] \in [0,1] = \{H_0^1, H_0^2, H_0^3\}.$$

The detection of an effect is made in two steps. First, the global null hypothesis $H_0^1: p_{As\ usual} \leq 0.9$ is tested. If this hypothesis is rejected, testing of the hypotheses H_0^2 and H_0^3 is not needed anymore since they will be rejected then, too. Secondly, if $H_0^1: p_{As\ usual} \leq 0.9$ is not rejected, the hypotheses H_0^2 and H_0^3 are to be tested. The test procedure is displayed in Figure 4.

This test procedure is coherent because a rejection of the null hypothesis in step 1 implies a rejection of the hypotheses in step 2. The test procedure is called a closed test procedure.

Within the closed test principle, hypotheses are tested by applying the exact binomial test.

- Step (1): Test of the probability $p_{As\ usual}$ (usually the largest probability)
  Null hypothesis: GMP cultivation has an effect, the probability of getting $As\ usual$ -answers is smaller than 90 % ($H_0: p_{As\ usual} \leq 0.9$)
- Step (2): Test of the p_{Minus} probabilities and p_{Plus} probabilities
  Null hypothesis: GMP cultivation has an effect, the probability of getting $Minus$- or $Plus$-answers is larger than 10 % ($H_0: p_{Minus} \geq 0.1$, $H_0: p_{Plus} \geq 0.1$)

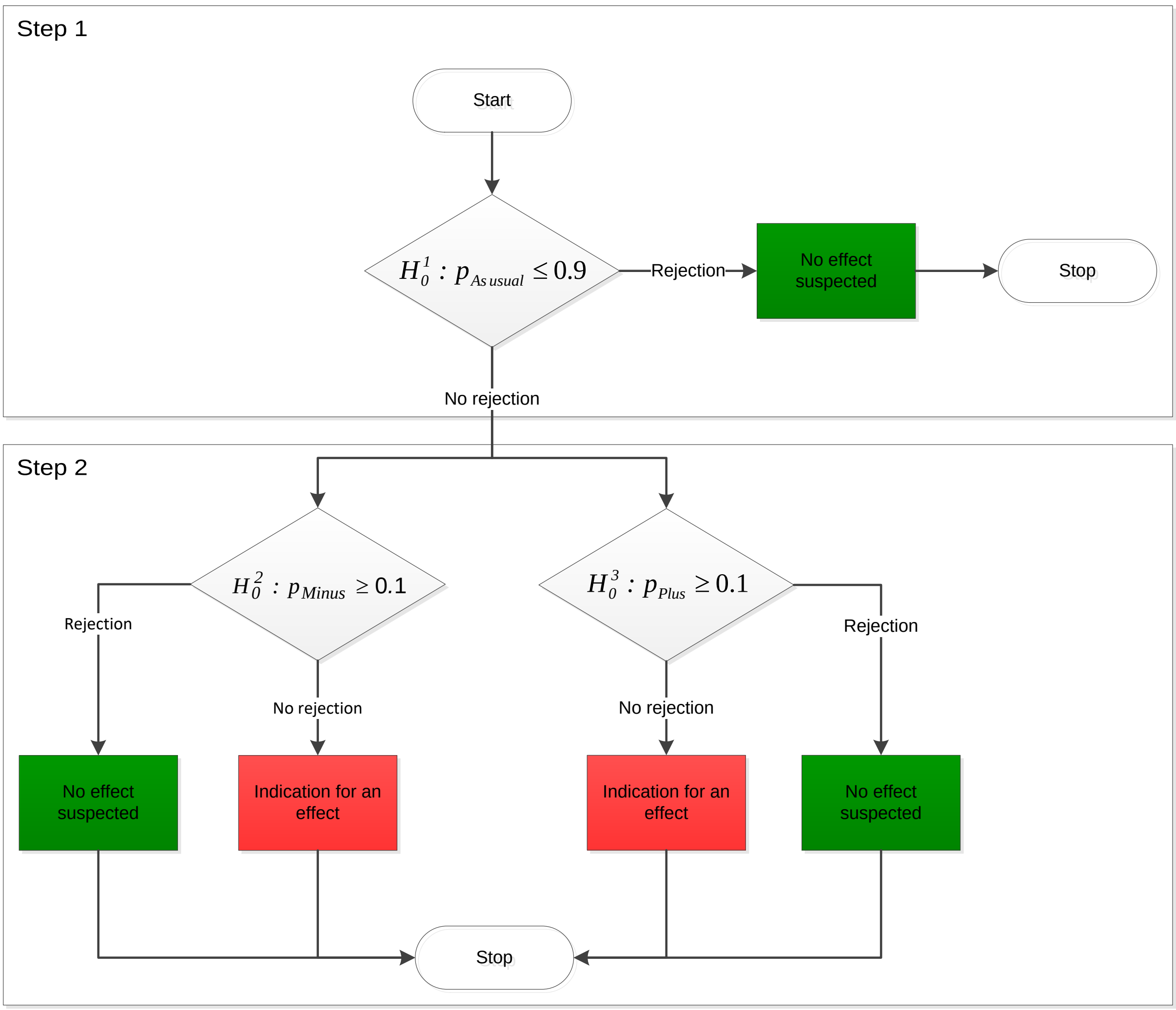

Figure 4: Closed test procedure for the three probabilities of $As\ usual$, $Plus$- and $Minus$-answers

This closed test procedure controls for the experiment-wise error rate because an erroneous decision, *i.e.* an error of the first kind (rejection of the null hypothesis although it is true) during the whole procedure can only be done once: an erroneous rejection of the null hypothesis (1) (*i.e.* in reality $p_{As\,usual} \leq 0.9$) corresponds to an erroneous rejection of the null hypotheses (2) (*i.e.* in reality $p_{Plus} \geq 0.1$ or $p_{Minus} \geq 0.1$) [Marcus, 1976], [Maurer, 1995].

Consequently the analysis of each monitoring character is to be performed according to the following scheme:

1. The frequencies of the farmer responses for the three categories are calculated. The calculation of frequencies and their percentages is done both on the basis of all and on the basis of valid answers. When farmers gave no statement, answers are accounted as missing values and therefore not considered valid. As a consequence, the "valid percentages" state the proportions of actually known answers, whereas the "percentages" only specify the proportions of the categories within the whole answer spectrum, including no answers. Additionally, the accumulated valid percentages are calculated to illustrate the distribution function and for quality control reasons.
2. The frequencies of $As\,usual$, $Plus$- and $Minus$- answers are statistically tested according to the closed principle test procedure as described above (in case of questions that allow for only two answers like *e.g. Crop Rotation's* "as usual"/"changed", only $As\,usual$- and $Plus$- answer frequencies are tested accordingly).
   The resulting p-values are compared to a level of significance $\alpha = 0.01$. If the p-value is smaller than $\alpha = 0.01$, the corresponding null hypothesis is rejected. If the p-value is larger than $\alpha = 0.01$, respective hypothesis cannot be rejected.
   - In case Hypothesis (1) with $p_{As\,usual} \leq 0.9$ is rejected, no effect is indicated.
   - In case Hypothesis (1) with $p_{As\,usual} \leq 0.9$ cannot be rejected, but both hypotheses (2) with $p_{Minus} \geq 0.1$ and $p_{Plus} \geq 0.1$ can be rejected, no effect is indicated.
   - In case Hypothesis (1) with $p_{As\,usual} \leq 0.9$ cannot be rejected and at least one of the hypotheses (2) cannot be rejected either, an effect is indicated.

   (See Figure 4 for a flow chart of the above named decision making processes.)
3. Where an effect is indicated, the effect must be interpreted (adverse/beneficial).
4. Where an adverse effect is identified, the cause of the effect must be ascertained (MON 810 cultivation or other influencing factors).
5. Identification of adverse effects potentially caused by MON 810 cultivation would require further examinations. Such cases, however, have neither been found in this years', nor in previous years' data.

Subsequently, 99 % confidence intervals are calculated for the $p_{As\,usual}$, p_{Minus} and p_{Plus}. The probabilities of, $As\,usual$, $Plus$- and $Minus$- answers with corresponding confidence intervals are illustrated graphically.

2.5 Sample size determination and selection

The sample size determination of the survey was done for a period of 10 years (authorization period). It was based on the exact binomial test. It depends on the threshold for the test, the error of the first kind α (Type I error), the error of the second kind β (Type II error) and the effect size d [Rasch, 2007a].

The error of the first kind is the probability to reject the null hypothesis although it is true, *i.e.* not to identify an existing effect. This probability should be as small as possible since it is the aim of GS to identify any existing effects. The error of the first kind is also called consumer's risk.

The error of the second kind is the probability to accept the null hypothesis although it is false, *i.e.* to identify an effect although none exists. This probability should also be as small as possible as it would raise false alarm (Table 4). The error of the second kind is also called producer's risk.

The magnitude of the effect size d was chosen from experience in analyzing farm questionnaires in a pilot study in Germany 2001 - 2005 [Schmidt, 2008].

Table 4: Error of the first kind α and error of the second kind β for the test decision in testing frequencies of $Plus$- or $Minus$-answers from farm questionnaires against the threshold of 10 %

		Real situation	
		$p \leq 0.9$ **Indication for an effect**	$p > 0.9$ **No effect**
Test decision	**Acceptance** $H_0 : p \leq 0.9$	Correct decision with Probability $1 - \alpha = 99$ %	Wrong decision with Probability $\beta = 1$ %
	Rejection $H_0 : p \leq 0.9$	Wrong decision with Probability $\alpha = 1$ %	Correct decision with Probability $1 - \beta = 99$ % $= POWER$

CADEMO light [Cademo, 2006] was used as proposed by [Rasch, 2007a] to determine the sample size for a binomial test (Method 3/62/1005). Within this survey the accuracy demands $p = 0.9$ (threshold for adverse effects to be tested: 90 % of $As\ usual$ -answers, $\alpha = 0.01$ (error of the first kind), $\beta = 0.01$ (error of the second kind), and $d = 3$ % (minimum difference of practical interest) should be met. Under these demands for a one sample problem, testing a probability against a threshold with a one-sided test, a sample size of 2 436 questionnaires was calculated. To get this sample size even in the case of questionnaires having to be excluded from the survey *e.g.* because of low quality, this number was rounded to 2 500 questionnaires.

Since the monitoring objects are fields where genetically modified crops are cultivated, the total population consists of all fields within the EU being cultivated within the 10-years authorization period. From this population a maximum of 2 500 fields has to be selected for the GS survey. Sampling of these 2 500 fields should ensure to reflect the range and distribution of plant production systems and environments exposed to GMP cultivation. This range is on one hand characterized by the growing season (year and its climatic, environmental conditions), while on the other hand, it is characterized by the geographic regions where GM cultivation takes place. Regions may vary in terms of their production systems, regulatory requirements, agro-political and socio-economic conditions and therefore are best described by European countries. Consequently, sampling takes place within strata (defined by years and countries of cultivation).

The total number of 2 500 monitoring objects is firstly equally subdivided into 250 objects per year. It is then tried to consider the fluctuant adoption of the GMP (grade of market maturity) by assigning these 250 objects to the respective countries on a yearly basis. Consequently, the sample cultivation areas with a high uptake of the GMP may be over-represented by a large number of monitored fields, while as countries with proportionally very low cultivation may be excluded from the monitoring. If fewer than 250 fields per year are cultivated, the maximum possible number of monitoring objects is surveyed.

In a second step, a quota considering

- the countries of MON810 cultivation in the respective year,
- the magnitude of MON 810 cultivation (ha planted per country/ ha planted in the EU) and
- local situation (average field size in the country)

is applied.

In reality, the sampling procedure is afflicted by several challenges:

- the total population of interest, i.e. the total number of fields (and the field sizes) is not known,
- the development of areas of MON810 cultivation cannot be predicted,
- for the definition of the yearly sampling frame, not the total number of fields but only the total cultivated area (in ha, see Table 12) is known.

Therefore the sampling frame for this survey cannot be based on the total population of fields with MON 810 cultivation in Europe. Instead, each year the total MON 810 cultivated area (in ha) is known.

Table 12 shows the cultivation areas of 2018. For Portugal and Spain, the number of survey completions targeted from each country was set in proportion to the country's MON810-planted area:

Table 5: Sampling number proportional to cultivated MON810 area in Portugal and Spain 2018

Country	MON 810 area	No of questionnaires
Portugal	5,733	12
Spain	115,246	238
Total	**120,979**	**250**

This procedure was repeated within the countries:

Portugal:

Table 6: Sampling number proportional to cultivated MON810 area in Portugal 2018

Region	MON 810 area	% of country surface	Proportional No of questionnaires	Sampling
Norte	60.69	0.01	0	0
Centro	1,311.46	22.87	3	3
Lisboa e Vale do Tejo	1,022.90	17.84	2	2
Alentejo	3,338.31	58.23	7	7
Total	**5,733.36**	**100.00**	**12**	**12**

Due to the relatively small cultivation area of MON 810, Norte was excluded from the monitoring.

Spain:

Table 7: Sampling number proportional to cultivated MON810 area in Spain 2018

Region	MON 810 area	% of country surface	Proportional No of questionnaires	Sampling
Andalucia	4,971.72	4.31	11	11
Aragón + Cataluña	83,683.53	72.61	173	173
Castilla Leon	8.95	0.01	0	0
Castilla-La-Mancha + Comunidad de Madrid	3,940.6	3.42	8	8
Comunidad Foral de Navarra	8,100.55	7.03	17	17
Comunidad Valenciana	238.24	0.21	0	0
Extremadura	14,137.77	12.27	29	29
Islas Baleares	162.94	0.14	0	0
La Rioja	0.00	0.00	0	0
Murcia	1.76	0.00	0	0
Islas Canarias	0.00	0.00	0	0
Total	**115,246.06**	**100.00**	**238**	**238**

Due to the relatively small cultivation area of MON 810, Castilla Leon, Comunidad Valencia, Islas Baleares, La Rioja, Murcia and Islas Canarias were excluded from the monitoring.

Aragón + Cataluña and *Castilla-La-Mancha + Comunidad de Madrid* were grouped into single regions, respectively, as the seed sales numbers obtained by the respective distributors did not allow for a clear distinction between the regions.

Within each region, the determined number of fields needed to be selected. Farmers were selected from customer lists of the interviewer companies, plus experience from previous surveys or search in the region. When buying the seeds, farmers are informed to possibly be contacted for a survey. All farmer refusals are recorded.

The whole sampling procedure ensured that the monitoring area was proportional to and representative of the total regional area under GM cultivation in 2018.

2.6 Power of the Test

The power of the test $p_{Minus} \geq 0.1$, $p_{Plus} \geq 0.1$, respectively is the probability to reject the null hypothesis of an effect where none exists (correct decision). It is defined as $1 - \beta$ (β = error of the second kind) and is calculated as followed:

$$Power = \sum_{F=0}^{F_u - 1} \left(\frac{n!}{F!\,(n-F)!} \right) p^F (1-p)^{n-F}$$

where:

$F_u = \min_F (P(F \leq F_E | H_0) > \alpha$

p = given probability of $Plus$- or $Minus$ -answers for which the power is calculated

F_E = absolute frequency of $Plus$- or $Minus$ -answers

Figure 5 illustrates the power for an alternative hypothesis value of 0.13 (effect size 0.03). The distribution of the null hypothesis value (0.10) is represented by the red curve; the distribution of the alternative hypothesis value (0.13) is represented by the blue curve. The green line shows the critical value for an error probability $\alpha = 0.01$. If the alternative hypothesis is actually true (GM cultivation has no effect) the rejection of the null hypothesis is a correct decision which will occur with 99 % probability (under the blue curve to the left of the green line), *i.e.* with a power of 99 %.

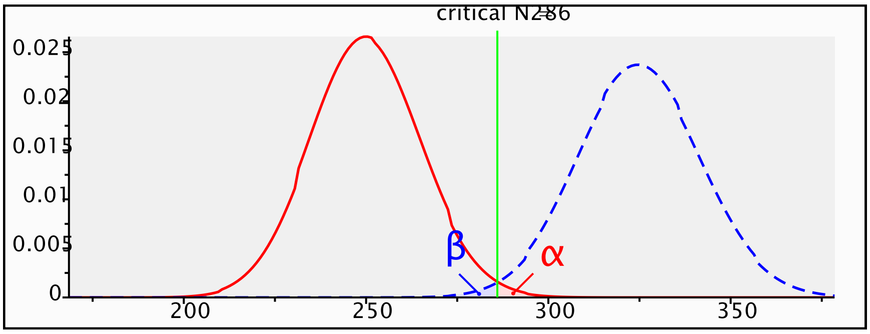

Figure 5: Null ($p = 0.1$) and alternative ($p = 0.13$) binomial distribution functions for a sample size of 2 500 type I and type II errors α and β both 0.01 (graph: *G*Power* Version 3.1.6)

2.7 Data management and quality control

A database was developed for data management and storage. For each question a variable was defined by a variable name (eight-digit in maximum) and a variable label (short description of the question). The variables were specified according to their type (qualitative or quantitative), format, *etc*. Missing values were defined (-1: no statement, -2: not readable). For not readable entries in the questionnaires, queries were formulated and the farmers were asked for clarification. Afterwards, these entries in the database were corrected. For quantitative variables (*e.g.* total maize area in ha) the real values from the questionnaire were taken for the database, for qualitative variables the possible parameter values (e.g. *As usual/ Plus/ Minus*) were defined and coded (and only the coded values taken).

High quality of the data is assured by preliminarily training the interviewers in a workshop via phone on a yearly basis. In face-to-face interviews, the interviewers are instructed to check whether the farmer`s answer corresponds to their documentation.

All data are entered and controlled for their quality and plausibility. A quality control check first verifies the completeness of the data. Some data fields (especially the monitoring characters or comments in case the farmer's assessments differ from *As usual*) are defined to be mandatory, therefore missing values or unreadable entries are not accepted. Furthermore, the values are verified for correctness (quantitative values within a plausible min-max range, qualitative values meeting only acceptable values). A plausibility control validates the variable values for their contents, both to identify incorrect answers and to prove the logical connections between different questions. It also looks for the consistency between *Plus-/ Minus*- answers and specifications, *i.e.* whether all these answers were provided with a specification and whether the specifications really substantiated the *Plus-/ Minus*-answers.

For any missing or implausible data the interviewers are asked to contact the farmers again to complete or correct the questionnaire (in these cases interviewers receive corresponding queries from BioMath).

3 Results

The questionnaires have been completed between February and March 2019. In the 2018 growing season 250 farm questionnaires have been collected. Quality and plausibility control confirmed that all 250 questionnaires could be considered for analysis. This good quality also resulted from the interviewer training.

The analysis shows that in most cases, the frequencies for the three categories of the monitoring characters show the expected balanced distribution. In some cases, deviations were identified.

An overview of numbers, percentages and levels of significance for the binomial tests of the data in 2018 is given in Table 8. The fields in the table highlighted in grey mark the cases for which the test against the 0.9/ 0.1 thresholds resulted in p-values greater than or equal to 0.01, so the null hypotheses (that these values are smaller than 0.9 or greater than 0.1, respectively) could not be rejected and therefore indicate the occurrence of an effect.

Table 9 lists the probabilities of $As\ usual$- / $Plus$- / $Minus$- answers for the monitoring characters together with corresponding 99 % confidence intervals. All probabilities with confidence intervals are shown on the same graph (for each of the $As\ usual$- / $Plus$- / $Minus$- answers) in Figure 6, thereby forming an overall pattern and allowing the assessment of MON 810 effects at one glance. The vertical dashed lines indicate the test thresholds of 0.9/ 0.1 (biological relevance).

No effect of MON 810 is indicated if

- for the $As\ usual$- probabilty the lower confidence bound is greater than the threshold of 0.9, *i.e.* the whole confidence interval lies on the right side of the dashed line or

An effect of MON 810 is indicated if

- for the $As\ usual$- probabilty the threshold lies between the lower and upper confidence bounds, *i.e.* the confidence interval crosses the dashed line.
- for the $As\ usual$- probabilty the upper confidence bound is smaller than the threshold, *i.e.* the whole confidence interval lies on the left side of the dashed line.

Table 8: Overview on the results of the closed test procedure for the monitoring characters in 2018 growing season

Monitoring character	N valid	*As usual*	P for p_0 = 0.9	*Minus*	P for p_0 = 0.1	*Plus*	P for p_0 = 0.1
Crop rotation	250	248 (99.2%)	< 0.01			2 (0.8%)	< 0.01
Time of planting	250	245 (98.0%)	< 0.01	1 (0.4%)	< 0.01	4 (1.6%)	< 0.01
Tillage and planting technique	250	250 (100.0%)	< 0.01			0 (0.0%)	< 0.01
Insect control practices	250	244 (97.6%)	< 0.01			6 (2.4%)	< 0.01
Weed control practices	250	249 (99.6%)	< 0.01			1 (0.4%)	< 0.01
Fungal control practices	250	250 (100.0%)	< 0.01			0 (0.0%)	< 0.01
Maize Borer control practice	250	244 (97.6%)	< 0.01			6 (2.4%)	< 0.01
Fertilizer Application	250	250 (100.0%)	< 0.01			0 (0.0%)	< 0.01
Irrigation Practices	250	250 (100.0%)	< 0.01			0 (0.0%)	< 0.01
Time of harvest	250	246 (98.4%)	< 0.01	1 (0.4%)	< 0.01	3 (1.2%)	< 0.01
Germination vigor	250	235 (94.0%)	< 0.01	1 (0.4%)	< 0.01	14 (5.6%)	< 0.01
Time to emergence	250	249 (99.6%)	< 0.01	0 (0.0%)	< 0.01	1 (0.4%)	< 0.01
Time to male flowering	250	249 (99.6%)	< 0.01	0 (0.0%)	< 0.01	1 (0.4%)	< 0.01
Plant growth and development	250	244 (97.6%)	< 0.01	3 (1.2%)	< 0.01	3 (1.2%)	< 0.01
Incidence of stalk / root lodging	250	190 (76.0%)	1.0	60 (24.0%)	1.0	0 (0.0%)	< 0.01
Time to maturity	250	238 (95.2%)	< 0.01	0 (0.0%)	< 0.01	12 (4.8%)	< 0.01
Yield	250	180 (72.0%)	1.0	1 (0.4%)	< 0.01	69 (27.6%)	1.0
Occurrence of volunteers	250	237 (94.8%)	< 0.01	13 (5.2%)	< 0.01	0 (0.0%)	< 0.01
Disease susceptibility	250	248 (99.2%)	< 0.01	2 (0.8%)	< 0.01	0 (0.0%)	< 0.01
Pest susceptibility	250	237 (94.8%)	< 0.01	13 (5.2%)	< 0.01	0 (0.0%)	< 0.01
Weed pressure	250	250 (100.0%)	< 0.01	0 (0.0%)	< 0.01	0 (0.0%)	< 0.01
Occurrence of insects	250	250 (100.0%)	< 0.01	0 (0.0%)	< 0.01	0 (0.0%)	< 0.01
Occurrence of birds	250	250 (100.0%)	< 0.01	0 (0.0%)	< 0.01	0 (0.0%)	< 0.01
Occurrence of mamals	250	250 (100.0%)	< 0.01	0 (0.0%)	< 0.01	0 (0.0%)	< 0.01
Performance of animals	5	5 (100.0%)	< 0.01			0 (0.0%)	0.590

For grey highlighted probability values the binomial test against the threshold of 90 % for *As usual*-answers or 10 % for *Minus* - or *Plus*-answers, respectively, resulted in p-values greater than $\alpha = 0.01$, so the null hypotheses, that these values are smaller than 90 % for *As usual*-answers or greater than 10 % for *Minus* - or *Plus*-answers, respectively, could not be rejected, *i.e.* an effect is indicated.

Table 9: Overview on the $p_{As\ usual}$, p_{Minus} and p_{Plus} probabilities of the monitoring characters and corresponding 99 % confidence intervals

Monitoring character	$p_{As\ usual}$	lower 99 % confidence limit	upper 99 % confidence limit	p_{Minus}	lower 99 % confidence limit	upper 99 % confidence limit	p_{Plus}	lower 99 % confidence limit	upper 99 % confidence limit
Crop rotation	99.2%	97.7%	100.7%	-	-	-	0.8%	0.0%	2.3%
Time of planting	98.0%	95.7%	100.3%	0.4%	0.0%	1.4%	1.6%	0.0%	3.6%
Tillage and planting technique	100.0%	100.0%	100.0%	-	-	-	0.0%	0.0%	0.0%
Insect control practices	97.6%	95.1%	100.1%	-	-	-	2.4%	0.0%	4.9%
Weed control practices	99.6%	98.6%	100.6%	-	-	-	0.4%	0.0%	1.4%
Fungal control practices	100.0%	100.0%	100.0%	-	-	-	0.0%	0.0%	0.0%
Maize Borer control practice	97.6%	95.1%	100.1%	-	-	-	2.4%	0.0%	4.9%
Fertilizer Application	100.0%	100.0%	100.0%	-	-	-	0.0%	0.0%	0.0%
Irrigation Practices	100.0%	100.0%	100.0%	-	-	-	0.0%	0.0%	0.0%
Time of harvest	98.4%	96.4%	100.4%	0.4%	0.0%	1.4%	1.2%	0.0%	3.0%
Germination vigor	94.0%	90.1%	97.9%	0.4%	0.0%	1.4%	5.6%	1.9%	9.3%
Time to emergence	99.6%	98.6%	100.6%	0.0%	0.0%	0.0%	0.4%	0.0%	1.4%
Time to male flowering	99.6%	98.6%	100.6%	0.0%	0.0%	0.0%	0.4%	0.0%	1.4%
Plant growth and development	97.6%	95.1%	100.1%	1.2%	0.0%	3.0%	1.2%	0.0%	3.0%
Incidence of stalk / root lodging	76.0%	69.0%	83.0%	24.0%	17.0%	31.0%	0.0%	0.0%	0.0%
Time to maturity	95.2%	91.7%	98.7%	0.0%	0.0%	0.0%	4.8%	1.3%	8.3%
Yield	72.0%	64.7%	79.3%	0.4%	0.0%	1.4%	27.6%	20.3%	34.9%
Occurrence of volunteers	94.8%	91.2%	98.4%	5.2%	1.6%	8.8%	0.0%	0.0%	0.0%
Disease susceptibility	99.2%	97.7%	100.7%	0.8%	0.0%	2.3%	0.0%	0.0%	0.0%
Pest susceptibility	94.8%	91.2%	98.4%	5.2%	1.6%	8.8%	0.0%	0.0%	0.0%
Weed pressure	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Occurrence of insects	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Occurrence of birds	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Occurrence of mamals	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Performance of animals	100.0%	100.0%	100.0%	-	-	-	0.0%	0.0%	0.0%

Grey highlighted confidence intervals cross the threshold of 90 % for $As\ usual$-answers or 10 % for $Minus$ - or $Plus$-answers, respectively, so the null hypotheses, that these values are smaller than 90 % for $As\ usual$-answers or greater than 10 % for $Minus$ - or $Plus$-answers, respectively, could not be rejected, *i.e.* an effect is indicated.

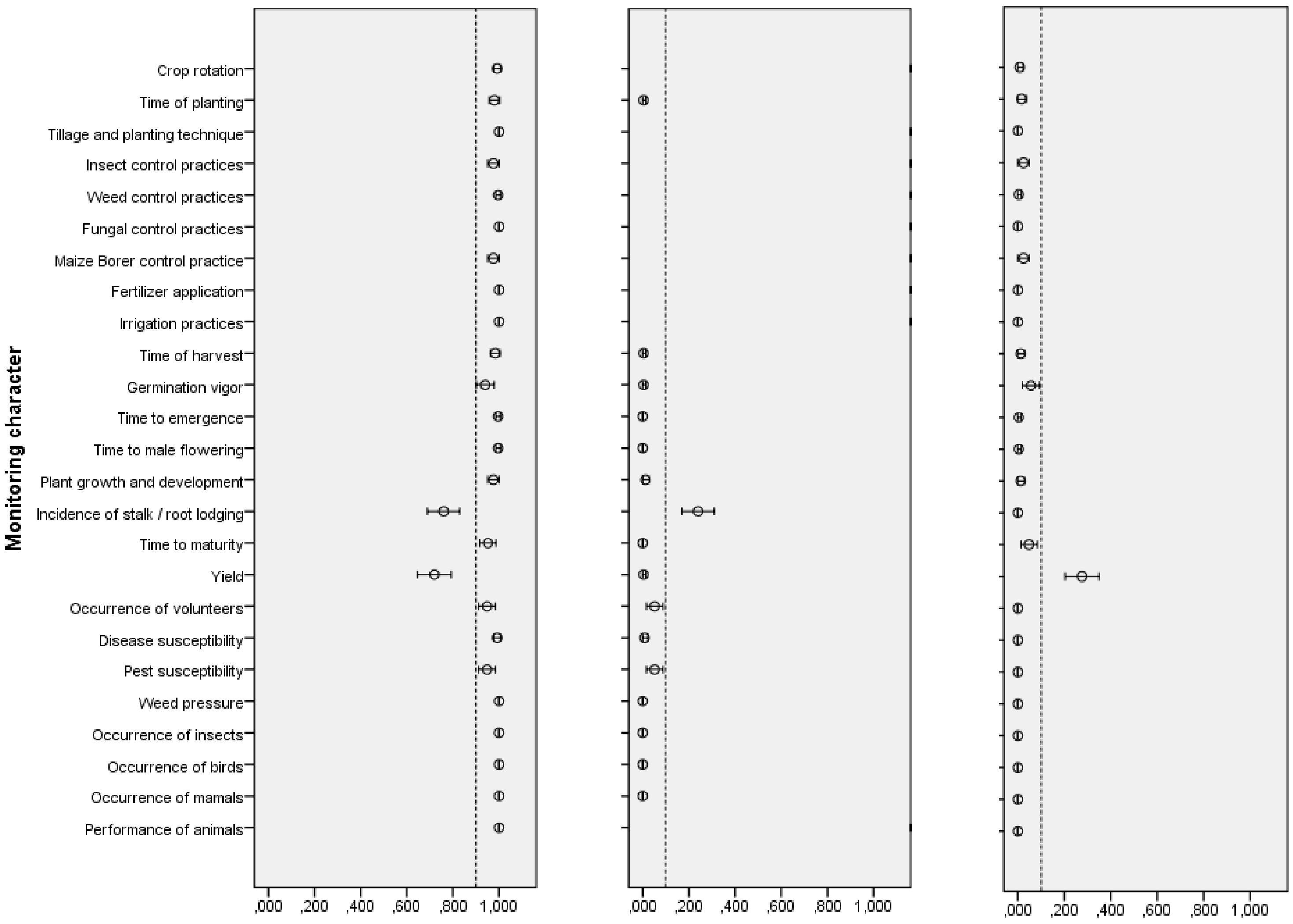

Figure 6: $As\ usual$- , $Plus$- and $Minus$ - answer probabilities of all monitoring characters, point estimates (circle) and 99 % confidence intervals (bars). Vertical dashed line indicates the test thresholds of 0.9 or 0.1, respectively (biological relevance)

Taken together, 2018 data indicate that in comparison to conventional maize, MON 810 plants

- had less incidence of stalk/root lodging,
- gave a higher yield.

In the following sections the detailed analysis of all parameters surveyed using the questionnaire in 2018 is described and the results are assessed scientifically.

3.1 Sampling and quality and plausibility control

The questionnaires have been completed between February and March 2019. In the 2018 growing season 250 farm questionnaires have been collected.

In Spain, the largest market, the surveys (238) were performed by Instituto Markin, SL[2], in Portugal the surveys (12) were performed by Agro.Ges - Sociedade de Estudos e Projectos[3]. These companies have an established experience in agricultural surveys.

In Spain, 479 farmers were contacted, 241 did not respond for the following reasons: because they did not grow MON810 in 2018 (74), they did not grow maize in 2018 (63), they grew MON810 in 2018 but refused to sign the consent form (42), they grew MON810 in 2018 but refused to answer the interview (39), they were absent or could not be localized (12) they were retired (11). The response rate was 50%. 82 interviewed farmers took part in the survey for the first time. According to the sampling scheme, the farmers came from the following regions:

Table 10: Number of farmers interviewed in Spain 2018

Region		**No of farmers**
Cataluña - Aragón		173
Lérida	71	
Huesca	80	
Zaragoza	22	
Navarra		17
Navarra	17	
Extremadura		29
Badajoz	9	
Cáceres	20	
Andalucía		11
Sevilla	11	
Castilla- La Mancha		8
Albacete	8	
Total		**238**

In Portugal, none of the contacted farmers refused to participate. The response rate was 100%. 9 interviewed farmers for the first time took part in the survey. According to the sampling scheme, the farmers came from the following regions:

[2] Instituto Markin, SL; c/ Caleruega, 60 4º D -28033 Madrid -Spain
[3] Agro.Ges -Sociedade de Estudos e Projectos, Av. da República, 412, 2750-475 Cascais -Portugal

Table 11: Number of farmers interviewed in Portugal 2018

Region	No of farmers
North	0
Center	3
Lisbon and Tagus Valley	2
Alentejo	7
Total	**12**

The quality and plausibility control confirmed that all 250 questionnaires could be considered for analysis. The high quality of the questionnaires can also be ascribed to the interviewer training.

The database currently contains 3,377 cases (questionnaires) for 13 field seasons: 252 for 2006, 291 for 2007, 297 for 2008, 240 for 2009, 271 for 2010, 249 for 2011, 249 for 2012, 256 for 2013, 261 for 2014, 261 for 2015, 250 for 2016, 250 for 2017 and 250 for 2018.

3.2 Part 1: Maize grown area

3.2.1 Location

In 2018, 250 questionnaires were surveyed in the cultivation areas of MON 810 in Spain and Portugal. With an area of 115,246 ha in Spain and 5,733 ha in Portugal, these two countries represent MON 810 cultivators in Europe. Of these areas, 3.2 % and 11.2 % were monitored in this study for Spain and Portugal, respectively (Table 12).

Figure 7 shows a geographical overview on the cultivation areas of MON 810 in Europe in 2018 (dark grey areas) and the distribution of the monitoring sites (numbers) per region.

Table 12: MON 810 cultivation and monitored areas in 2018

Country	Total planted MON 810 area (ha)	Monitored MON 810 area (ha)	Monitored MON 810 area / total planted MON 810 area (%)
Spain	115,246	3,735	3.2
Portugal	5,733	641	11.2
Total	**120,979**	**4,376**	**3.6**

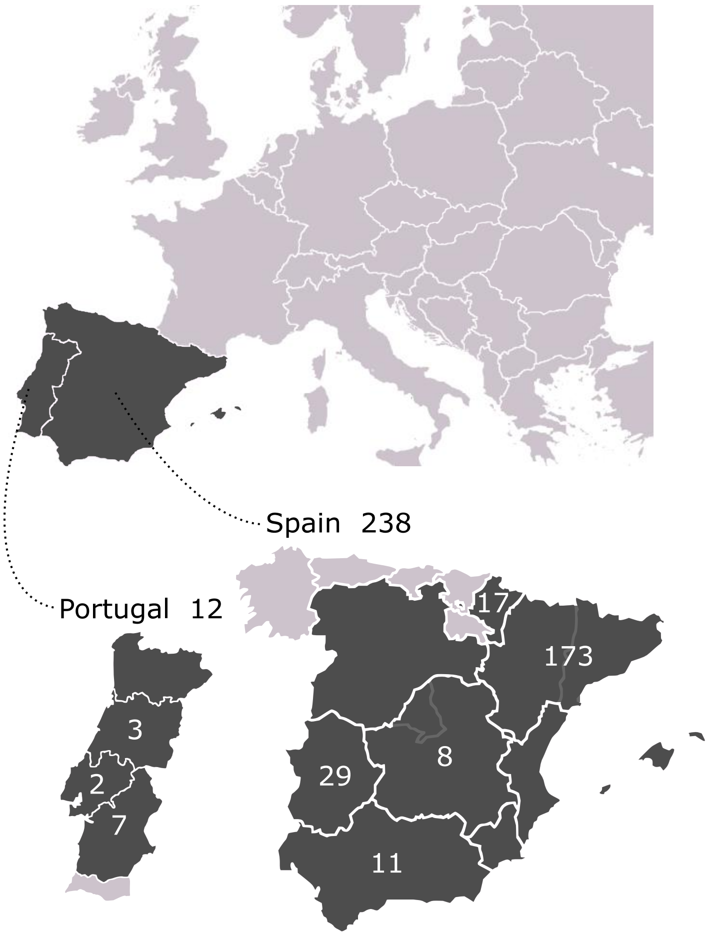

Figure 7: Number of sampling sites within the cultivation areas (dark grey) of MON 810 in Europe in 2018

3.2.2 Surrounding environment

The farmers were asked to describe the land usage in the surrounding of the areas planted with maize. 249/250 fields (99.6 %) were surrounded by farmland, 1 field was surrounded by forest or wild habitat (Table 13, Figure 8).

Table 13: Land usage in the surrounding of the areas planted with MON 810 in Europe in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	Farmland	249	99.6	99.6	99.6
	Forest or wild habitat	1	0.4	0.4	100.0
	Total	**250**	**100.0**	**100.0**	

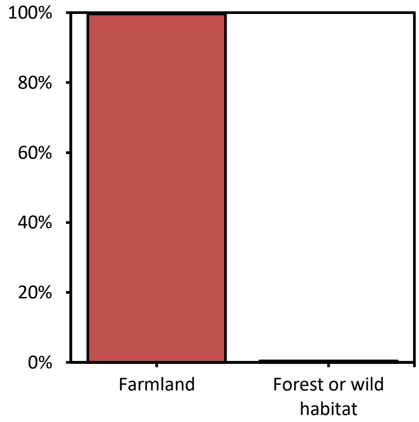

Figure 8: Land usage in the surrounding of the areas planted with MON 810 in Europe in 2018

3.2.3 Size and number of fields of the maize cultivated area

The size of the total maize area at the farms in 2018 ranged from 1 to 370 hectares. The average MON 810 areas per surveyed farmer in 2018 were 16.0 ha in Spain and 53.0 ha in Portugal. Details for cultivation of maize from 2006 to 2018 by country can be found in Table 14.

Table 14: Maize area (ha) per surveyed farmer in 2006, 2007, 2008 and 2009

		2006			2007			2008			2009		
Country	**Total Area (ha)**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
Spain	all maize	26.9	1.0	204.0	31.6	1.0	210.0	31.6	1.5	294.0	28.3	3.0	260.0
	MON 810	21.0	1.0	170.0	25.2	1.0	200.0	24.9	0.5	266.0	21.1	2.0	200.0
France	all maize	80.4	9.6	500.0	54.6	6.0	500.0	-	-	-	-	-	-
	MON 810	18.3	0.4	104.0	35.8	2.0	150.0	-	-	-	-	-	-
Portugal	all maize	100.3	10.0	278.0	89.3	7.0	470.0	78.6	10.0	350.0	78.8	8.0	310.0
	MON 810	35.3	3.0	130.0	54.8	0.8	320.0	41.1	2.5	240.0	47.8	1.0	250.0
Czech Republic	all maize	424.6	52.0	2,500.0	433.8	89.3	1,400.0	431.9	57.4	3,000.0	338.9	8.4	789.1
	MON 810	28.2	1.5	125.0	86.3	19.5	466.0	107.6	10.0	561.1	90.4	6.5	500.0
Slovakia	all maize	491.7	65.0	1,300.0	277.2	20.0	659.4	340.2	124.0	637.3	546.7	270.0	895.0
	MON 810	10.0	10.0	10.0	50.6	10.0	174.6	130.1	10.0	400.0	132.3	50.0	285.0
Germany	all maize	274.8	39.0	1,110.0	239.5	20.0	1,130.0	256.1	4.8	1,470.0	-	-	-
	MON 810	17.3	1.0	50.0	43.0	0.5	166.0	51.6	0.2	200.0	-	-	-
Romania	all maize	-	-	-	1,969.8	253.0	5,616.0	591.4	5.4	6,789.0	417.5	2.5	6,869.0
	MON 810	-	-	-	61.4	0.5	216.0	149.0	2.0	2,705.0	62.1	1.0	1,114.0
Poland	all maize	-	-	-	79.0	20.0	130.0	222.7	4.2	940.0	58.0	39.0	95.0
	MON 810	-	-	-	13.0	11.0	15.0	17.0	4.2	50.0	12.8	5.5	25.0

Table 14 (cont): Maize area (ha) per surveyed farmer in 2010, 2011, 2012 and 2013

		2010			2011			2012			2013		
Country	**Total Area (ha)**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
Spain	all maize	34.2	2.0	300.0	33.6	2.0	300.0	33.0	1.0	320.0	41.6	1.5	1,000.0
	MON 810	23.9	1.0	240.0	24.7	2.0	220.0	21.8	1.0	278.0	27.7	1.0	700.0
France	all maize	-	-	-	-	-	-	-	-	-	-	-	-
	MON 810	-	-	-	-	-	-	-	-	-	-	-	-
Portugal	all maize	78.4	9.0	377.0	95.9	10.0	377.0	96.7	10.0	300.0	103.7	10.0	537.0
	MON 810	53.9	1.5	264.0	54.2	2.0	264.0	61.5	1.5	240.0	58.4	1.0	240.0
Czech Republic	all maize	355.7	2.2	2,000.0	409.9	45.0	900.0	492.2	8.4	2,000.0	454.0	9.3	1,300.0
	MON 810	112.7	2.0	654.0	146.0	20.0	640.0	108.6	6.6	230.0	95.8	7.3	250.0
Slovakia	all maize	594.9	150.0	859.6	986.0	447.6	1,700.0	862.9	862.9	862.9	-	-	-
	MON 810	184.2	60.0	400.7	103.0	48.1	140.8	169.0	169.0	169.0	-	-	-
Germany	all maize	-	-	-	-	-	-	-	-	-	-	-	-
	MON 810	-	-	-	-	-	-	-	-	-	-	-	-
Romania	all maize	196.9	20.0	1,100.0	180.3	65.0	700.0	124.0	20.0	500.0	749.0	548.0	950.0
	MON 810	32.9	0.1	284.0	32.8	2.5	99.0	21.6	0.0	59.3	227.8	55.6	400.0
Poland	all maize	61.1	19.0	150.0	61.8	10.0	180.0	-	-	-	-	-	-
	MON 810	23.8	1.5	100.0	25.3	1.0	130.0	-	-	-	-	-	-

Table 14 (cont): Maize area (ha) per surveyed farmer in 2014, 2015, 2016 and 2018

		2014			2015			2016			2017			2018		
Country	**Total Area (ha)**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
Spain	all maize	53.0	2.0	1,950	40.7	45.4	579	45.4	1.0	700	45.4	1.0	800	21.0	1.0	100
	MON 810	34.0	1.0	1,445	25.8	33.8	400	33.8	1.0	600	33.8	1.0	681	16.0	1.0	83
France	all maize	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MON 810	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Portugal	all maize	111.7	10.0	800	109.6	128.8	728	128.8	37.0	180	128.8	19.0	374	96.0	10.0	370
	MON 810	64.3	1.0	640	66.3	75.0	582	75.0	10.0	136	75.0	5.0	147	53.0	4.0	220
Czech Republic	all maize	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MON 810	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slovakia	all maize	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MON 810	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Germany	all maize	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MON 810	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Romania	all maize	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MON 810	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Poland	all maize	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MON 810	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Figure 9 shows the mean percentage of MON 810 cultivation area within total maize area per farmer from 2006 to 2018.

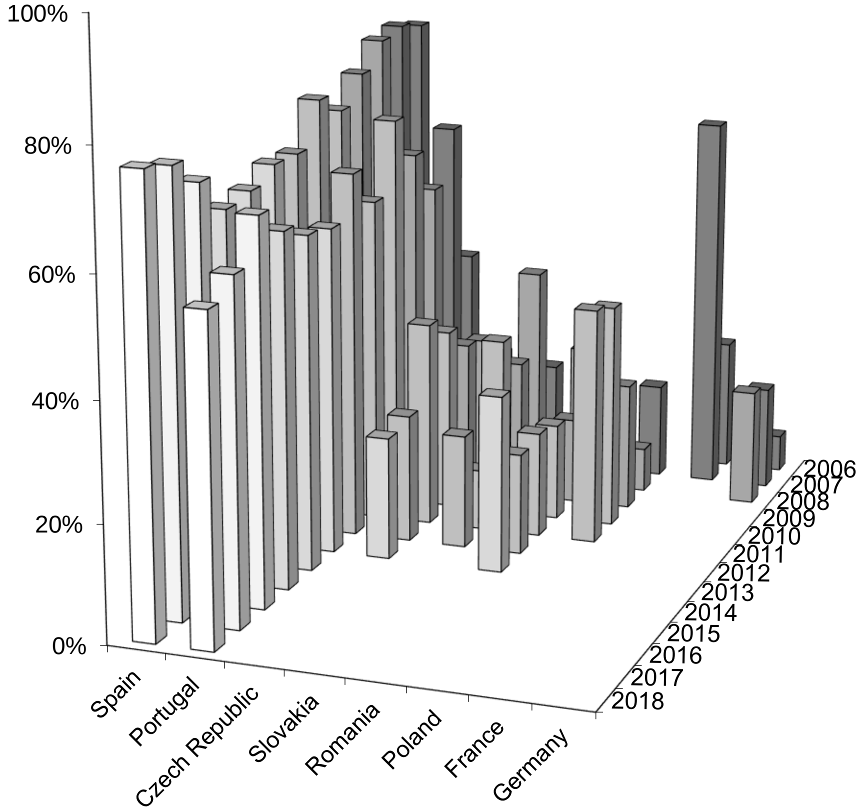

Figure 9: Mean percentage of MON 810 cultivation area of total maize area per farmer in 2006 - 2018 (surveyed countries only)

In 2018, MON 810 was cultivated on 1 - 65 fields per farm. On average every farmer cultivated MON 810 on 4 fields (Table 15).

Table 15: Number of fields with MON 810 in 2018

Valid N	Mean	Minimum	Maximum	Sum
250	4.12	1	65	1031

3.2.4 Maize varieties grown

The farmers were asked to list up to five MON 810 varieties and up to five conventional maize varieties they cultivated on their farm in 2018. 48 different MON 810 varieties and 59 different conventional maize varieties were listed. The most frequently listed varieties (at least 6 times) together with their respective frequencies are listed in Table 16.

Table 16: Names of most frequent MON 810 and conventional maize varieties in 2018

MON 810 maize		**Conventional maize**	
Variety	**Frequency**	**Variety**	**Frequency**
P 0937 Y	68	P 0937	55
DKC 6729 YG	67	DKC 6664	36
P 1570 Y	52	P 1570	29
P 1921 Y	27	DKC 6728	26
DKC 5032 YG	23	P 1921	18
P 1758 Y	15	DKC 5031	15
LG 30690 YG	13	P 1524	11
PR 33 Y 72	9	P 1574	7
P 0933 Y	8	P 0933	7
DKC 6041 YG	7	Lerma	6
P 1547 Y	7		
P 0725 Y	7		
P 1574 Y	7		
LG 30490 YG	7		
DKC 5741 YG	7		
LG 30601 YG	7		
DKC 5784 YG	6		
MAS 69 YG	6		

3.2.5 Soil characteristics of the maize grown area

To assess the possible influence of the soil on monitoring characters, data on soil characteristics, quality and humus content were surveyed. Table 17 and Figure 10 summarize the reported soil types of the maize grown area.

Table 17: Predominant soil type of maize grown area in 2018

		Frequency	**Percent**	**Valid percentages**	**Accumulated percentages**
Valid	very fine	1	0.4	0.4	0.4
	fine	59	23.6	23.6	24.0
	medium	142	56.8	56.8	80.8
	medium-fine	11	4.4	4.4	85.2
	coarse	18	7.2	7.2	92.4
	no predominant soil type	19	7.6	7.6	100.0
Total		**250**	**100.0**	**100.0**	

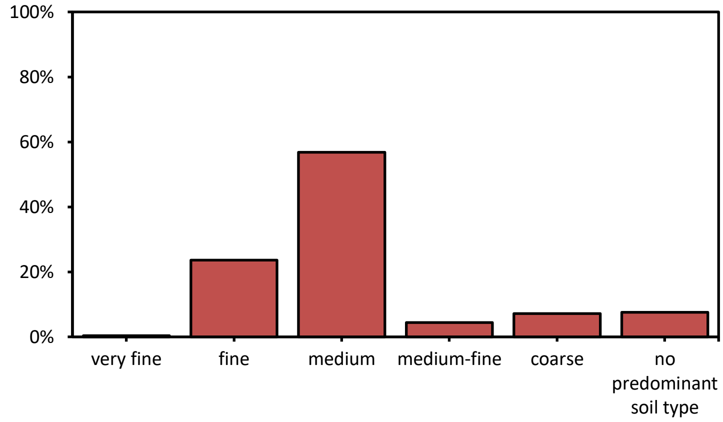

Figure 10: Predominant soil type of maize grown area in 2018

Farmers' responses regarding the soil quality of the maize-grown areas are given in Table 18 and Figure 11. 88.4 % (221/250) of the maize was grown on *normal* or *good* soil according to the response of the farmers.

Table 18: Soil quality of the maize grown area as assessed by the farmers in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	below average - poor	3	1.2	1.2	1.2
	average - normal	218	87.2	87.2	88.4
	above average - good	29	11.6	11.6	100.0
Total		**250**	**100.0**	**100.0**	

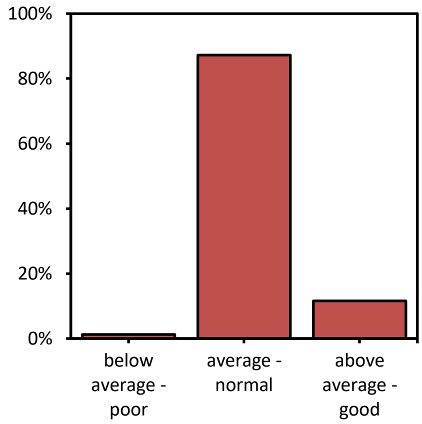

Figure 11: Soil quality of the maize grown area as assessed by the farmers in 2018

66 farmers were able to specify the humus content (not a commonly known measure all over Europe), which ranged from 1.0 % to 4.0 % with a mean of 3.3 % (Table 19). 184 farmers did not specify the humus content.

Table 19: Humus content (%) in 2018

Valid N	Mean	Minimum	Maximum	Missing N
66	3.3	1.0	4.0	184

3.2.6 Local disease, pest and weed pressure in maize

Data of local disease, pest and weed pressures in maize were collected to find out if these environmental data had any influence on the values of the monitoring characters. These data differ from year to year, depending on the cultivation area and reflect the assessment of the farmer.

3.2.6.1 Local disease pressure (fungal, viral) as assessed by the farmers

The local disease pressure (fungal, viral) in maize was assessed to be low or $as\ usual$ by 98.0 % (245/250) of the farmers (Table 20, Figure 12).

Table 20: Farmers assessment of the local disease pressure (fungal, viral) in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	low	147	58.8	58.8	58.8
	as usual	98	39.2	39.2	98.0
	high	5	2.0	2.0	100.0
Total		**250**	**100.0**	**100.0**	

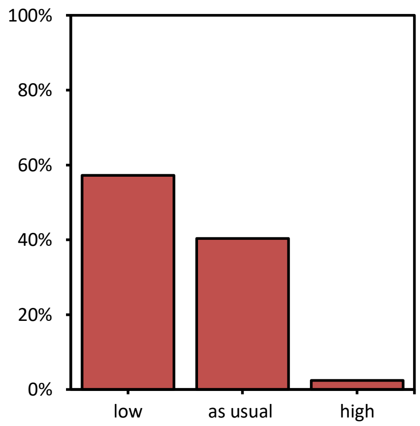

Figure 12: Farmers assessment of the local disease pressure (fungal, viral) in 2018

3.2.6.2 Local pest pressure (insects, mites, nematodes) as assessed by the farmers

Regarding the local pest pressure (insects, mites, nematodes), 85.6 % (214/250) of the farmers evaluated it to be low or $as\ usual$ and 14.4 % (36/250) evaluated it to be $high$ (Table 21, Figure 13).

Table 21: Farmers assessment of the local pest pressure (insects, mites, nematodes) in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	low	118	47.2	47.2	47.2
	as usual	96	38.4	38.4	85.6
	high	36	14.4	14.4	100.0
Total		**250**	**100.0**	**100.0**	

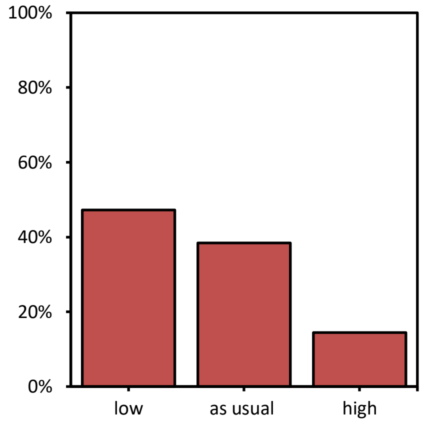

Figure 13: Farmers assessment of the local pest pressure (insects, mites, nematodes) in 2018

3.2.6.3 Local weed pressure as assessed by the farmers

97.2 % (243/250) assessed the local weed pressure to be low or $as\ usual$ and 2.8 % (7/250) evaluated it to be $high$ (Table 22, Figure 14).

Table 22: Farmers assessment of the local weed pressure in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	low	41	16.4	16.4	16.4
	as usual	202	80.8	80.8	97.2
	high	7	2.8	2.8	100.0
Total		**250**	**100.0**	**100.0**	

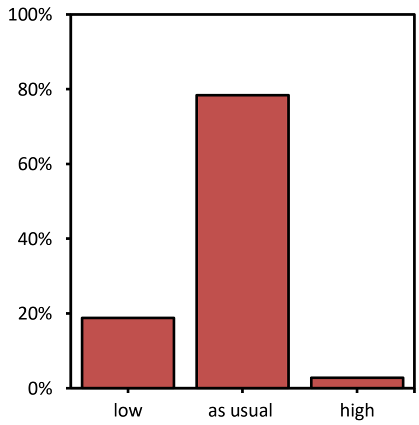

Figure 14: Farmers assessment of the local weed pressure in 2018

3.3 Part 2: Typical agronomic practices to grow maize

3.3.1 Irrigation of maize grown area

100.0 % (250/250) of the farmers irrigated their fields (Table 23). The irrigation of the maize grown area is a productivity factor. These data reflect the general practices on the Iberian Peninsula. The irrigation depends on the weather conditions, even though it could be relevant for the analysis of GM maize specific effects.

Table 23: Irrigation of maize grown area in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	yes	250	100.0	100.0	100.0
	no	0	0.0	0.0	100.0
Total		**250**	**100.0**	**100.0**	

Most of the farmers used Sprinkler (46.4 %) or Gravity (39.6 %) irrigation followed by Pivot (8.4 %). The remaining 14 farmers used more than one of the named systems or other types of irrigation (Table 24, Figure 15).

Table 24: Irrigation types of maize grown area in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	Sprinkler	116	46.4	46.4	46.4
	Gravity	99	39.6	39.6	86.0
	Pivot	21	8.4	8.4	94.4
	other	12	4.8	4.8	99.2
	Gravity and Sprinkler	1	0.4	0.4	99.6
	Gravity and Pivot	1	0.4	0.4	100.0
Total		**250**	**100.0**	**100.0**	

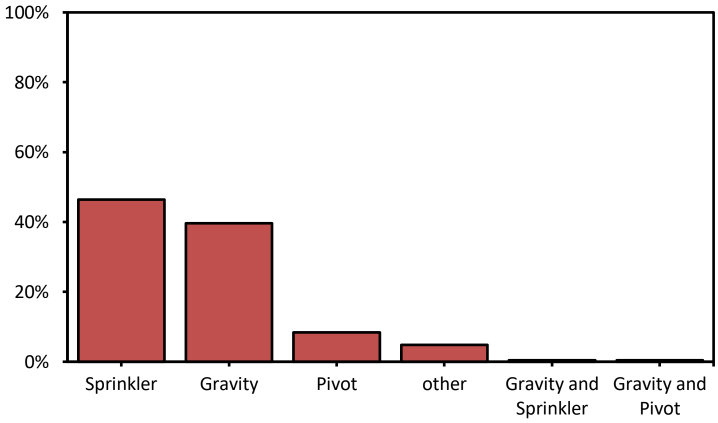

Figure 15: Irrigation types of maize grown area in 2018

3.3.2 Major rotation of maize grown area

The main crop rotation within three years is $maize - maize - maize$ followed by $maize - barley - maize$. More crop rotations were mentioned, but all with frequencies lower than 20 (Table 25).

Table 25: Major rotation of maize grown area before 2018 planting season (two years ago and previous year) sorted by frequency.

	Two years ago	Previous year	Frequency	Valid Percentage	Accumulated percentage
Valid	maize	maize	110	44.0	44.0
	maize	barley	35	14.0	58.0
	wheat	maize	18	7.2	65.2
	barley	maize	12	4.8	70.0
	maize	wheat	10	4.0	74.0
	maize	tomato	7	2.8	76.8
	alfalfa	alfalfa	6	2.4	79.2
	tomato	maize	5	2.0	81.2
	maize	pea	4	1.6	82.8
	alfalfa	barley	3	1.2	84.0
	alfalfa	maize	2	0.8	84.8
	barley	vegetables	2	0.8	85.6
	maize	cotton	2	0.8	86.4
	maize	potato	2	0.8	87.2
	barley	barley	2	0.8	88.0
	maize	sunflower	2	0.8	88.8
	ryegrass	ryegrass	2	0.8	89.6
	cotton	maize	1	0.4	90.0
	pea	maize	1	0.4	90.4
	barley / alfalfa	maize	1	0.4	90.8
	sunflower / maize	maize	1	0.4	91.2
	maize	vegetables	1	0.4	91.6
	wheat	vegetables	1	0.4	92.0
	barley	no cultivation	1	0.4	92.4
	broccoli / potato / pea	multiple	1	0.4	92.8
	potato / cabbage	multiple	1	0.4	93.2
	oats	oat / tomato	1	0.4	93.6
	pea	barley	1	0.4	94.0
	wheat	barley	1	0.4	94.4
	cauliflower / wheat	barley	1	0.4	94.8
	maize	alfalfa	1	0.4	95.2
	wheat	sunflower	1	0.4	95.6
	tomato	sunflower	1	0.4	96.0
	alfalfa	wheat	1	0.4	96.4
	cereals	ryegrass	1	0.4	96.8
	maize	onion	1	0.4	97.2
	wheat	onion	1	0.4	97.6
	oat / tomato	tomato	1	0.4	98.0
	tomato	tomato	1	0.4	98.4
	maize	broccoli	1	0.4	98.8
	broccoli	spinach	1	0.4	99.2
	maize	pea / wheat	1	0.4	99.6
	fruit	fruit	1	0.4	100.0
Total			**250**	**100.0**	

3.3.3 Soil tillage practices

The farmers were asked to answer whether they performed soil tillage. 96.8 % (242/250) said yes (Table 26, Figure 16) while 3.2 % (8/250) answered no.

Table 26: Soil tillage practices in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	yes	242	96.8	96.8	96.8
	no	8	3.2	3.2	100.0
Total		**250**	**100.0**	**100.0**	

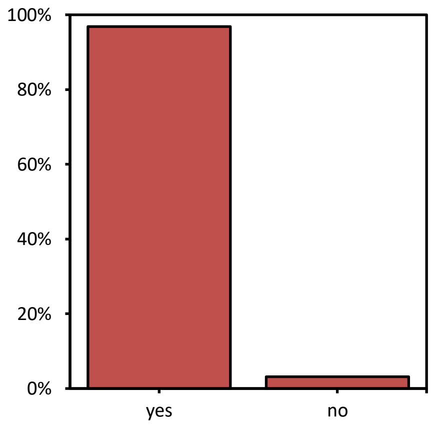

Figure 16: Soil tillage practices in 2018

All farmers who said yes specified the time of tillage. 73.6 % (178/242) performed it in $winter$, 26.4 % (64/242) in $spring$ and no one in $winter\ and\ spring$ (Table 27, Figure 17).

Table 27: Time of tillage in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	winter	178	73.6	73.6	73.6
	spring	64	26.4	26.4	100.0
	winter & spring	0	0.0	0.0	100.0
Total		**242**	**100.0**	**100.0**	

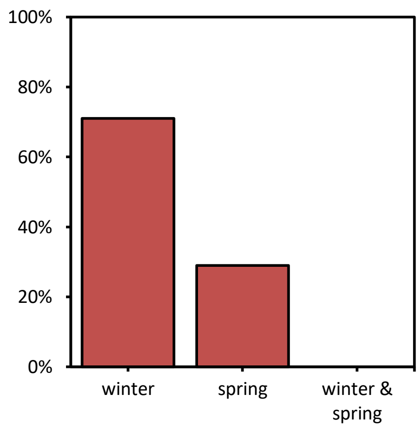

Figure 17: Time of tillage in 2018

3.3.4 Maize planting technique

92 % (230/250) of the farmers used *conventional* maize planting techniques, 4.8 % (12/250) *mulch* and 3.2 % (8/250) used *direct sowing* (Table 28, Figure 18).

Table 28: Maize planting technique in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	conventional planting	230	92.0	92.0	92.0
	mulch	12	4.8	4.8	96.8
	direct sowing	8	3.2	3.2	100.0
Total		**250**	**100.0**	**100.0**	

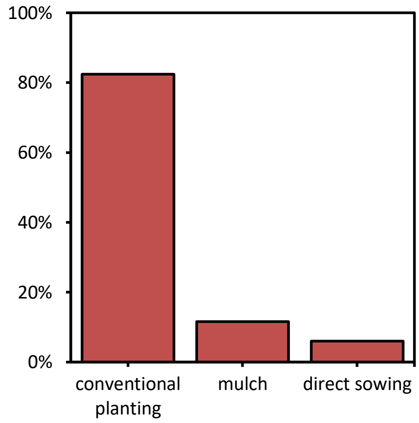

Figure 18: Maize planting technique in 2018

3.3.5 Typical weed and pest control practices in maize

Farmers were asked to specify the typical weed and pest control practices for maize at their farms. For conventional maize all farmers (250/250) applied $insecticides$ and 2.4 % (6/248) of them additionally applied $insecticides\ against\ corn\ borers$. All of the farmers (250/250) used $herbicides$. None of the farmers used $mechanical\ weed\ control$, $fungicides$ or $biocontrol\ treatment$ (Table 29)

Table 29: Typical weed and pest control practices in maize in 2018

Insecticide(s)		**Frequency**	**Percent**
	yes	250	100.0
	no	0	0.0
Total		250	100.0
Insecticide(s) against Corn Borer		**Frequency**	**Percent**
	yes	6	2.4
	no	244	97.6
Total		250	100.0
Use of biocontrol treatments		**Frequency**	**Percent**
	yes	0	0.0
	no	250	100.0
Total		250	100.0
Herbicide(s)		**Frequency**	**Percent**
	yes	250	100.0
	no	0	0.0
Total		250	100.0
Mechanical weed control		**Frequency**	**Percent**
	yes	0	0.0
	no	250	100.0
Total		250	100.0
Fungicide(s)		**Frequency**	**Percent**
	yes	0	0.0
	no	250	100.0
Total		250	100.0
Other		**Frequency**	**Percent**
	yes	0	0.0
	no	250	100.0
Total		250	100.0

3.3.6 Application of fertilizer to maize grown area

All of the farmers (250/250) applied fertilizer to the maize grown area (Table 30).

Table 30: Application of fertilizer to maize grown area in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	yes	250	100.0	100.0	100.0
	no	0	0.0	0.0	100.0
Total		**250**	**100.0**	**100.0**	

3.3.7 Typical time of maize sowing

For quality control and to see if the collected data are plausible the farmers were asked about the typical time of maize sowing.

The time of sowing ranged from 01 Feburary 2018 to 20 July 2018 (Table 31).

Table 31: Typical time of maize sowing in 2018

	Minimum	Maximum	Mean	Valid N
Sowing from	01.02.2018	15.07.2018	20.04.2018	250
Sowing till	01.03.2018	20.07.2018	16.05.2018	250

3.3.8 Typical time of maize harvest

In order to verify the plausibility of the data, farmers were also asked for their typical time of harvest. The time of harvest for maize grain ranged from 25 August 2018 to 31 December 2018 and for forage maize from 08 August 2018 to 30 November 2018 (Table 32).

Table 32: Typical time of maize harvest in 2018

	Minimum	Maximum	Mean	Valid N
Harvest grain maize from	25.08.2018	25.12.2018	22.10.2018	245
Harvest grain maize till	07.09.2018	31.12.2018	21.11.2018	245
Harvest forage maize from	08.08.2018	01.11.2018	04.10.2018	13
Harvest forage maize till	16.08.2018	30.11.2018	24.10.2018	13

3.4 Part 3: Observations of MON 810

3.4.1 Agricultural practice for MON 810 (compared to conventional maize)

3.4.1.1 Crop rotation

The crop rotation for MON 810 was specified to be $as\ usual$ in 99.2 % (248/250) of the cases (Table 33, Figure 19). The individual specifications for $changed$ crop rotation before MON 810 are given in Appendix A, Table A 1.

Table 33: Crop rotation for MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	as usual	248	99.2	99.2	99.2
	changed	2	0.8	0.8	100.0
Total		**250**	**100.0**	**100.0**	

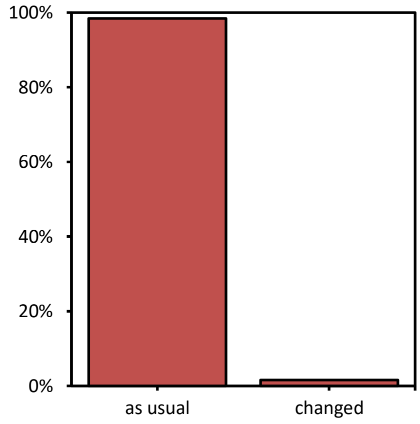

Figure 19: Crop rotation of MON 810 compared to conventional maize in 2018

(1) The valid percentage of $as\ usual$ crop rotation (99.2 %) is significantly greater than 90 %. The resulting p-value is less than the level of significance $\alpha = 0.01$ (Table 34). The null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 100.0 %.

No effect on crop rotation is indicated.

Table 34: Test results as well as 99% confidence intervals for $p_{As\ usual}$, p_{Minus} and p_{Plus} probabilities of crop rotation in MON 810 compared to conventional maize in 2018

N valid	$As\ usual$	p-value for $p_{As\ usual} = 0.9$	$Minus$	p-value for $p_{Minus} = 0.1$	$Plus$	p-value for $p_{Plus} = 0.1$
250	248 (99.2%)	< 0.01				

$p_{As\ usual}$	lower 99 % confidence limit	upper 99 % confidence limit	p_{Minus}	lower 99 % confidence limit	upper 99 % confidence limit	p_{Plus}	lower 99 % confidence limit	upper 99 % confidence limit
99.2%	97.7%	100.7%	-	-	-	0.8%	0.0%	2.3%

3.4.1.2 Time of planting

The time of planting of MON 810 was specified to be $as\ usual$ compared to conventional maize by 98.0 % (245/250) of the farmers (Table 35, Figure 20). The individual specifications for $later$ and $earlier$ planting of MON 810 are given in Appendix A, Table A 2.

Table 35: Time of planting for MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	earlier	1	0.4	0.4	0.4
	as usual	245	98.0	98.0	98.4
	later	4	1.6	1.6	100.0
Total		**250**	**100.0**	**100.0**	

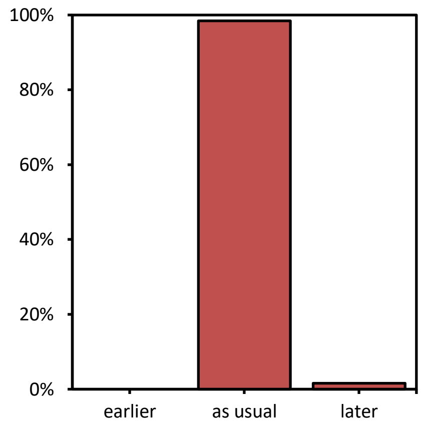

Figure 20: Time of planting of MON 810 compared to conventional maize in 2018

(1) The valid percentage of $as\ usual$ time of planting (98.0 %) is significantly greater than 90 %. The resulting p-value is less than the level of significance $\alpha = 0.01$ (Table 36). The null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 100%.

No effect on time of planting is indicated.

Table 36: Test results as well as 99% confidence intervals for $p_{As\ usual}$, p_{Minus} and p_{Plus} probabilities of time of planting in MON 810 compared to conventional maize in 2018

N valid	$As\ usual$	p-value for $p_{As\ usual}$ = 0.9	$Minus$	p-value for p_{Minus} = 0.1	$Plus$	p-value for p_{Plus} = 0.1
250	245 (98.0%)	< 0.01				

$p_{As\ usual}$	lower 99 % confidence limit	upper 99 % confidence limit	p_{Minus}	lower 99 % confidence limit	upper 99 % confidence limit	p_{Plus}	lower 99 % confidence limit	upper 99 % confidence limit
98.0%	95.7%	100.3%	0.4%	0.0%	1.4%	1.6%	0.0%	3.6%

3.4.1.3 Tillage and planting techniques

None of the farmers changed their tillage and planting techniques of MON 810 compared to those used for conventional maize, as reflected in Table 37.

Table 37: Tillage and planting techniques for MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	as usual	250	100.0	100.0	100.0
	changed	0	0.0	0.0	100.0
Total		**250**	**100.0**	**100.0**	

No effect on tillage and planting techniques is indicated.

3.4.1.4 Insect and corn borer control practice

Insecticides applied in MON 810 fields sorted by their regulatory approval as seed treatment, spray application or microgranules are listed per country in Appendix A, Table A 3. MON 810 received insecticide treatments mainly through seed coatings, for which Thiacloprid was the major active ingredient in 2018. Abamectin and Lambda-cyhalothrin were the most used active ingredients for spraying. Furthermore, Chlorpyrifos or Lambda-cyhalothrin were the active ingredients of all named granulate insecticides.

All farmers were asked to describe their insect control practice in MON 810 compared to conventional maize. 97.6 % (244/250) specified no change in practice, while 2.4 % (6/250) used a $different$ program (Table 38, Figure 21).

Table 38: Use of insect control in MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	as usual	244	97.6	97.6	97.6
	changed	6	2.4	2.4	100.0
Total		**250**	**100.0**	**100.0**	

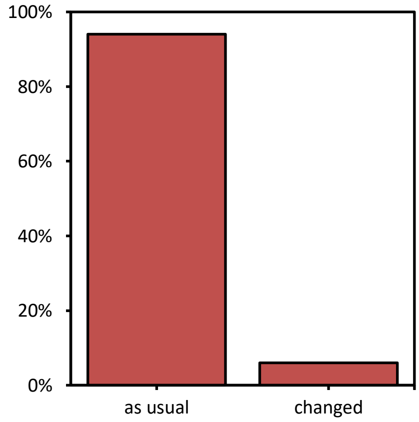

Figure 21: Insect control practice of MON 810 compared to conventional maize in 2018

(1) The valid percentage of $as\ usual$ insect control practice (97.6 %) is significantly greater than 90 %. The resulting p-value is less than the level of significance $\alpha = 0.01$ (Table 39) The null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 100%.

No effect on insect control practice is indicated.

Table 39: Test results as well as 99% confidence intervals for $p_{As\ usual}$, p_{Minus} and p_{Plus} probabilities of insect control practice in MON 810 compared to conventional maize in 2018

N valid	$As\ usual$	p-value for $p_{As\ usual}$ = 0.9	$Minus$	p-value for p_{Minus} = 0.1	$Plus$	p-value for p_{Plus} = 0.1
250	244 (97.6%)	< 0.01				

$p_{As\ usual}$	lower 99 % confidence limit	upper 99 % confidence limit	p_{Minus}	lower 99 % confidence limit	upper 99 % confidence limit	p_{Plus}	lower 99 % confidence limit	upper 99 % confidence limit
97.6%	95.1%	100.1%	-	-	-	2.4%	0.0%	4.9%

All farmers that stated a difference in their insect control practices compared to conventional maize (Table 40) said that they specifically changed their corn borer control practice, as it is not necessary in MON 810 (Table 41, Figure 22). All individual explanations are given in Appendix A, Table A 4.

Table 40: Insect control practice compared to conventional maize in the context of the general use of insecticides in 2018

		Insect control practice in MON 810		
		as usual	changed	**Total**
Do you usually use insecticides? (section 3.3.5)	yes	0	6	**6**
	no	244	0	**244**
Total		**244**	**6**	**250**

Table 41: Corn Borer control practice compared to conventional maize in the context of the general use of insecticides against Corn Borer in 2018

		Corn borer control practice in MON 810		
		as usual	changed	**Total**
Do you usually use insecticides specifically against corn borer? (section 3.3.5)	yes	0	6	**6**
	no	244	0	**244**
Total		**244**	**6**	**250**

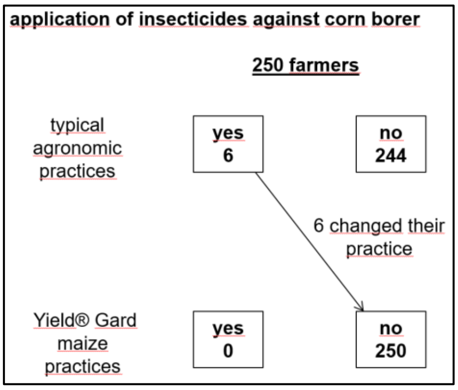

Figure 22: Change of insect control practice in MON 810 compared to conventional maize in 2018

The reduced use of conventional insecticides to control corn borers can be anticipated, since MON 810 is specifically designed to control corn borers as *Ostrinia nubilalis* and *Sesamia* spp. Therefore, planting of MON 810 makes insecticide applications for this purpose obsolete.

3.4.1.5 Weed control practice

The herbicides applied in MON 810 fields are listed in Appendix A, Table A 5. A wide number of herbicides and actives were used. The main actives of herbicides that were cited by the farmers are:

- (S)-Metolachlor
- Isoxaflutole
- Nicosulfuron
- Mesotrione
- Foramsulfuron
- Dicamba

all of which are well-known products used for weed control in maize.

The farmers were asked to describe their weed control practice in MON 810 in 2018 compared to conventional maize. 99.6% of the farmers used the same weed control in MON 810 compared to conventional maize, while a single farmer changed the weed control (Table 42, Figure 23). The one farmer (from Spain) applying a different weed control practice stated "*I do one herbicide application in YieldGard and two in conventional*".

Table 42: Use of weed control in MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	as usual	249	99.6	99.6	99.6
	changed	1	0.4	0.4	100.0
Total		**250**	**100.0**	**100.0**	

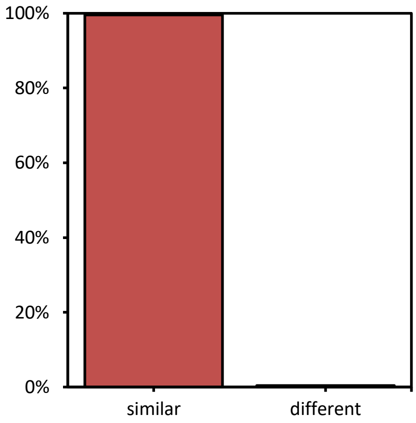

Figure 23: Use of weed control in MON 810 compared to conventional maize in 2018

(1) The valid percentage of $as\ usual$ weed control practice (99.6 %) is significantly greater than 90 %. The resulting p-value is less than the level of significance $\alpha = 0.01$ (Table 43). The null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 100%.

No effect on weed control practice is indicated.

Table 43: Test results as well as 99% confidence intervals for $p_{As\ usual}$, p_{Minus} and p_{Plus} probabilities of weed control in MON 810 compared to conventional maize in 2018

N valid	$As\ usual$	p-value for $p_{As\ usual} = 0.9$	$Minus$	p-value for $p_{Minus} = 0.1$	$Plus$	p-value for $p_{Plus} = 0.1$
250	249 (99.6%)	< 0.01				

$p_{As\ usual}$	lower 99 % confidence limit	upper 99 % confidence limit	p_{Minus}	lower 99 % confidence limit	upper 99 % confidence limit	p_{Plus}	lower 99 % confidence limit	upper 99 % confidence limit
99.6%	98.6%	100.6%	-	-	-	0.4%	0.0%	1.4%

3.4.1.6 Fungal control practice

Since in 2018 no farmer declared to use a fungicide, no statement about the most common active ingredient in fungicides can be made.

None of the farmers changed their fungal control practice of MON 810 compared to that of conventional maize (Table 44).

Table 44: Use of fungicides on MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	as usual	250	100.0	100.0	100.0
	changed	0	0.0	0.0	100.0
Total		**250**	**100.0**	**100.0**	

No effect on fungal control practice is indicated.

3.4.1.7 Fertilizer application practice

None of the farmers changed their fertilizer application practice of MON 810 compared to that of conventional maize (Table 45).

Table 45: Use of fertilizer in MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	as usual	250	100.0	100.0	100.0
	changed	0	0.0	0.0	100.0
Total		**250**	**100.0**	**100.0**	

No effect on fertilizer application practice is indicated.

3.4.1.8 Irrigation practice

None of the farmers changed their irrigation practice of MON 810 compared to that of conventional maize (Table 46).

Table 46: Irrigation practice in MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	as usual	250	100.0	100.0	100.0
	changed	0	0.0	0.0	100.0
Total		**250**	**250**	**100.0**	

No effect on irrigation practice is indicated.

3.4.1.9 Harvest of MON 810

The farmers were asked whether they harvested MON 810 earlier or later than conventional maize or as usual. 246 of them (98.4 %) responded that they did not change the harvesting date for MON 810. Only a single farmer (0.4 %) stated that MON 810 was harvested *later* and 3 farmers (1.2 %) harvested *earlier* (Table 47, Figure 24). The complete individual feedback of the farmers for a changed harvesting time is given in Appendix A, Table A 6.

Table 47: Harvest of MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	earlier	1	0.4	0.4	0.4
	as usual	246	98.4	98.4	98.8
	later	3	1.2	1.2	100.0
Total		**250**	**100.0**	**100.0**	

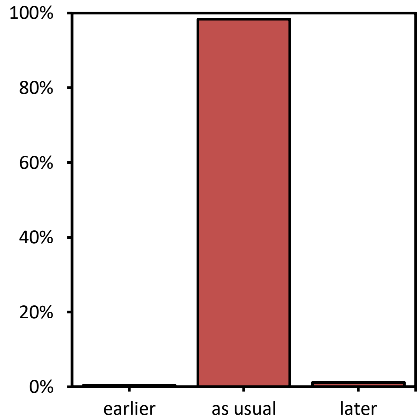

Figure 24: Harvest of MON 810 compared to conventional maize in 2018

(1) The valid percentage of $as\ usual$ harvest of MON 810 (98.4 %) is significantly greater than 90 %. The resulting p-value is less than the level of significance $\alpha = 0.01$ (Table 48). The null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 100%.

No effect on the harvest time is indicated.

Table 48: Test results as well as 99% confidence intervals for $p_{As\ usual}$, p_{Minus} and p_{Plus} probabilities of harvesting time in MON 810 compared to conventional maize in 2018

N valid	$As\ usual$	p-value for $p_{As\ usual} = 0.9$	$Minus$	p-value for $p_{Minus} = 0.1$	$Plus$	p-value for $p_{Plus} = 0.1$
250	246 (98.4%)	< 0.01				

$p_{As\ usual}$	lower 99 % confidence limit	upper 99 % confidence limit	p_{Minus}	lower 99 % confidence limit	upper 99 % confidence limit	p_{Plus}	lower 99 % confidence limit	upper 99 % confidence limit
98.4%	96.4%	100.4%	0.4%	0.0%	1.4%	1.2%	0.0%	3.0%

Assessment of differences in agricultural practice in MON 810 (compared to conventional maize)

Agricultural practices in MON 810 (compared to conventional maize) were not changed in terms of time of crop rotation, time of planting or harvest, tillage and planting techniques, weed control practice, fungal control practice, fertilizer application practice, irrigation practice and insect and corn borer control practice.

3.4.2 Characteristics of MON 810 in the field (compared to conventional maize)

3.4.2.1 Germination vigour

While 14 farmers (5.6 %) assessed the germination of MON 810 to be $more\ vigorous$, 94.0 % (235/250) found it to be $as\ usual$ and 1 farmer (0.4 %) found MON 810 to be $less\ vigorous$ (Table 49, Figure 25). Individual explanations for the observations of the farmers are given in Appendix A, Table A 7.

Table 49: Germination of MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less vigourous	1	0.4	0.4	0.4
	as usual	235	94.0	94.0	94.4
	more vigourous	14	5.6	5.6	100.0
Total		**250**	**100.0**	**100.0**	

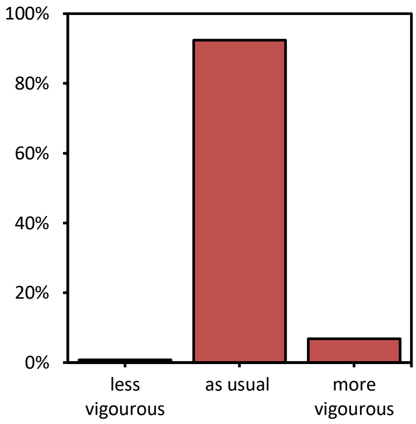

Figure 25: Harvest of MON 810 compared to conventional maize in 2018

(1) The valid percentage of $as\ usual$ germination vigor (94.0 %) is significantly greater than 90 %. The resulting p-value is less than the level of significance $\alpha = 0.01$ (Table 50). The null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 57%.

No effect on the germination vigor is indicated.

Table 50: Test results as well as 99% confidence intervals for $p_{As\ usual}$, p_{Minus} and p_{Plus} probabilities of germination vigour in MON 810 compared to conventional maize in 2018

N valid	$As\ usual$	p-value for $p_{As\ usual} = 0.9$	$Minus$	p-value for $p_{Minus} = 0.1$	$Plus$	p-value for $p_{Plus} = 0.1$
250	235 (94.0%)	< 0.01				

$p_{As\ usual}$	lower 99 % confidence limit	upper 99 % confidence limit	p_{Minus}	lower 99 % confidence limit	upper 99 % confidence limit	p_{Plus}	lower 99 % confidence limit	upper 99 % confidence limit
94.0%	90.1%	97.9%	0.4%	0.0%	1.4%	5.6%	1.9%	9.3%

3.4.2.2 Time to emergence

99.6 % (249/250) of the farmers found the time to emergence to be $as\ usual$, 0.4 % (1/250) assessed the time to emergence to be $delayed$ (Table 51, Figure 26). The individual explanation for this observation is given in Appendix A, Table A 7.

Table 51: Time to emergence of MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	accelerated	0	0.0	0.0	0.0
	as usual	249	99.6	99.6	99.6
	delayed	1	0.4	0.4	100.0
Total		**250**	**100.0**	**100.0**	

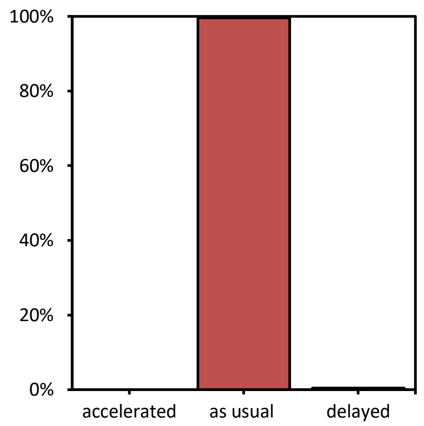

Figure 26: Time to emergence of MON 810 compared to conventional maize in 2018

(1) The valid percentage of $as\ usual$ time to emergence (99.6 %) is significantly greater than 90 %. The resulting p-value is less than the level of significance $\alpha = 0.01$ (Table 52). The null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 100%.

No effect on the time to emergence is indicated.

Table 52: Test results as well as 99% confidence intervals for $p_{As\ usual}$, p_{Minus} and p_{Plus} probabilities of time to emergence in MON 810 compared to conventional maize in 2018

N valid	$As\ usual$	p-value for $p_{As\ usual} = 0.9$	$Minus$	p-value for $p_{Minus} = 0.1$	$Plus$	p-value for $p_{Plus} = 0.1$
250	249 (99.6 %)	< 0.01				

$p_{As\ usual}$	lower 99 % confidence limit	upper 99 % confidence limit	p_{Minus}	lower 99 % confidence limit	upper 99 % confidence limit	p_{Plus}	lower 99 % confidence limit	upper 99 % confidence limit
99.6%	98.6%	100.6%	0.0%	0.0%	0.0%	0.4%	0.0%	1.4%

3.4.2.3 Time to male flowering

99.6% (249/250) of the farmers assessed the time to male flowering to be $as\ usual$, only 1 farmer (0.4 %) assessed the time to male flowering to be $delayed$ (Table 53, Figure 27). Individual explanations for these observations are given in Appendix A, Table A 7.

Table 53: Time to male flowering of MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	accelerated	0	0.0	0.0	0.0
	as usual	249	99.6	99.6	99.6
	delayed	1	0.4	0.4	100.0
Total		**250**	**100.0**	**100.0**	

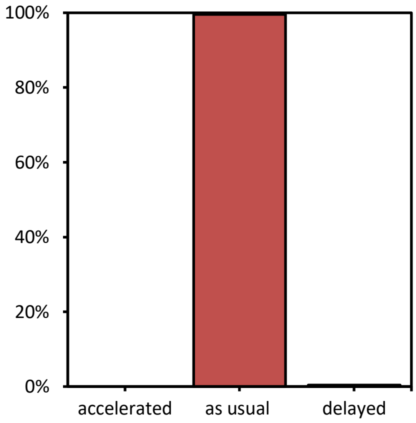

Figure 27: Time to male flowering of MON 810 compared to conventional maize in 2018

(1) The valid percentage of $as\ usual$ time to male flowering (99.6 %) is significantly greater than 90 %. The resulting p-value is less than the level of significance $\alpha = 0.01$ (Table 54). The null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 100%.

No effect on time to male flowering is indicated.

Table 54: Test results as well as 99% confidence intervals for $p_{As\ usual}$, p_{Minus} and p_{Plus} probabilities of time of male flowering in MON 810 compared to conventional maize in 2018

N valid	$As\ usual$	p-value for $p_{As\ usual} = 0.9$	$Minus$	p-value for $p_{Minus} = 0.1$	$Plus$	p-value for $p_{Plus} = 0.1$
250	249 (99.6 %)	< 0.01				

$p_{As\ usual}$	lower 99 % confidence limit	upper 99 % confidence limit	p_{Minus}	lower 99 % confidence limit	upper 99 % confidence limit	p_{Plus}	lower 99 % confidence limit	upper 99 % confidence limit
99.6%	98.6%	100.6%	0.0%	0.0%	0.0%	0.4%	0.0%	1.4%

3.4.2.4 Plant growth and development

Plant growth and development was assessed to be $delayed$ in 1.2 % (3/250), $accelerated$ in 1.2 % (3/250), and to be $as\ usual$ in 97.6 % (244/250) of all cases (Table 55, Figure 28). Individual explanations for these observations are given in Appendix A, Table A 7.

Table 55: Plant growth and development of MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	accelerated	3	1.2	1.2	1.2
	as usual	244	97.6	97.6	98.8
	delayed	3	1.2	1.2	100.0
Total		**250**	**100.0**	**100.0**	

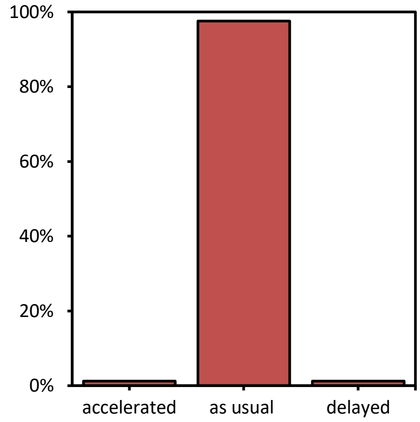

Figure 28: Plant growth and development of MON 810 compared to conventional maize in 2018

(1) The valid percentage of $as\ usual$ plant growth and development (97.6 %) is significantly greater than 90 %. The resulting p-value is less than the level of significance $\alpha = 0.01$ (Table 56). The null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 100%.

No effect on plant growth and development is indicated.

Table 56: Test results as well as 99% confidence intervals for $p_{As\ usual}$, p_{Minus} and p_{Plus} probabilities of plant growth and development in MON 810 compared to conventional maize in 2018

N valid	$As\ usual$	p-value for $p_{As\ usual} = 0.9$	$Minus$	p-value for $p_{Minus} = 0.1$	$Plus$	p-value for $p_{Plus} = 0.1$
250	244 (97.6%)	< 0.01				

$p_{As\ usual}$	lower 99 % confidence limit	upper 99 % confidence limit	p_{Minus}	lower 99 % confidence limit	upper 99 % confidence limit	p_{Plus}	lower 99 % confidence limit	upper 99 % confidence limit
97.6%	95.1%	100.1%	1.2%	0.0%	3.0%	1.2%	0.0%	3.0%

3.4.2.5 Incidence of stalk/root lodging

Incidence of stalk/root lodging was assessed to be $less$ in MON 810 compared to conventional maize in 24.0 % (60/250) of all cases and $as\ usual$ in 76.0 % (190/250) (Table 57, Figure 29). Individual explanations for these observations are given in Appendix A, Table A 7.

Table 57: Incidence of stalk/root lodging of MON 810 compared to conventional maize in 2018

		Frequency	**Percent**	**Valid percentages**	**Accumulated percentages**
Valid	less often	60	24.0	24.0	24.0
	as usual	190	76.0	76.0	100.0
	more often	0	0.0	0.0	100.0
Total		**250**	**100.0**	**100.0**	

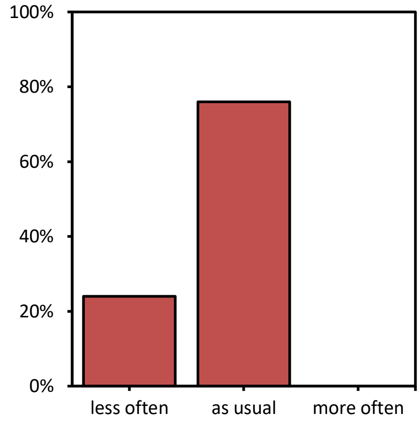

Figure 29: Incidence of stalk/root lodging of MON 810 compared to conventional maize in 2018

(1) The valid percentage of $as\ usual$ incidence of stalk/root lodging (76.0 %) is less than 90 %. The resulting p-value is larger than the level of significance $\alpha = 0.01$ (Table 58) and therefore, the corresponding null hypothesis $p_{as\ usual} \leq 0.9$ could not be rejected.

(2) The valid percentage of $less$ incidence of stalk/root lodging (24.0 %) exceeds the 10 % threshold. The resulting p-value is larger than the level of significance $\alpha = 0.01$ (Table 58) and therefore, the corresponding null hypothesis $p_{less\ often} \geq 0.1$ could not be rejected.

The valid percentage of $more$ incidence of stalk/root lodging (0.0 %) is significantly smaller than 10 %. The resulting p-value is smaller than the level of significance $\alpha = 0.01$ (Table 58). The null hypothesis $p_{more\ often} \geq 0.1$ is rejected with a power of 100%.

An effect on the incidence of stalk/root lodging of MON 810 is indicated.

Table 58: Test results as well as 99% confidence intervals for $p_{As\ usual}$, p_{Minus} and p_{Plus} probabilities of incidence of stalk/root lodging in MON 810 compared to conventional maize in 2018

N valid	$As\ usual$	p-value for $p_{As\ usual}$ = 0.9	$Minus$	p-value for p_{Minus} = 0.1	$Plus$	p-value for p_{Plus} = 0.1
250	190 (76.0%)	1.0	60 (24.0%)	1.0	0 (0.0%)	< 0.01

$p_{As\ usual}$	lower 99 % confidence limit	upper 99 % confidence limit	p_{Minus}	lower 99 % confidence limit	upper 99 % confidence limit	p_{Plus}	lower 99 % confidence limit	upper 99 % confidence limit
76.0%	69.0%	83.0%	24.0%	17.0%	31.0%	0.0%	0.0%	0.0%

3.4.2.6 Time to maturity

4.8 % (12/250) of the farmers assessed the time to maturity to be $delayed$ for MON 810 and $as\ usual$ in 95.2 % (238/250) (Table 59, Figure 30). Individual explanations for these observations are given in Appendix A, Table A 7.

Table 59: Time to maturity of MON 810 compared to conventional maize in 2018

		Frequency	**Percent**	**Valid percentages**	**Accumulated percentages**
Valid	accelerated	0	0.0	0.0	0.0

	as usual	238	95.2	95.2	95.2
	delayed	12	4.8	4.8	100.0
Total		**250**	**100.0**	**100.0**	

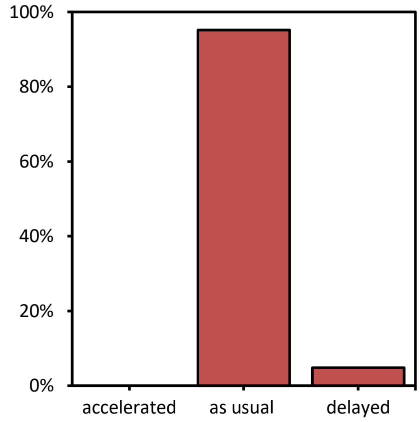

Figure 30: Time to maturity of MON 810 compared to conventional maize in 2018

(1) The valid percentage of $as\ usual$ time to maturity (95.2 %) is significantly greater than 90 %. The resulting p-value is less than the level of significance $\alpha = 0.01$ (Table 60). The null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 85%.

No effect on time to maturity is indicated.

Table 60: Test results as well as 99% confidence intervals for $p_{As\ usual}$, p_{Minus} and p_{Plus} probabilities of time to maturity in MON 810 compared to conventional maize in 2018

N valid	$As\ usual$	p-value for $p_{As\ usual}$ = 0.9	$Minus$	p-value for p_{Minus} = 0.1	$Plus$	p-value for p_{Plus} = 0.1
250	238 (95.2%)	< 0.01				

$p_{As\ usual}$	lower 99 % confidence limit	upper 99 % confidence limit	p_{Minus}	lower 99 % confidence limit	upper 99 % confidence limit	p_{Plus}	lower 99 % confidence limit	upper 99 % confidence limit
95.2%	91.7%	98.7%	0.0%	0.0%	0.0%	4.8%	1.3%	8.3%

3.4.2.7 Yield

Yield was $higher$ in 27.6 % (69/250) of all cases and $lower$ in 1 case (0.4 %) (Table 61, Figure 31). Individual explanations for these observations are given in Appendix A, Table A 7.

Table 61: Yield of MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	lower yield	1	0.4	0.4	0.4
	as usual	180	72.0	72.0	72.4
	higher yield	69	27.6	27.6	100.0
Total		**250**	**100.0**	**100.0**	

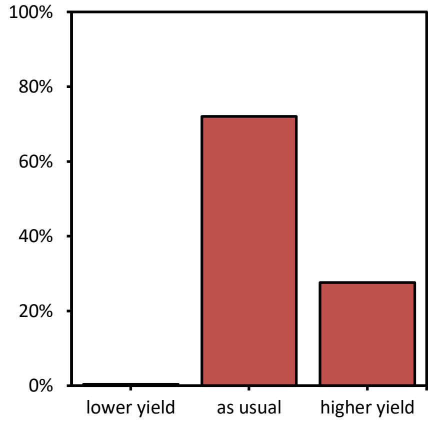

Figure 31: Yield of MON 810 compared to conventional maize in 2018

(1) The valid percentage of $as\ usual$ yield (72.0 %) is smaller than 90 %. The resulting p-value is larger than the level of significance $\alpha = 0.01$ (Table 62) and therefore, the corresponding null hypothesis $p_{as\ usual} \leq 0.9$ could not be rejected.

(2) The valid percentage of $lower$ yield (0.4 %) is significantly smaller than 10 %. The resulting p-value is smaller than the level of significance $\alpha = 0.01$ (Table 62). The null hypothesis $p_{lower\ yield} \geq 0.1$ is rejected with a power of 100%.

The valid percentage of $higher$ yield (27.6 %) exceeds the 10 % threshold. The resulting p-value is greater than the level of significance $\alpha = 0.01$ (Table 62) and therefore, the corresponding null hypothesis $p_{higher\ yield} \geq 0.1$ could not be rejected.

An effect on yield of MON 810 is indicated.

Table 62: Test results as well as 99% confidence intervals for $p_{As\ usual}$, p_{Minus} and p_{Plus} probabilities of yield in MON 810 compared to conventional maize in 2018

N valid	$As\ usual$	p-value for $p_{As\ usual}$ = 0.9	$Minus$	p-value for p_{Minus} = 0.1	$Plus$	p-value for p_{Plus} = 0.1
250	180 (72.0%)	1.0	1 (0.4%)	< 0.01	69 (27.6%)	1.0

$p_{As\ usual}$	lower 99 % confidence limit	upper 99 % confidence limit	p_{Minus}	lower 99 % confidence limit	upper 99 % confidence limit	p_{Plus}	lower 99 % confidence limit	upper 99 % confidence limit
72.0%	64.7%	79.3%	0.4%	0.0%	1.4%	27.6%	20.3%	34.9%

3.4.2.8 Occurrence of volunteers

The occurrence of volunteers was assessed to be $less$ frequent for MON 810 than for conventional maize in 5.2 % (13/250) and $as\ usual$ in 94.8 % (237/250) of all cases (Table 63, Figure 32). Individual explanations for these observations are given in Appendix A, Table A 7.

Table 63: Occurrence of MON 810 volunteers compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less often	13	5.2	5.2	5.2
	as usual	237	94.8	94.8	100.0
	more often	0	0.0	0.0	100.0
Total		**250**	**100.0**	**100.0**	

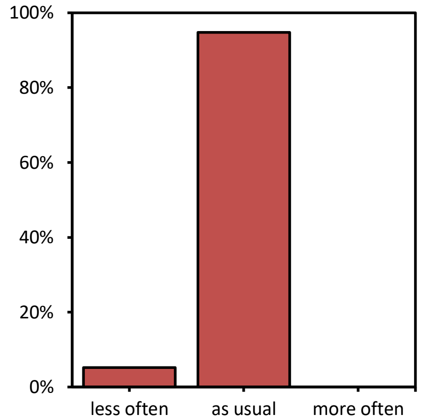

Figure 32: Occurrence of MON 810 volunteers compared to conventional maize in 2018

(1) The valid percentage of $as\ usual$ occurrence of volunteers (94.8 %) is significantly greater than 90 %. The resulting p-value is smaller than the level of significance $\alpha = 0.01$ (Table 64). The null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 77%.

No effect on occurrence of MON 810 volunteers is indicated.

Table 64: Test results as well as 99% confidence intervals for $p_{As\ usual}$, p_{Minus} and p_{Plus} probabilities of occurrence of volunteers in MON 810 compared to conventional maize in 2018

N valid	$As\ usual$	p-value for $p_{As\ usual}$ = 0.9	$Minus$	p-value for p_{Minus} = 0.1	$Plus$	p-value for p_{Plus} = 0.1
250	237 (94.8 %)	<0.01				

$p_{As\ usual}$	lower 99 % confidence limit	upper 99 % confidence limit	p_{Minus}	lower 99 % confidence limit	upper 99 % confidence limit	p_{Plus}	lower 99 % confidence limit	upper 99 % confidence limit
94.8%	91.2%	98.4%	5.2%	1.6%	8.8%	0.0%	0.0%	0.0%

<u>Assessment of differences in the characteristics of MON 810 in the field (compared to conventional maize)</u>

The results for the characteristics of MON 810 in the field compared to conventional maize can be summarized as follows

- an unchanged germination,
- an unchanged time to emergence,
- an unchanged time to male flowering,
- an unchanged plant growth and development,
- a less frequent incidence of stalk/root lodging,
- a unchanged time to maturity,

- a higher yield and
- an unchanged occurrence rate of volunteers.

These results underline the substantial equivalence of MON 810 to comparable conventional lines, as evidenced by genomic and proteomic analyses [Coll, 2008]; [Coll, 2009]; [Coll, 2010]; [Coll, 2011].

Corn borer damage affects especially yield negatively, therefore the differences in yield characters can be explained by the absence of corn borer damage. The difference in the incidence of stalk/root lodging can be explained similarly. Therefore, differences in these parameters are anticipated and only underline the effectiveness of corn borer control.

All additional observations during plant growth are listed in Appendix A, Table A 8.

3.4.3 Disease susceptibility in MON 810 fields (compared to conventional maize)

Farmers assessed MON 810 to be $less\ susceptible$ to diseases in 0.8 % (2/250) of the time (Table 65, Figure 33).

Table 65: Disease susceptibility in MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less susceptible	2	0.8	0.8	0.8
	as usual	248	99.2	99.2	100.0
	more susceptible	0	0.0	0.0	100.0
Total		**250**	**100.0**	**100.0**	

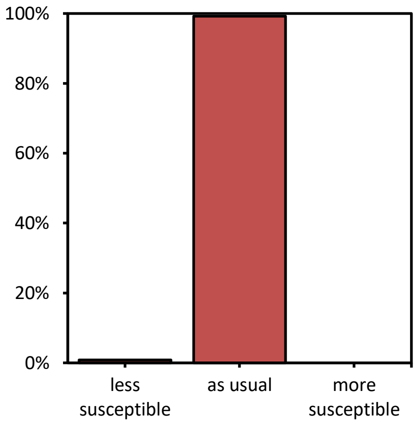

Figure 33: Disease susceptibility of MON 810 compared to conventional maize in 2018

(1) The valid percentage of $as\ usual$ disease susceptibility (99.2 %) is greater than 90 %. The resulting p-value is greater than the level of significance $\alpha = 0.01$ (Table 66) The null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 100%.

No effect on disease susceptibility is indicated.

Table 66: Test results as well as 99% confidence intervals for $p_{As\ usual}$, p_{Minus} and p_{Plus} probabilities of disease susceptibility in MON 810 compared to conventional maize in 2018

N valid	$As\ usual$	p-value for $p_{As\ usual} = 0.9$	$Minus$	p-value for $p_{Minus} = 0.1$	$Plus$	p-value for $p_{Plus} = 0.1$
250	248 (99.2%)	< 0.01				

$p_{As\ usual}$	lower 99 % confidence limit	upper 99 % confidence limit	p_{Minus}	lower 99 % confidence limit	upper 99 % confidence limit	p_{Plus}	lower 99 % confidence limit	upper 99 % confidence limit
99.2%	97.7%	100.7%	0.8%	0.0%	2.3%	0.0%	0.0%	0.0%

The 2 farmers that answered different from $as\ usual$ were asked to specify the difference in disease susceptibility by listing the diseases with an explanation. Table 67 lists the reported diseases with an assessment of the disease susceptibility of MON 810 compared to conventional maize. This list shows that the different susceptibility was attributed to a lower susceptibility to *Fusariosis* (0.8 %, 2/250), *Hongos generos fusarium* 0.8 %, 2/250*), Ustilago maydis* (0.4 %, 1/250) and *Sphacelotheca reiliana* *(*0.4 %, 1/250).

Table 67: Specification of differences in disease susceptibility in MON 810 compared to conventional maize in 2018

Group	Species	More	Less
Fungus	*Fusariosis*	0	2
	Hongos generos fusarium	0	2
	Ustilago maydis	0	1
	Sphacelotheca reiliana	0	1

Additional comments on disease susceptibility are given in Appendix A, Table A 9.

Assessment of differences in disease susceptibility in MON 810 fields (compared to conventional maize)

The 2 farmers reported less disease susceptibility to some fungal species, specified as *Fusariosis*, *Hongos generos fusarium, Ustilago maydis* and *Sphacelotheca reiliana.*

The finding of supposedly less disease susceptible MON 810 varieties is not surprising, as it has been well established that feeding holes and tunnels of the corn borer serve as entry points for secondary fungal infections, especially for *Fusarium* spp. *Ustilago maydis* also has a high incidence especially with stressed plants (water stress, mechanical wounding, insect feeding damage), so that any reduction of a stress factor would immediately result in a lower incidence of disease. Therefore, the observed differences can be explained by corn borer control and confirm previous observations of lower fungal infections in MON 810 reported in the scientific literature [Munkvold, 1999]; [Dowd, 2000]; [Bakan, 2002]; [Hammond, 2003]; [Wu, 2006]. The farmers' comments (Appendix A, Table A 9) corroborate the findings from above.

3.4.4 Insect pest control in MON 810 fields (compared to conventional maize)

The insect pest control of *O. nubilalis* (European corn borer) was assessed to be *very good* or *good* in 100.0 % (250/250) of the cases (Table 68, Figure 34).

Table 68: Insect pest control of *O. nubilalis* in MON 810 in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	weak	0	0.0	0.0	0.0
	good	16	6.4	6.4	6.4
	very good	234	93.6	93.6	100.0
Total		**250**	**100.0**	**100.0**	

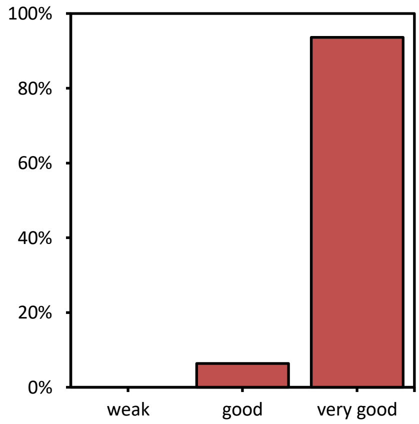

Figure 34: Insect pest control of *Ostrinia nubilalis* in MON 810 in 2018

100.0 % (249/249) of the farmers who gave a valid answer attested a *good* or *very good* control of *Sesamia* spp. (Pink Borer) (Table 69, Figure 35).

Table 69: Insect pest control of *Sesamia* spp. in MON 810 in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	weak	0	0.0	0.0	0.0
	good	16	6.4	6.4	6.4
	very good	233	93.2	93.6	100.0
	Total	**249**	**99.6**	**100.0**	
Missing	No statement	1	0.4		
Total		**250**	**100.0**		

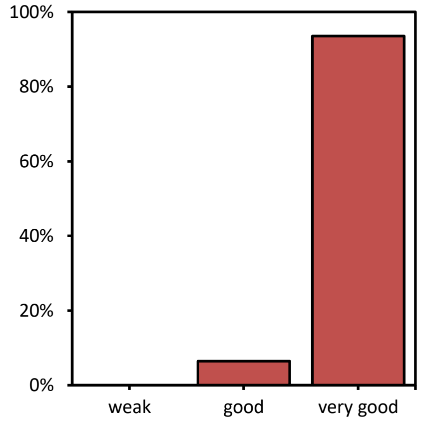

Figure 35: Insect pest control of *Sesa mia* spp. in MON 810 in 2018

Additional comments on insect pest control are listed in Appendix A, Table A 10.

<u>Assessment of insect pest control in MON 810 fields (compared to conventional maize)</u>

The results show that both pests (*Ostrinia nubilalis* and *Sesamia* spp.) are effectively controlled by MON 810.

3.4.5 Other pests (other than *Ostrinia nubilalis* and *Sesamia* spp.) in MON 810 fields (compared to conventional maize)

Farmers assessed MON 810 to be less susceptible to pests in 5.2 % (13/250) of all cases (Table 70, Figure 36).

Table 70: Pest susceptibility of MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less susceptible	13	5.2	5.2	5.2
	as usual	237	94.8	94.8	100.0
	more susceptible	0	0.0	0.0	100.0
Total		**250**	**100.0**	**100.0**	

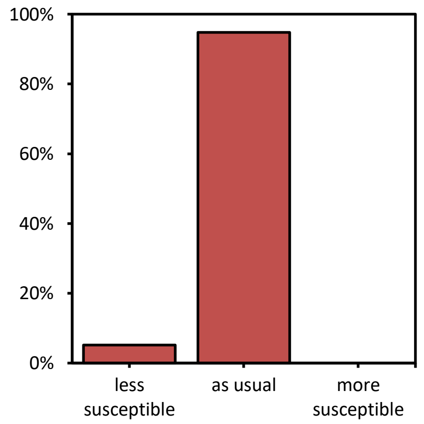

Figure 36: Pest susceptibility of MON 810 compared to conventional maize in 2018

(1) The valid percentage of $as\ usual$ susceptibility to other pests (94.8 %) is significantly greater than 90 %. The resulting p-value is smaller than the level of significance $\alpha = 0.01$ (Table 71). The null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 77%.

No effect on susceptibility to other pests is indicated.

Table 71: Test results as well as 99% confidence intervals for $p_{As\ usual}$, p_{Minus} and p_{Plus} probabilities of pest susceptibility in MON 810 compared to conventional maize in 2018

N valid	$As\ usual$	p-value for $p_{As\ usual} = 0.9$	$Minus$	p-value for $p_{Minus} = 0.1$	$Plus$	p-value for $p_{Plus} = 0.1$
250	237 (94.8%)	< 0.01				

$p_{As\ usual}$	lower 99 % confidence limit	upper 99 % confidence limit	p_{Minus}	lower 99 % confidence limit	upper 99 % confidence limit	p_{Plus}	lower 99 % confidence limit	upper 99 % confidence limit
94.8%	91.2%	98.4%	5.2%	1.6%	8.8%	0.0%	0.0%	0.0%

The 13 farmers that answered different from *as usual* were asked to specify the observed difference in pest susceptibility by listing respective pests with an explanation. Table 72 lists the reported pests with an assessment of the pest susceptibility of MON 810, compared to conventional maize. This list shows that the lower pest susceptibility was predominantly attributed to a lower susceptibility to pests of the order Lepidoptera.

Table 72: Specification of differences in pest susceptibility in MON 810 compared to conventional maize in 2018

Order	Name	N valid	*As usual*	*P* for $p_0 = 0.9$	*Minus*	*P* for $p_0 = 0.1$	*Plus*	*P* for $p_0 = 0.1$
Lepidoptera	Agrotis Ipsilon	250	239 (95.6%)	< 0.01	11 (4.4%)	< 0.01		
	Spodoptera Frugiperda	250	240 (96.0%)	< 0.01	10 (4.0%)	< 0.01		
	Heliothis	250	249 (99.6%)	< 0.01	1 (0.4%)	< 0.01		
	Mythimna spp. (Mitima)	250	249 (99.6%)	< 0.01	1 (0.4%)	< 0.01		
Coleoptera	Diabrotica / Agriotes	250	248 (99.2%)	< 0.01	2 (0.8%)	< 0.01		

What becomes clear in Table 72 is that for all listed pests

(1) the valid percentages of $as\ usual$ pest susceptibility in MON 810 compared to conventional maize in 2018 are greater than 90 %. The resulting p-values are smaller than the level of significance $\alpha = 0.01$. The null hypotheses $p_{as\ usual} \leq 0.9$ could be rejected with a power of 91 %, 95 %, 100 %, 100 %, and 100 % for *Agrotis ipsilon, Spodoptera frugiperda, Heliothis, Mythimna spp. (Mitima),* and Diabrotica / Agriotes, respectively.

No effect of those pests is indicated.

Additional comments on other pest (other than *Ostrinia nubilalis* and *Sesamia* spp.) are given in Appendix A, Table A 11.

<u>Assessment of differences in susceptibility to other pests in MON 810 fields (compared to conventional maize)</u>

The data suggests that the susceptibility to other pests in MON 810 is slightly reduced.

The reduced susceptibility of MON 810 to Lepidoptera is not surprising, given the numerous scientific studies of laboratory and field experiments showing that the Cry protein expressed in MON 810 does not have a negative effect on any insects other than those belonging to the order for which it specifically has toxic properties [Marvier, 2007]; [Wolfenbarger, 2008]. The monitoring data thus corroborate the conclusions drawn during the environmental risk assessment and ongoing research.

3.4.6 Weed pressure in MON 810 fields (compared to conventional maize)

All farmers (250/250) found the weed pressure to be *as usual* in MON 810 fields compared to conventional fields (Table 73).

Table 73: Weed pressure in MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less weeds	0	0.0	0.0	0.0
	as usual	250	100.0	100.0	100.0
	more weeds	0	0.0	0.0	100.0
Total		**250**	**100.0**	**100.0**	

No effect on weed pressure is indicated.

The farmers were asked to name the three most abundant weeds in their MON 810 fields. Weeds that were listed more than 25 times are:

- *Sorghum halepense*
- *Abutilon theophrasti*
- *Amaranthus retroflexus*
- *Chenopodium album*
- *Datura stramonium*
- *Xanthium strumarium*
- *Echinochloa spp.*

All named weeds and the corresponding frequencies of nomination are listed in Appendix A,Table A 12.

Assessment of differences in weed pressure in MON 810 fields (compared to conventional maize)

It is not surprising that the weed pressure in MON 810 fields has been described as similar to that in conventional maize. In accordance with the observations described in Section 3.4.1, no changes in weed control practices were reported in MON 810 fields compared to conventional maize fields.

3.4.7 Occurrence of wildlife in MON 810 fields (compared to conventional maize)

3.4.7.1 Occurrence of non target insects

All farmers (250/250) assessed the occurrence of non target insects in MON 810 fields to be *as usual* (Table 74).

Table 74: Occurrence of non target insects in MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less	0	0.0	0.0	0.0
	as usual	250	100.0	100.0	100.0
	more	0	0.0	0.0	100.0
Total		**250**	**100.0**	**100.0**	

No effect on the occurrence of non target insects is indicated.

3.4.7.2 Occurrence of birds

All farmers (250/250) assessed the occurrence of non target birds in MON 810 fields to be *as usual* (Table 75).

Table 75: Occurrence of birds in MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less	0	0.0	0.0	0.0
	as usual	250	100.0	100.0	100.0
	more	0	0.0	0.0	100.0
Total		**250**	**100.0**	**100.0**	

No effect on the occurrence of birds is indicated.

3.4.7.3 Occurrence of mammals

All farmers (250/250) assessed the occurrence of non target mammals in MON 810 fields to be *as usual* (Table 76). Three farmers (all from Portugal) gave additional comments on a strong presence of wild boars in both MON 810 and conventional maize fields.

Table 76: Occurrence of mammals in MON 810 compared to conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less	0	0.0	0.0	0.0
	as usual	250	100.0	100.0	100.0
	more	0	0.0	0.0	100.0
Total		**250**	**100.0**	**100.0**	

No effect on the occurrence of mammals is indicated.

Assessment of differences in occurrence of wildlife in MON 810 fields (compared to conventional maize)

The occurrence of wildlife in MON 810 is reported to be unchanged for non target insects, birds and mammals. None of the farmers stated that they found a changed number of wildlife animals.

These results again underline the specificity of the expressed Cry protein towards Lepidoptera, exhibiting no effect on other wildlife, especially non target insects. MON 810 thus is substantially equivalent to conventional maize and hosts the same wildlife. Birds are dependent on insects and wild plants in the agricultural landscape, and are a good indicator for larger scale level effects. The same holds true for mammals, although their occurrence in maize fields is limited. Studies have shown that no impact on mammals caused by the consumption of MON 810 is to be expected [Shimada, 2003]; [Shimada, 2006a]; [Shimada, 2006b]; [Stumpff, 2007]; [Bondzio, 2008].

3.4.8 Feed use of MON 810 (if previous year experience with MON 810)

2.0 % (5/250) of the farmers used the harvest of MON 810 to feed their animals (Table 77, Figure 37). These data reflect only the range of feeding; it is assumed that only farmers that cultivate silage maize feed them to their livestock. That could explain why only 2.0 % of the surveyed farmers fed MON 810, however, there are no strong data supporting this assumption.

Table 77: Use of MON 810 harvest for animal feed in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	yes	5	2.0	2.0	2.0
	no	245	98.0	98.0	100.0
Total		**250**	**100.0**	**100.0**	

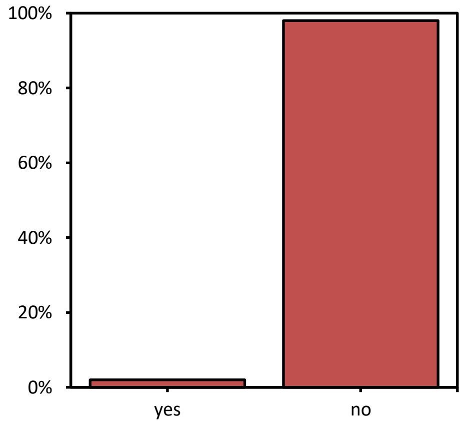

Figure 37: Use of MON 810 harvest for animal feed in 2018

Out of the 5 farmers who did feed the harvest of MON 810 to their animals, 100.0 % (5/5) found the performance of their animals to be *as usual* when compared to animals fed with conventional maize (Table 78).

Table 78: Performance of animals fed MON 810 compared to animals fed conventional maize in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	as usual	5	100.0	100.0	100.0
	changed	0	0.0	0.0	100.0
Total		**5**	**100.0**	**100.0**	

No effect on the performance of animals fed with MON 810 is indicated.

Assessment of differences in feed use of MON 810 (if previous year experience with MON 810)

No farmer found a difference in performance of animals fed with MON 810.

3.4.9 Any additional remarks or observations

In the 2018 season no farmer made a comment on additional remarks or observations, *i.e.* no unexpected (adverse) effects are reported.

3.5 Part 4: Implementation of *Bt* maize specific measures

3.5.1 Information on good agricultural practices on MON 810

100 % (250/250) of the farmers reported to have been informed about the good agricultural practices applicable to MON 810 (Table 79).

97.6 % (244/250) of the farmers considered the training sessions to be either $useful$ or $very\ useful$ (Table 80 and Figure 38). This information indicates that the great majority of the farmers had been exposed to a valuable training concerning MON 810.

Table 79: Information on good agricultural practices in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	yes	250	100.0	100.0	100.0
	no	0	0.0	0.0	100.0
Total		**250**	**100.0**	**100.0**	

Table 80: Evaluation of training sessions in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	very useful	62	24.8	24.8	24.8
	useful	182	72.8	72.8	97.6
	not useful	6	2.4	2.4	100.0
Total		**250**	**100.0**	**100.0**	

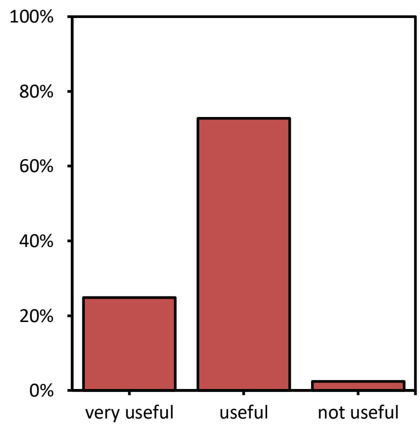

Figure 38: Evaluation of training sessions in 2018

3.5.2 Seed

The question "was the bag labeled with accompanying documentation indicating that the product is genetically modified maize MON 810" was answered with yes in 100 % (250/250) of the cases. This indicated that the bags were labeled appropriately and that the label and the accompanying documentation were clear to the farmers.

The great majority of the farmers (91.2 %) reported that they are following the label recommendations on the seed bags (Table 81 and Figure 39). 21 farmers (8.4 %) admitted that they did not follow the label recommendations. All of these farmers explained that they did not plant a refugee. Deviations from the label recommendations are listed in Appendix A, Table A 13.

Table 81: Compliance with label recommendations in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	yes	228	91.2	91.6	91.6
	no	21	8.4	8.4	100.0
	Total	**249**	**99.6**	**100.0**	
Missing	no statement	1	0.4		
Total		**250**	**100.0**		

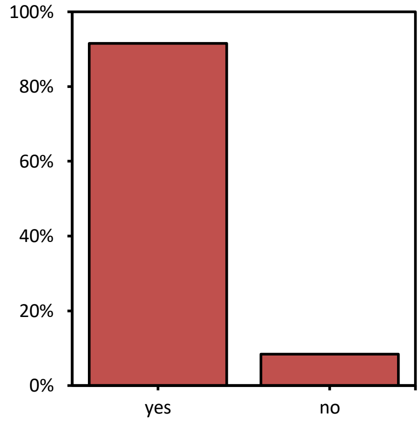

Figure 39: Compliance with label recommendations in 2018

3.5.3 Prevention of insect resistance

79.2 % (198/250) of the farmers did plant a refuge within their farms (Table 82, Figure 40). Additionally, 12.0 % (30/250) of the farmers did not plant a refuge because they had less than 5 ha of MON 810 maize planted on their farm (the Insect Resistance Management Plan states that no refuge is required if less than 5 hectares of *Bt* maize are planted). 8.8 % (22/250) of the farmers reported that they did not plant a refuge although having more than 5 ha of maize planted on their farm.

Table 82: Planting of a refuge in 2018

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	yes	198	79.2	79.2	79.2
	no, because the surface of Bt maize is < 5 ha	30	12.0	12.0	91.2
	no	22	8.8	8.8	100.0
Total		**250**	**100.0**	**100.0**	

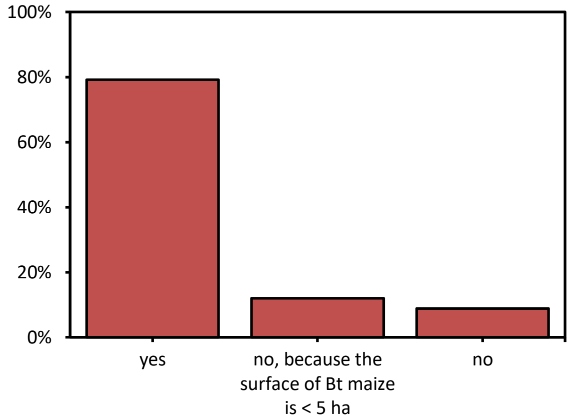

Figure 40: Planting of a refuge in 2018

Therefore, 91.2 % (228/250) of the farmers followed the label recommendations.

All cases of not planting a refuge because of a *Bt* maize planted area < 5 ha occurred in Spain (Table 83).

Table 83: Refuge implementation per country in 2018

		Refuge implementation			
	Country	**Yes**	**No, because the area of *Bt* maize is < 5 ha**	**No**	**Total**
Valid	Spain	186	30	22	238
	Portugal	12	0	0	12
Total		**198**	**30**	**22**	**250**

As a result of the continuous and intensive training of farmers with regards to implementing a refuge, the overall compliance is again high this year. In Spain 9.2% (22/238) of the farmers who were required to did not plant a refuge, for which two main reasons were given. The first reason was that the farmers felt it complicates the planting and/or they did not have enough time (14/21, 63.3 %), while the second reason was that they feared the yield losses in conventional maize (6/21, 28.6 %). All individual reasons for not planting a refuge are listed in Appendix A, Table A 14.

The locations of the *Bt*-maize fields and total number of farmers where no refuges were planted were as follows: Lerida (10 farmers), Caceres (5 farmers), Huesca (5 farmers), Badajoz (1 farmer), and Sevilla (1 farmer). Further information cannot be provided due to personal data protection obligations (privacy regulations).

4 Conclusions

The analysis of 250 questionnaires from a survey of farmers cultivating MON 810 in 2018 in the two MON 810 cultivating European countries, Spain and Portgal, did not reveal unexpected adverse effects that could be associated with maize hybrids containing the genetic modification in MON 810. The sample size was proven to be large enough to significantly reject the hypotheses on adverse effects under the specific 2018 conditions.

The statistically significant effects reported in Part 3 were neither unexpected nor adverse. The corresponding observations correlate to the intended insect protection trait present in MON 810.

This set of data is entered in a database, and complements data collected from the 2006 to 2018 growing seasons. Currently, the database contains data of 3377 valid questionnaires. As shown in Table 84 and Table 85 the frequency patterns of farmers' answers in 2018 are similar to those of the previous years in the sense that no new effects have been observed. Instead, it can be noted that the number of results significantly different from $as\ usual$ decreased, so that in 2018 only two significant effects were found, whereas in the last years there have usually been more than five. Further notice, however, that the frequencies in Table 84 and Table 85 had been going down continuously over the last years, so that this is not an unexpected outcome.

After thirteen years of farmer questionnaires, no unexpected (adverse) effects have been indicated. Compared to the cultivation practices in conventional maize, farmers use nearly the same practices for cultivating MON 810. The abscence of damage caused by corn borers on the MON 810 plants renders the plants healthier and provides related benefits to the farmers.

In contrast to the data of the monitoring characters, the data of the influencing factors differ between the years.

Table 84: Overview on the frequency of $Minus$[4] answers of the monitoring characters in 2006 - 2018 in percent [%].
Grey-colored boxes mark cases where Hypothesis (2a) $H_0: p_{Minus} \geq 0.1$ could not be rejected.

Monitoring character[1]	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Time of planting	1.6	3.4	2.7	2.9	1.8	1.2	0.0	0.0	0.4	0.4	0.8	0.0	0.4
Time of harvest	2.4	3.8	3.4	2.1	2.2	0.4	0.0	0.0	0.4	0.0	0.0	0.0	0.4
Germination vigor	6.0	4.1	1.7	0.8	0.0	0.0	0.4	0.8	0.0	0.0	0.4	0.8	0.4
Time to emergence	6.9	3.1	6.4	5.4	4.1	0.8	0.8	0.0	0.0	0.4	4.0	0.0	0.0
Time to male flowering	0.4	1.7	4.7	2.1	3.7	0.0	0.8	0.8	0.0	0.0	0.8	0.0	0.0
Plant growth and development	6.5	6.9	9.8	5.9	7.0	0.8	1.6	1.2	0.0	1.1	2.0	0.4	1.2
Incidence of stalk / root lodging	58.9	36.2	38.6	31.9	35.1	24.5	28.1	17.2	26.8	27.2	33.2	20.8	24.0
Time to maturity	2.0	4.8	4.3	2.9	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yield	2.4	3.9	4.4	1.7	1.8	0.0	2.4	2.0	1.5	0.0	0.4	0.4	0.4
Occurrence of volunteers	33.9	8.4	11.1	10.8	8.2	6.9	4.2	4.0	1.1	3.8	11.6	5.2	5.2
Disease susceptibility	36.1	21.7	34.7	29.3	25.6	19.7	17.3	12.5	5.4	4.2	6.8	2.4	0.8
Pest susceptibility	11.1	5.9	18.5	17.2	18.6	17.7	21.3	18.0	16.1	21.8	12.8	8.4	5.2
Weed pressure	0.4	2.1	1.7	2.1	4.8	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.0
Occurrence of wildlife[3]	2.9	6.1	7.7	-	-	-	-	-	-	-		-	-
Occurrence of insects[2]	-	-	-	0.9	0.8	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Occurrence of birds[2]	-	-	-	0.4	1.2	0.4	0.0	0.0	0.4	0.0	0.4	0.0	0.0
Occurrence of mammals[2]	-	-	-	0.9	1.1	0.4	0.4	0.4	0.4	0.0	0.4	0.0	0.0

[1] Monitoring characters and their categories are defined in section 2.2.
[2] These characters are surveyed since the 2009 season.
[3] This character is surveyed since the 2008 season.
[4] The question on wildlife was asked until 2008. In 2009 it was split into three questions (non target insects, birds, mammals).

Table 85: Overview on the frequency of $Plus^5$ answers of the monitoring characters in 2006 - 2018 in percent [%]. Grey-colored boxes mark cases where Hypothesis (2b) $H_0: p_{Plus} \geq 0.1$ could not be rejected.

Monitoring Character[1]	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Crop rotation[2]	-	-	-	0.8	1.8	0.8	4.4	5.9	3.8	6.5	1.6	1.6	0.8
Time of planting	6.0	3.8	2.7	1.3	4.1	1.6	3.6	5.1	4.2	6.5	1.6	1.6	1.6
Tillage and planting technique	0.0	0.7	0.0	0.4	0.4	0.0	2.0	2.0	3.1	3.5	1.2	0.4	0.0
Insect control practices	48.0	11.9	22.2	18.3	16.2	24.9	17.3	16.4	16.5	14.6	7.6	6.0	2.4
Corn borer control practice[3]	-	-	9.8	22.9	15.5	22.9	18.1	16.0	16.1	14.2	7.2	6.0	0.4
Weed control practices	0.4	0.3	0.3	0.0	0.4	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0
Fungal control practices	0.0	1.1	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4
Fertilizer Application	0.8	0.3	0.0	0.4	0.4	0.0	0.0	2.3	0.4	0.0	0.0	0.0	0.0
Irrigation Practices	1.6	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0
Time of harvest	24.1	18.6	13.8	7.9	6.6	4.4	4.0	5.1	4.6	4.2	2.0	0.8	1.2
Germination vigor	8.0	6.9	11.4	14.6	16.2	5.6	5.6	7.4	11.9	13.0	8.4	6.8	5.6
Time to emergence	5.6	3.8	2.0	0.8	0.4	0.0	0.4	0.4	0.0	0.0	0.8	0.4	0.4
Time to male flowering	1.6	7.7	3.7	1.7	2.6	2.0	1.2	0.4	0.4	0.0	0.0	0.4	0.4
Plant growth and development	1.6	4.8	2.7	2.1	3.7	0.8	2.0	0.8	0.0	0.4	0.4	1.6	1.2
Incidence of stalk / root lodging	1.6	0.3	0.3	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to maturity	30.9	25.9	24.0	14.6	16.2	12.9	16.1	12.5	11.5	6.1	14.8	10.8	4.8
Yield	68.7	44.8	52.7	56.9	49.8	43.4	43.0	34.8	36.0	50.6	46.8	38.4	27.6
Occurrence of volunteers	0.0	1.7	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0
Disease susceptibility	2.0	1.0	0.7	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pest susceptibility	1.2	1.4	0.7	1.3	0.0	0.0	0.4	0.4	0.4	0.0	0.0	0.0	0.0
Weed pressure	0.0	0.3	0.3	0.0	0.4	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0
Occurrence of wildlife[4]	2.1	2.9	2.4	-	-	-	-	-	-	-	-	-	-
Occurrence of insects[2]	-	-	-	0.9	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Occurrence of birds[2]	-	-	-	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Occurrence of mammals[2]	-	-	-	1.3	1.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Performance of animals	0.0	6.7	4.9	8.9	12.3	10.5	10.3	7.7	0.0	0.0	0.0	12.5	0.0

[1] Monitoring characters and their categories are defined in section 2.2.[2] These characters are surveyed since the 2009 season.
[3] This character is surveyed since the 2008 season.
[4] The question on wildlife was asked until 2008. In 2009 it was split into three questions (non target insects, birds, mammals).

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List of abbreviations

GM	genetically modified
GMO	genetically modified organism
GMP	genetically modified plant

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6 Annex A Tables of free entries

Table A 1: Specifications for *changed* crop rotation before planting MON 810 (Section 3.4.1.1)

Country	Quest. Nr.	Crop rotation	Comments
Spain	5271	changed	I plant YieldGard after peas and I plant conventional after maize
Spain	5286		I plant YieldGard after ryegrass and I plant conventional after barley

Table A 2: Specifications for different time of planting of MON 810 (Section 3.4.1.2)

Country	Quest. Nr.	Time of planting	Comments aggregate	Comments
Spain	5363	earlier	-	I plant long cycle YieldGard and short cycle conventional
Spain	5152	later	short cycle	Short cycle variety
Spain	5153			I plant short cycle YieldGard, the conventional is long cycle
Spain	5271			I plant YieldGard after conventional because it is short cycle
Spain	5286			I plant YieldGard after conventional because its cycle is shorter

Table A 3: Insecticides applied in MON 810 (Section 3.4.1.4) differentiated by their use

Active Ingredient	Insecticide as cited by the Farmer	Spain	Portugal	Total
Seed Treatment				
Thiacloprid	Sondio	214	12	226
Sprayed				
Abamectin	Apache, Bersite, Boreal	39	0	39
Alpha-Cypermethrin	Cibelte 10 LE, Daskor 440	2	0	2
Chlorantraniliprole	Coragen 20 SC	3	0	3
Chlorpyrifos	Clorpirifos 48, Choke	4	0	4
Deltamethrin	Delta Plus, Combo, Deltagri, Deltaplan	4	0	4
Lambda-cyhalothrin	Atrapa, Karate Zeon	11	11	22
Granulated				
Chlorpyrifos	Chas 5 G, Clorifos 5 G, Cloripirifos 5 G, Insect 5 G, Piritec 5 G, Pison	41	0	41
Lambda-cyhalothrin	TRIKA Lambda 1	5	0	5

Table A 4: Explanations for *different* insect and corn borer control practice in MON 810 (Section 3.4.1.4)

Country	**Quest. Nr.**	**Insecticides in conv. maize**	**Insect control practice in MON 810**	**Explanation of differences in insect control practice**
Spain	5286	yes	different	I treat the conventional with Coragen 20 SC against ECB, in YieldGard is not necessary because YieldGard is resistant to ECB
Portugal	5128			The agricultural producer didn´t make any treatments in the Yieldgard maize for the control of maize borer.
Portugal	5129			The YG plant is protect for the maize borer. No trts in the YG maize for the control of maize borer.
Portugal	5135			The YG plant is protect for the maize borer. No trts in the YG maize for the control of maize borer.
Portugal	5136			The agricultural producer did not make any applications treatments in the Yieldgard maize for the control of maize borers.
Portugal	5137			The agricultural producer didn´t make any treatments in the Yieldgard maize for the control of maize borer.

Table A 5: Herbicides applied in MON 810 (Section 3.4.1.5)

Active Ingredient	Herbicides as stated by the farmers	Spain	Portugal	Total
(S)-Metolachlor 31.25% + Terbuthylazine 18.75%	Primextra Líquido Gold	113	1	114
Nicosulfuron 6%	Elite Plus 6 OD	66	0	66
Isoxaflutol 22.5% + Tiencarbazona-Metil 9%	Adengo	56	0	56
Mesotrione 4% + (S)-Metolachlor 40%	Camix	48	0	48
Dicamba 48%	Banvel D	35	0	35
Tembotriona 4.4%	Laudis OD	31	0	31
Isoxaflutol 24%	Spade Flexx	22	0	22
Glyphosate 36%	Glyphosate 36%	13	0	13
Fluroxipir 20%	Starane 20	12	0	12
Mesotrione 3.75% + Terbuthylazine 18.75% + (S)-Metolachlor 31.25%	Lumax	2	8	10
Foramsulfuron 3% + Tiencarbazona Metil 1%	Monsoon Active	10	0	10
2,4-D 30% + Florasulam 0.62%	Mustang	5	4	9
Nicosulfuron 42.9% + Rimsulfuron 10.7%	Principal	7	0	7
Nicosulfuron 4%	Elite M	5	0	5
Glyphosate 36%	Roundup	5	0	5
Sulcotrione	Sudoku	0	5	5
(S)-Metolachlor, Terbuthylazine	Tyllanex Magnum	5	0	5
Dimetenamida-p 21.25%, Pendimetalina 25%	Wing P	5	0	5
Nicosulfuron, Terbuthylazine	Winner Top	0	5	5
Foramsulfuron, Isoxadifen-ethyl	Option	0	4	4
Bromoxynil	Buctril	3	0	3
Mesotrione	Callisto	1	2	3
Dicamba 50%, Prosulfuron 5%	Casper	3	0	3
Mesotrione, (S)-Metolachlor, Terbuthylazine	Gardoprim Plus Gold	3	0	3
Aclonifen, Isoxaflutol	Lagon	3	0	3
Dimethenamid-P, Terbuthylazine	Link Combi	0	3	3
Nicosulfuron, Terbuthylazine	Nicoter	0	3	3
Nicosulfuron 4%	Nic-Sar	3	0	3
Sulcotrione	Zeus	0	3	3
Foramsulfuron, Isoxadifen-ethyl	Cubix	2	0	2
Mesotrione 7.73%, Nicosulfuron 3%	Elumis	2	0	2
Aclonifen, Isoxaflutol	Memphis	2	0	2
Nicosulfuron	Nicosulfuron 4%	2	0	2
Nicosulfuron	Sajon	2	0	2
Fluroxypyr	Tomahawk	2	0	2
Nicosulfuron 4%	Victus	2	0	2
MCPA 50%	Arges 500	1	0	1
Bromoxinil 23.5%	Bromoxinil 24 EC	1	0	1
Mesotrione 10%	Callisto 100 SC	1	0	1
Nicosulfuron 24%	Chaman Forte	1	0	1
Nicosulfuron 4%	Crew	1	0	1
(S)-Metolachlor, Terbuthylazine	Cuña Plus	1	0	1
Sulcotrione	Decano	1	0	1
Dicamba 48%	Dimbo 480 SL	1	0	1
Fluroxipir 20%	Fluroxipir 20%	1	0	1
Nicosulfuron 24%	Milagro	1	0	1
Nicosulfuron 4%	Nycos	1	0	1
Dicamba 55% + Nicosulfuron 9.2% + Rimsulfuron 2.3%	Principal Plus	1	0	1
Dimethenamid-P	Spectrum	1	0	1
Pendimethalin	Stomp Aqua	1	0	1
Pethoxamid	Successor 600	1	0	1
Sulcotrione	Sulcotrina	1	0	1

Table A 6: Explanations for different harvest time of MON 810 (Section 3.4.1.9)

Country	Quest. Nr.	Harvest	Comments aggregate	Comments
Spain	5363	earlier	-	I plant and harvest YieldGard before conventional
Spain	5152	later		I plant and harvest short cycle YieldGard later
Spain	5153	later		I plant and harvest short cycle YieldGard later than conventional
Spain	5271	later		I plant and harvest short cycle YieldGard later

Table A 7: Explanations for characteristics of MON 810 different from *as usual* (Section 3.4.2)
Grey-colored fields mark answers that are not “as usual”.

Country	Quest. Nr.	Germi-nation	Emergence	Male flow-ering	Plant growth	Stalk/-root lodging	Maturity	Yield	Volun-teers	Comments
Spain	5140	as usual	as usual	as usual	as usual	less often	delayed	more yield	as usual	YieldGard is resistant against ECB, it is healthier, it is more green, it ripens a little bit later, it does not fall and it gives more kilos than conventional
Spain	5143	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is resistant against ECB, it is healthier, it is more green, it ripens a little bit later, it does not fall and it gives more kilos than conventional
Spain	5149	more vigorous	as usual	as usual	accelerated	less often	as usual	more yield	less often	YieldGard has more vigour and it grows faster, it does not have ECB's damages, it does not fall, there are no volunteers the next year and it gives more kilos than conventional
Spain	5150	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard has more vigour and it grows faster, it does not have ECB's damages, it does not fall, there are no volunteers the next year and it gives more kilos than conventional
Spain	5152	as usual	as usual	as usual	as usual	as usual	as usual	more yield	as usual	YieldGard has more vigour and it grows faster, it does not have ECB's damages, it does not fall, there are no volunteers the next year and it gives more kilos than conventional
Spain	5155	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not present ECB's damages, it does not fall, it is more green and it produces more kilos than conventional
Spain	5156	less vigorous	as usual	delayed	delayed	as usual	as usual	less yield	as usual	YieldGard does not assimilate correctly the nitrogenous fertillizer and it grew slowly, with a little bit of vigour, and it flowered a week later and produced less amount than the conventional
Spain	5158	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is healthier because is resistant to ECB, it does not fall and it produces more than conventional
Spain	5159	as usual	delayed	as usual	as usual	less often	delayed	more yield	as usual	YieldGard blooms a little bit later, it does not present ECB's damages and it does not fall, it has more moisture and it delays
Spain	5160	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not suffer ECB's damages, it does not fall, it is healthier and produces more than the conventional
Spain	5161	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is resistant to ECB, it is healthier, does not fall and it is more productive than conventional
Spain	5162	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall and generates more production than conventional because it does not have ECB's damages
Spain	5163	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall, without ECB's damages and produces more kilos than the conventional
Spain	5165	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is healthier, without ECB's damages, it does not fall, everything is harvested and it produces more than the conventional
Spain	5170	as usual	as usual	as usual	as usual	less often	as usual	more yield	less often	YieldGard does not present ECB's damages, it does not fall, there are no volunteers a year after and it produces more than the conventional
Spain	5171	as usual	as usual	as usual	as usual	less often	as usual	more yield	less often	YieldGard is healthier, without ECB's damages, it does not fall, and there are no volunteers a year after. Everything is harvested and YieldGard produces more kilos than the conventional

Spain	5172	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is resistant to ECB's, it does not fall, is healthier and gives more production than conventional
Spain	5173	as usual	as usual	as usual	as usual	less often	as usual	more yield	less often	YieldGard is healthier because is resistant to ECB, it does not fall, there are no volunteers and it is more productive than theconventional
Spain	5175	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall because it does not have ECB's damages and it produces more kilos than conventional
Spain	5177	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall and produces more than the conventional because it does not have ECB's damages
Spain	5180	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall and it is more productive thant conventional beucause it does not have ECB's damages
Spain	5181	as usual	as usual	as usual	accelerated	less often	delayed	more yield	less often	YieldGard it is healthier, without ECB'S damages, it grows faster and does not fall, it is more green and it ripens a little bitlater, there are no volunteers a year after and it produces 1.200 kg/ha more than conventional
Spain	5182	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall and produces more than the conventional because it does not have ECB's damages
Spain	5184	as usual	as usual	as usual	as usual	as usual	as usual	more yield	as usual	YieldGard produces more than conventional because it is healthier without ECB's damages
Spain	5185	as usual	as usual	as usual	as usual	less often	delayed	more yield	less often	YieldGard is resistant to ECB's damages, it does not fall, it does not produces volunteers, ripens a few days later because it has more moisture and generates more kilos than the conventional
Spain	5186	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is healthier, without ECB's damages, it does not fall, everything is harvested and it produces more amount than the conventional
Spain	5188	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not have ECB's damages, does not fall, all of it is harvested and it produces more than conventional
Spain	5189	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall, without ECB's damages and is more productive than the conventional
Spain	5192	as usual	as usual	as usual	as usual	less often	as usual	more yield	less often	YieldGard is resistant to ECB, it does not fall, there are no volunteers a year after and produces more than conventional
Spain	5197	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall because it does not have ECB's damages, it is healthier and is more productive than conventional
Spain	5199	as usual	as usual	as usual	as usual	less often	delayed	more yield	less often	YieldGard is healthier, is more green, it ripens a little bit later, it does not fall because it does not have ECB's damages, there are no volunteers a year after and produces 1.500 kg/ha more than conventional
Spain	5200	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is resistant to ECB, it does not fall, all of it is harvested and produces more kilos than conventional
Spain	5201	as usual	as usual	as usual	as usual	as usual	as usual	more yield	as usual	YieldGard does not have ECB's damages, it is healthier and produces more than the conventional
Spain	5202	as usual	as usual	as usual	as usual	less often	delayed	more yield	less often	YieldGard does not fall because it does not present ECB's damages, it is more green and we had to delay some days the maturation, there are no volunteers a year after and produces more than conventional
Spain	5207	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not present ECB's damages, does not fall and produces more than conventional
Spain	5219	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not present ECB's damages, does not fall and produces more than conventional
Spain	5220	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is healthier, does not fall because is resistant to ECB and is more productive than the conventional

Spain	5229	as usual	as usual	as usual	as usual	as usual	as usual	more yield	as usual	YieldGard does not have ECB's damages and produces more than the conventional
Spain	5233	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall and produces more amount than the conventional because it is healthier without ECB's damages
Spain	5234	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall and produces more kilos than conventional because is healthier without ECB's damages
Spain	5238	as usual	as usual	as usual	as usual	less often	as usual	as usual	as usual	YieldGard does not fall because is resistant to ECB
Spain	5253	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall and produces 1.000 kg/ha more than conventional because it does not have ECB's damages
Spain	5255	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is resistant to ECB, it does not fall and produces1.200 kg/ha more than conventional
Spain	5256	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is healthier, without ECB's damages, it does not fall and produces more than the conventional
Spain	5261	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall and produces more than conventional because it does not have ECB's damages
Spain	5271	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall, everything is harvested and generates more kilos than conventional because there are no ECB's damages
Spain	5273	as usual	as usual	as usual	as usual	as usual	as usual	more yield	as usual	YieldGard is always healthier even when there is no ECB and produces between 500-2.000 kg/ha more than the conventional
Spain	5274	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall because is resistant to ECB, is healthier and produces more than conventional
Spain	5286	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is resistant to ECB, it does not fall, all of it is harvested and produces more kilos than conventional
Spain	5288	as usual	as usual	as usual	as usual	as usual	as usual	more yield	as usual	YieldGard produces more than the conventional because it does not have ECB's damages
Spain	5290	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not have ECB's damages, does not fall and produces more than conventional
Spain	5291	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is healthier because is resistant to ECB, it does not fall and produces more than the conventional
Spain	5295	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is healthier without ECB's damages,it does no fall, everything is harvested and generates more kilos than conventional
Spain	5301	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is resistant to ECB, does not fall and is more productive than the conventional
Spain	5303	as usual	as usual	as usual	delayed	less often	delayed	more yield	less often	YieldGard is healthier, grows faster and delays the ripening a little bit. YieldGard does not fall, there are no volunteers a year after and it produces more than conventional
Spain	5304	as usual	as usual	as usual	delayed	less often	delayed	more yield	less often	YieldGard does not present ECB's damages and does not fall. A year after there are no volunteers, it is more green, grows slowerand ripens a few days later producing more kilos than conventional
Spain	5313	as usual	as usual	as usual	as usual	less often	as usual	more yield	less often	YieldGard is resistant to ECB, does not fall and there are no volunteers a year after. All of it is harvested and it produces more than the conventional
Spain	5316	as usual	as usual	as usual	as usual	less often	as usual	more yield	less often	YieldGard is healthier, without ECB's damages, does not fall and does not produce volunteers. Everything is harvested and generates more kilos than conventional
Spain	5321	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall because is resistant to ECB, is healthier and produces more kilos than conventional

Spain	5325	as usual	as usual	as usual	as usual	as usual	delayed	as usual	as usual	YieldGard ripens a few days later than conventional because is more green and has more moisture
Spain	5333	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is healthier because is resistant to ECB, it does not fall and generates more kilos than conventional
Spain	5352	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is healthier, without ECB's damages, it does not fall and produces more than the conventional
Spain	5356	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall and is more productive than conventional because there are no ECB's damages
Spain	5357	as usual	as usual	as usual	as usual	as usual	as usual	more yield	as usual	YieldGard produces more kilos than the conventional because is healthier without ECB's damages
Spain	5361	as usual	as usual	as usual	as usual	less often	delayed	as usual	as usual	YieldGard is healthier, more green, with more moisture, it does not fall and ripens a few days later than the conventional
Spain	5362	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard does not fall and generates more production than conventional because it does not have ECB's damages
Spain	5365	as usual	as usual	as usual	as usual	as usual	delayed	as usual	as usual	YieldGard has more moisture than the conventional and ripens a few days later
Spain	5366	as usual	as usual	as usual	as usual	as usual	delayed	as usual	as usual	YieldGard is more green, with more moisture and it ripens a week later than the conventional
Spain	5369	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is resistant to ECB, does not fall, is healthier and produces more than conventional
Spain	5370	as usual	as usual	as usual	as usual	as usual	as usual	more yield	as usual	YieldGard is more productive than the conventional because it does not present ECB's damages
Spain	5374	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YiledGard does not fall and produces more kilos than the conventional because there are no ECB's damages
Spain	5377	as usual	as usual	as usual	as usual	less often	as usual	more yield	as usual	YieldGard is resistant to ECB, does not fall, all of it is harvested and it produces more than the conventional
Portugal	5128	more vigorous	as usual	as usual	as usual	as usual	as usual	more yield	as usual	The average yields of 14 970 kg/ha in the YG dry maize, an average of 600 kg/ha higher compared with conv. maize. The vigor androbustness of the YG maize were importants to fight the bad weather conditions in this campaign particularly the strong wind gusts.
Portugal	5129	more vigorous	as usual	as usual	as usual	as usual	as usual	more yield	as usual	High quality and safety production were the main agronomical characteristics and were a reflection of the great sanity of the YG. In that last campaign the average yields of 14 420 kg/ha in the YG dry maize, were 400 kg/há average higher compared with conv. maize.
Portugal	5130	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	The agronomical characteristics mentioned were: robustness, vigour and force of the YG Maize and were very important to fight the bad weather conditions in this campaign particularly the strong wind gusts. The average yields of 12 500 kg/ha in the YG dry maize, were similar compared with conv. maize.
Portugal	5131	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	Higher vigour, force, sanity and resistance to fight the bad weather conditions particularly the strong wind gusts were the advantages mentioned by the agr. prod.. The average yields of 12 200 kg/ha in the YG dry maize, were similar compared with conv. maize.
Portugal	5132	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	The quality and high vigour were importants fo the main sanity of YG maize. The average yields of 11 500 kg/ha in the YG dry maize, were similar compared with conv. maize.

Portugal	5133	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	The good quality, robustness, vigour and force were importants for the main sanity and safety production of YG maize. The average yields of 14 160 kg/ha in the YG dry maize, were similar compared with conv. maize.
Portugal	5134	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	Despite the Atypical year / last campaign of production of lower incidence of pests, the higher sanity and quality of YG maize were the main agronomical characteristics. The average yields of 14 500 kg/ha in the YG dry maize, were similar compared with conv. maize.
Portugal	5135	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	The Sanity, bigger vigour and great safety production of YG were the main agronomical characteristics and were a reflection of the great quality of the YG maize. The average yields of 12 250 kg/ha in the YG dry maize, were similar compared with conv. maize
Portugal	5136	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	Excellent vigour of YG maize were associated to the higher sanity and quality of YG. The average yields of 12 450 kg/ha in the YG dry maize, were similar compared with conv. maize.
Portugal	5137	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	Sublime vigour, robustness for better resistance to fight the bad weather conditions particularly the strong wind gusts were theadvantages mentioned. The average yields of 15 500 kg/ha in the YG dry maize, were similar compared with conv. maize.
Portugal	5138	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	Good quality, high vigour and great safety production were importants for the main sanity of YG maize. The average yields of 52500 kg/ha in the YG forage maize were similar compared with conv. forage maize.
Portugal	5139	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	Huge vigour and large sanity and safety production were the main agronomical characteristics of the YG maize. The average yieldsof 50 000 - 55 000 kg/ha in the YG forage maize were similar compared with conv. forage maize.

Table A 8: Additional observation during plant growth of MON 810 (Section 3.4.2)

Country	Quest. Nr.	Comments aggregate	Comments
Spain	5141	No corn borer in 2018	There was not ECB's attack and YieldGard and conventional developed in the same way
Spain	5142		When there is no ECB's attack, you do not see differences between YieldGard and conventional
Spain	5145		When there is not ECB, YieldGard and conventional developed in the same way
Spain	5147		There were not differences between YieldGard and conventional because there was not ECB's attack
Spain	5148		There was not ECB's attack and there were not differences between YieldGard and conventional either
Spain	5168		There was not ECB's attack and I did not see differences between YieldGard and conventional
Spain	5190		There were not differences between YieldGard and conventional because there was not ECB's attack
Spain	5195		ECB did not attack, therefore YieldGard and conventional behaved in a similar way
Spain	5196		Differences between YieldGard and conventional were not seen because ECB did not attack
Spain	5198		Because there was not ECB's attack YieldGard and conventional developed in a similar way
Spain	5201		YieldGard has more moisture than conventional
Spain	5202		ECB is more harmful in the late conventional plantings, on the other hand, YieldGard is completely healthy
Spain	5203		No differences were seen between YieldGard and conventional because ECB did not attack
Spain	5206		There was not ECB's attack and no differences were seen between YieldGard and conventional
Spain	5209		YieldGard and conventional behaved in a similar way because there was not ECB's attack
Spain	5210		There were not differences between YieldGard and conventional because there was not ECB's attack
Spain	5212		When there is no ECB's attack, you do not observe differences between YieldGard and conventional
Spain	5215		No differences were seen between YieldGard and conventional because ECB did not attack
Spain	5217		There was not ECB's attack and there were not differences between YieldGard and conventional either
Spain	5218		YieldGard and conventional behaved in a similar way because there was not ECB's attack
Spain	5223		There were not differences between YieldGard and conventional because there was not ECB's attack
Spain	5225		YieldGard and conventional behaved in a similar way because there was not ECB's attack
Spain	5230		There was not ECB's attack therefore there were not differences between YieldGard and conventional
Spain	5231		I did not appreciate differences between YieldGard and conventional because there was not ECB's attack
Spain	5235		There were not differences between YieldGard and conventional because there was not ECB's attack
Spain	5237		When there is no ECB's attack, you do not see differences between YieldGard and conventional
Spain	5240		I did not observe differences between YieldGard and conventional because there was not ECB
Spain	5241		There was not ECB's attack and YieldGard and conventional developed in the same way
Spain	5243		Differences between YieldGard and conventional were not seen because there was not ECB's attack
Spain	5247		There were not differences between YieldGard and conventional because there was not ECB's attack
Spain	5249		There was not ECB's attack and YieldGard and conventional behaved in the same way
Spain	5250		YieldGard and conventional behaved in a similar way because there was not ECB's attack

Spain	5252		I did not see differences between YieldGard and conventional because there was not ECB's attack
Spain	5254		When there is not ECB, YieldGard and conventional developed in the same way
Spain	5257		Without differences between YieldGard and conventional because there was not ECB
Spain	5259		There was not ECB's attack and YieldGard and conventional developed in the same way
Spain	5260		ECB did not attack and there were not differences between YieldGard and conventional
Spain	5261		Yieldgard is more green and healthier than conventional
Spain	5263		There were not differences between YieldGard and conventional because there was not ECB's attack
Spain	5264		There were not differences between YieldGard and conventional because there was not ECB's attack
Spain	5267		YieldGard and conventional behaved in a similar way because there was not ECB's attack
Spain	5270		YieldGard and conventional behaved in a similar way because there was not ECB's attack
Spain	5272		Because there was not ECB's attack YieldGard and conventional developed in a similar way
Spain	5275		Without differences between YieldGard and conventional because there was not ECB
Spain	5279		If there is not ECB, you cannot observe differences between YieldGard and conventional
Spain	5281		There was not ECB's attack and there were not differences between YieldGard and conventional either
Spain	5284		If there is not ECB, YieldGard and conventional behave in a similar way
Spain	5293		Without differences between YieldGard and conventional because there was not ECB
Spain	5297		No differences were seen between YieldGard and conventional because there was not ECB's attack
Spain	5299		ECB did not attack and YieldGard and conventional developed in a similar way
Spain	5300		Without differences between YieldGard and conventional because there was not ECB
Spain	5302		There were not differences between YieldGard and conventional because ECB did not attack
Spain	5303		YieldGard produces 2.000-3.000 kg/ha more than conventional when there is ECB's attack
Spain	5304		YieldGard's grain has more moisture than the conventional
Spain	5307		There was not ECB's attack and there were not differences between YieldGard and conventional either
Spain	5309		Because there was not ECB's attack no differences between YieldGard and conventional were observed
Spain	5311		No differences were seen between YieldGard and conventional because there was not ECB
Spain	5314		ECB did not attack and YieldGard and conventional developed in a similar way
Spain	5315		Without differences between YieldGard and conventional because ECB did not attack
Spain	5317		There were not differences between YieldGard and conventional because there was not ECB's attack
Spain	5319		YieldGard and conventional behaved in a similar way because there was not ECB's attack
Spain	5320		When there is not ECB, you cannot observe differences between YieldGard and conventional
Spain	5324		There was not ECB's attack nor differences between YieldGard and conventional
Spain	5326		No differences were seen between YieldGard and conventional because ECB did not attack
Spain	5329		Without differences between YieldGard and conventional because ECB did not attack
Spain	5330		ECB did not attack and differences between YieldGard and conventional were not seen
Spain	5334		I do not observe differences when there is not ECB's attack
Spain	5335		YieldGard has one or two more moisture's degrees than the conventional
Spain	5336		ECB did not attack and there were not differences between YieldGard and conventional
Spain	5338		ECB did not attack and YieldGard and conventional developed in a similar way

Spain	5339		There was not ECB's attack nor differences between YieldGard and conventional
Spain	5340		There was not ECB's attack in the area
Spain	5343		There was not ECB's attack nor differences between YieldGard and conventional
Spain	5344		YieldGard and conventional behaved in a similar way because there was not ECB's attack
Spain	5346		YieldGard has two more moisture's degrees than conventional
Spain	5347		ECB did not attack and YieldGard and conventional behaved in the same way
Spain	5348		There was not ECB's attack nor differences between YieldGard and conventional
Spain	5350		Without differences between YieldGard and conventional because there was not ECB
Spain	5351		I did not observe differences between YieldGard and conventional because there was not ECB
Spain	5353		There was not ECB's attack and no differences were observed between YieldGard and conventional
Spain	5355		Without differences between YieldGard and conventional because ECB did not attack
Spain	5356		YieldGard has more moisture than conventional
Spain	5360		There was not ECB's attack and there were not differences between YieldGard and conventional either
Spain	5363		ECB did not attack and differences between YieldGard and conventional were not seen
Spain	5365		YieldGard's grain has two or three more moisture's degrees than the conventional
Spain	5367		YieldGard is more green and has more moisture than the conventional
Spain	5368		There was not ECB's attack and I did not see differences between YieldGard and conventional
Spain	5372		There were not differences between YieldGard and conventional because there was not ECB's attack
Spain	5373		There was not ECB's attack and YieldGard and conventional behaved in the same way

Table A 9: Additional comments on disease susceptibility (Section 3.4.3)

Country	Quest. Nr.	Disease susceptibility	Comments aggregate	Comments
Portugal	5128	as usual	-	Difficult to analyze the susceptibility of diseases because of the lower presence in the local / region of production of diseases. Nothing to report about diseases susceptibility.
Portugal	5129	as usual		Did not check any difference in the susceptibility of diseases. Difficult to analyze the susceptibility because of the lower presence in the local / region of production of diseases.
Portugal	5130	as usual		It was nothing significant the diseases susceptibility. Lower presence in the region of production of diseases.
Portugal	5131	as usual		Nothing to report in the region of production. It was nothing significant the diseases susceptibility.
Portugal	5132	as usual		It was not notorious and had nothing to report in the region of production.
Portugal	5133	as usual		Increasingly pronounced presence in the local of production of the disease "Cephalosporium Maydis" but without any differencein susceptibility.
Portugal	5134	as usual		Great pronounced presence in the local of production of the disease ""Cephalosporium Maydis"" but without any difference in susceptibility.
Portugal	5135	as usual		Normal and without any difference in susceptibility but higher presence in the local of production of the disease CephalosporiumMaydis.
Portugal	5138	as usual		Nothing to report in the last campaign and in the region of production about the diseases susceptibility.
Spain	5149	less susceptible	Fewer fungus attacks	YieldGard is healthier and has fewer fungus' attacks than conventionalYieldGard is stronger, withoud ECB's damages and has fewer fungus' attack than conventional
Spain	5286	less susceptible		YieldGard suffers fewer fusarium's and ustilago's attacks than conventionalYieldGard does not present ECB's damages and is healthier with fewer fungus' problems than conventional

Table A 10: Additional comments on insect pest control (Section 3.4.4)

Country	Quest. Nr.	Ostrinia nubilalis	Sesamia spp.	Comments
Spain	5193	good	good	I observed ECB's damages in the variety ES ZOOM YG in the cycle's end in the ear of maize
Spain	5271	very good	very good	YieldGard is very effective against ECB and you can observe it in the late plantings of maize when the ECBs attacks are stronger
Spain	5286	very good	very good	YieldGard does not present ECB's damages and the conventional does even when is treated with insecticides
Spain	5297	very good	very good	YieldGard is very efficient against ECB, specially in the late plantings of short cycle's maize
Portugal	5128	very good	very good	Strong and secure control of the maize borers in the yieldgard maize.
Portugal	5129	very good	very good	Effective control and total combat of control the maize borers in the yieldgard maize.
Portugal	5130	very good	very good	Despite the lower presence in the local / region of production of the maize borers in this last campaign, the control were sublime.
Portugal	5131	very good	very good	Important control despite this campaign were a lower presence in the local / region of production of the maize borers.
Portugal	5132	very good	very good	The results were very satisfactory in the yieldgard fields.
Portugal	5133	very good	very good	Very good control of the maize borers in the yieldgard maize.
Portugal	5135	very good	very good	Very good Effective and control of the maize borers in the yieldgard maize.
Portugal	5136	very good	very good	Total control and large effective control of the maize borers.
Portugal	5139	very good	very good	Greatly positive and effective control of the maize borers in the yieldgard maize.

Table A 11: Additional comments on pest susceptibility (Section 3.4.5)

Country	Quest. Nr.	Pest susceptibility	Order of insect pest	Comments aggregate	Comments
Spain	5329	less susceptible	Mythimna spp. (Mitima), Heliothis	Less susceptible, although lower incidence of pests in general	YieldGard does not suffer Mithymna and Heliothis attacks and the conventional does
Portugal	5128		Spodoptera Frugiperda		This last campaign the region of production had a very lower incidence of pests in general. Difficult to analyze the susceptibility of other pests. Despite that the YG maize was less susceptible to the attack of different other pests because of their high
Portugal	5129		Agrotis Ipsilon		Despite in last campaign the region of production had a very lower incidence of pests in general the lower susceptibility (moreresistant) to other pests were evident.
Portugal	5130		Spodoptera Frugiperda, Diabrotica / Agriotes, Agrotis Ipsilon		Despite this last year the region of production had a lower incidence of pests in general, the sanity and quality of the YG maize was relevant.
Portugal	5131		Spodoptera Frugiperda, Agrotis Ipsilon		Despite the lower incidence of pests in general the sanity of the YG maize was high and important to better resistant from the attack of the diferent other pests.
Portugal	5132		Spodoptera Frugiperda, Agrotis Ipsilon		The sanity of the YG maize was the most important reason to had a better resistant from the attack of the diferent other pests.
Portugal	5133		Spodoptera Frugiperda, Agrotis Ipsilon		Atypical year / last campaign of production. Difficult to analyze the susceptibility of other pests. Despite that the YG maize was less susceptible to the attack of different other pests because of their high sanity.
Portugal	5134		Spodoptera Frugiperda, Agrotis Ipsilon, Diabrotica / Agriotes		The sanity of the YG maize was fundamental. The fact that the YG maize was resistant to the attack of the maize borer pest madethe YG plants less susceptible from the attacks of other pests.
Portugal	5135		Spodoptera Frugiperda, Agrotis Ipsilon		Despite this last year the region of production had a lower incidence of pests in general, the sanity and quality of the YG maize was always high and important.
Portugal	5136		Agrotis Ipsilon, Spodoptera Frugiperda		The huge quality and sanity of the Yieldgard maize allowed the better resistant from the attack of the diferent other pests.

Portugal	5137		Agrotis Ipsilon		This last year the region of production had a very lower incidence of pests in general. Despite that the YG maize was less susceptible to the attack of different other pests because of their large sanity.
Portugal	5138		Spodoptera Frugiperda, Agrotis Ipsilon		Despite in last campaign the region of production had a very lower incidence of pests in general the lower susceptibility (moreresistant) to other pests were evident and important. The Sanity of the YG maize was always higher.
Portugal	5139		Agrotis Ipsilon, Spodoptera Frugiperda		High safety production of the YG maize, good sanity of YG provided better resistance from the attack of the different other pest

Table A 12: Weeds that occurred in MON 810 (Section 3.4.6)

Name of weed	**Frequency**
Sorghum halepense	140
Abutilon theophrasti	128
Amaranthus retroflexus	113
Chenopodium album	99
Datura stramonium	42
Xanthium strumarium	37
Cyperus spp.	29
Echinochloa spp.	27
Echinochloa crus-galli	23
Cynodon dactylon	22
Solanum nigrum	21
Setaria spp.	13
Digitaria sanguinalis	9
Portulaca oleracea	8
Hordeum sp.	8
Cirsium arvense	5
Amaranthus blitoides	5
Medicago sativa	4
Xanthium spinosum	4
Polygonum persicaria	3
Phragmites australis	2
Lolium spp.	2
Cirsium spp.	1
Raphanus raphanistrum	1
Malva spp.	1
Sinapis spp.	1
Triticum sp.	1
Rumex spp.	1

Table A 13: Motivations for not complying with the label recommendations (section 3.5.2)

Country	Quest. Nr.	Compliance	Reasons
Spain	5155	no	I did not plant refuge
Spain	5159		I did not plant refuge
Spain	5167		I did not plant refuge
Spain	5170		I did not plant refuge
Spain	5175		I did not plant refuge
Spain	5177		I did not plant refuge
Spain	5180		I did not plant refuge
Spain	5238		I did not plant refuge
Spain	5247		I did not plant refuge
Spain	5252		I did not plant refuge
Spain	5293		I did not plant the 20% of the refuge just the 6%
Spain	5303		I did not plant refuge in the second planting maize
Spain	5307		I did not plant refuge
Spain	5316		I did not plant refuge
Spain	5331		I did not plant refuge in the first planting maize
Spain	5332		I did not plant refuge
Spain	5343		I just plant the 5% of the refuge instead of the 20%
Spain	5350		I did not plant refuge
Spain	5351		I did not plant refuge in the second planting maize
Spain	5354		I did not plant refuge
Spain	5360		I did not plant refuge
Spain	5363		I did not plant refuge

Table A 14: Motivations for not planting a refuge (section 3.5.3)

Country	Quest. Nr.	Plant refuge?	Reasons
Spain	5155	no	Due to lack of time I need to plant fast because YieldGard is of short cycle
Spain	5159		Because on the contiguous plots are planted conventional maize
Spain	5167		It complicates the planting
Spain	5170		ECB produces a lot of losses in the harvest
Spain	5175		ECB produces big losses in the harvest
Spain	5177		ECB reduces a lot of the conventional maize production
Spain	5180		I have small plots and the planting is complicated
Spain	5238		Because I planted maize in two different periods of time and in each of them the surface was fewer than 5 hectares
Spain	5247		I have small plots and the planting is complicated
Spain	5252		I did not find conventional maize seeds with the same cycle than YieldGard to plant the refuge
Spain	5293		I just planted the 6% of the refuge because I have small plots and it complicates the planting
Spain	5303		ECB produces a lot of losses in the harvest specially in late plantings
Spain	5307		I have small plots and the planting is complicated
Spain	5316		It complicates the planting because I have two small plots
Spain	5331		Due to lack of time during the planting of the first planting maize
Spain	5332		I have small plots and the planting is complicated, on the other hand, ECB reduces the conventional maize production
Spain	5343		I planted refuge, but just the 5% of the surface instead of the 20% because it complicates the planting
Spain	5350		It complicates the planting
Spain	5354		ECB produces many losses in the harvest of the conventional maize of the refuge
Spain	5360		ECB produces a lot of losses in the harvest
Spain	5363		I have small plots and the planting is complicated

7 Annex B Questionnaire

2	0	1	8	-	0	1	-	M	A	R	-	E	S	-	0	1	-	1	1	1	1	1

Year - Event - Partner - Country -Interviewer- Farmer ID

EuropaBio Monitoring WG

Farmer Questionnaire

Product: insect protected YieldGard® maize

Farmer personal and confidential data

Name of farmer: ______________________________

Address of farmer: ______________________________

City: ______________________________

Postal code: ______________________________

Name of interviewer: ______________________________

Date of interview (DD / MM / YYYY):_____/______/_________

The personal data of the farmer will be handled in accordance with applicable data protection legislation. The personal data of the farmers may be used for the purpose of interviews necessary for the survey if the farmers have authorised this use as per the data protection legislation.

The questionnaires will be encoded to protect farmers' identity in the survey and confidentiality agreements will be put in place between the different parties (i.e. authorisation holders, licensees, interviewers and analyst) to further enforce this. The identity of a farmer will only be revealed to the authorisation holders if an adverse effect linked to their trait has been identified and needs to be investigated.

Furthermore, the agreements between the different parties will also ensure that any information collected in the questionnaires will not be improperly shared or used.

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Code:

Year ☐☐☐☐ Event ☐☐ Partner ☐☐☐ Country ☐☐ Interviewer ☐☐

Farmer ☐☐☐☐☐

Coding explanations:

2	0	1	8	-	0	1	-	M	A	R	-	E	S	-	0	1	-	1	1	1	1	1

Year — Event Code — Partner[1] Code — Country Code — Interviewer[2] Code — Farmer Code

Codes:

Event:	01	MON 810
	02	...
Partner[6]:	MON	Monsanto
	MAR	Markin
	AGR	Agro.Ges
	...	...
Country:	ES	Spain
	PT	Portugal
	RO	Romania
	…	
Interviewer[7]:	01 A	
	02 B	
	03 …	

Farmer: unique ID for each farmer

---

[6] Partner is the organization that implements the survey

[7] Interviewer is the employee from the Partner that is contacting the farmers

2	0	1	8	-	0	1	-	M	A	R	-	E	S	-	0	1	-	1	1	1	1	1

Year - Event - Partner - Country -Interviewer- Farmer ID

1 Maize grown area

1.1 *Location:*

Country: ____

County: ____

1.2 *Surrounding environment:*

Which of the following would best describe the land usage in the surrounding of the areas planted with YieldGard® maize

O Farmland
O Forest or wild habitat
O Residential or industrial

1.3 *Size and number of fields of the maize cultivated area:*

Total area of all maize cultivated on farm (ha) ________________

Total area of YieldGard® maize cultivated on farm (ha) ________________

Number of fields cultivated with YieldGard® maize ______________

1.4 *Maize varieties grown:*

List up to five YieldGard® maize varieties planted this season:

1. _________________________
2. _________________________
3. _________________________
4. _________________________
5. _________________________

List up to five conventional varieties planted this season:

1. _________________________
2. _________________________
3. _________________________
4. _________________________
5. _________________________

Are you growing any other GM maize varieties this season?[8]

O Yes O No

[8] Note: This question does not need to be asked in the 2013 season.

1.5 Soil characteristics of the maize grown area:

Mark the predominant soil type of the maize grown area (soil texture):

O very fine (clay)
O fine (clay, sandy clay, silty clay)
O medium (sandy clay loam, clay loam, sandy silt)
O medium-fine (silty clay loam, silt loam)loam)
O coarse (sand, loamy sand, sandy loam)
O no predominant soil type (too variable across the maize grown area on the farm)
O I do not know

Characterize soil quality of the maize grown area (fertility):

O below average - poor
O average - normal
O above average -good

Organic carbon content (%) ____________________

1.6 Local pest and disease pressure in maize:

Characterize this season's general pest pressure on the maize cultivated area:

Diseases (fungal, viral)	O Low	O As usual	O High
Pests (insects, mites, nematodes)	O Low	O As usual	O High
Weeds	O Low	O As usual	O High

2 Typical agronomic practices to grow maize on your farm

2.1 Irrigation of maize grown area:

O Yes O No

If yes, which type of irrigation technique do you apply:

O Gravity O Sprinkler O Pivot O Other

2.2 Major rotation of the maize grown area:

previous year: ________________________

two years ago: ________________________

2.3 Soil tillage practices:

O No O Yes (mark the time of tillage: O Winter O Spring)

2.4 Maize planting technique:

O Conventional planting
O Mulch
O Direct sowing

2.5 Mark all typical weed and pest control practices in maize at your farm:

O Herbicide(s)

8 O Insecticide(s)
If box checked, do you treat against maize borers? O Yes O No

O Fungicide(s)
O Mechanical weed control
O Use of bio control treatments (e.g. Trichogramma)
O Other, please specify: ______________________

2.6 Application of fertilizer to maize grown area:

O Yes O No

2.7 Typical time of maize sowing range (DD:MM – DD:MM):

_________/_________ -- _________/__________

2.8 Typical time of maize harvest range (DD:MM – DD:MM):

Grain maize: _________/_________ -- _________/__________
Forage maize: _________/_________ -- _________/__________

3 Observations of YieldGard® maize

3.1 Agricultural practices in YieldGard® maize (compared to conventional maize)

Did you change your agricultural practices in YieldGard® maize compared to conventional maize? If any of the answers is different from «As usual», please specify the change.

How did you perform your crop rotate for YieldGard® maize compared with conventional maize?

O As usual O Changed, because (*describe the rotation*): ______________
____
____

Did you plant YieldGard® maize earlier or later than conventional maize?

O As usual O Earlier O Later, because: ___________________________

2	0	1	8	-	0	1	-	M	A	R	-	E	S	-	0	1	-	1	1	1	1	1

Year - Event - Partner - Country -Interviewer- Farmer ID

Did you change your soil tillage or maize planting techniques to plant YieldGard® maize?

O As usual O Changed, because: ________________________________

Full commercial name of insecticides you applied in YieldGard® maize field, including seed treatments:

1. ______________________________________
2. ______________________________________
3. ______________________________________
4. ______________________________________

Full commercial name of herbicides you applied in YieldGard® maize field:

1. ______________________________________
2. ______________________________________
3. ______________________________________
4. ______________________________________

Full commercial name of fungicides you applied in YieldGard® maize field:

1. ______________________________________
2. ______________________________________
3. ______________________________________
4. ______________________________________

In 2013, how were the weed and pest control practices in YieldGard® maize when compared to conventional maize?

Insecticides: O Similar O Different, because: ____________________________

Herbicides: O Similar O Different, because: ____________________________

Fungicides: O Similar O Different, because: ____________________________

In 2013, did you change maize borer control practices in YieldGard® maize when compared to conventional maize?

O Similar O Changed, because: ________________________________

In 2013, how were the fertilizer application practices in YieldGard® maize when compared to conventional maize?

O Similar O Changed, because:____________________________

In 2013, how were the irrigation practices in YieldGard® maize when compared to conventional maize?

O Similar O Changed, because:____________________________

Did you harvest YieldGard® maize earlier or later than conventional maize?

O Similar O Earlier O Later Because:______________________

3.2 Characteristics of YieldGard® maize in the field (compared to conventional maize)

Germination vigour	O As usual	O More vigourous	O Less vigourous
Time to emergence	O As usual	O Accelerated	O Delayed
Time to male flowering	O As usual	O Accelerated	O Delayed
Plant growth and development	O As usual	O Accelerated	O Delayed
Incidence of stalk/root lodging	O As usual	O More often	O Less often
Time to maturity	O As usual	O Accelerated	O Delayed
Yield	O As usual	O Higher yield	O Lower yield
Occurrence of volunteers from previous year planting (if relevant)	O As usual	O More often	O Less often

If any of the answers above is different from «As usual», please specify:
____
____
____
____

Please detail any additional unusual observations regarding the YieldGard® maize maize during its growth:____

____

____

3.3 Characterise the YieldGard® maize susceptibility to disease (compared to conventional maize)

Overall assessment of disease susceptibility of YieldGard® maize compared to conventional maize (fungal, viral diseases):

O As usual   O More susceptible[9]   O Less susceptible[4]

If the above answer is different from «As usual», please specify the difference in disease susceptibility in the list and the commentary section below:

1. *Fusarium* spp   O More   O Less
2. *Ustilago maydis = U. zeae*   O More   O Less
3. xxx   O More   O Less
4. xxx   O More   O Less
5. xxx   O More   O Less
6. Other: ______________   O More   O Less

Additional comments: ______________________________

____

____

3.4 Characterise the INSECT pest control in YieldGard® maize fields (compared to conventional maize)

On the two insects controlled by YieldGard® maize, overall efficacy of the GM varieties on:

1. European corn borer (Ostrinia nubilalis):

   O Very good   O Good   O Weak   O Don't Know

2. Pink borer (Sesamia spp):

   O Very good   O Good   O Weak   O Don't Know

Additional comments: ______________________________

____

____

[9] More susceptible than conventional maize or Less susceptible than conventional maize

3.5 Characterise the YieldGard® maize susceptibility to OTHER pests susceptibility (compared to conventional maize)

Except the two insects mentioned above, overall assessment of pest susceptibility of YieldGard® maize compared to conventional maize (insect, mite, nematode pests):

O A usual O More susceptible O Less susceptible

If the above answer is different from «As usual», please specify the difference in pest susceptibility in the list and the commentary section below:

1. ____________________ O More O Less
2. ____________________ O More O Less
3. ____________________ O More O Less
4. ____________________ O More O Less
5. ____________________ O More O Less

Additional comments: ____

____

3.6 Characterise the weed pressure in YieldGard® maize fields (compared to conventional maize)

Overall assessment of the weed pressure in YieldGard® maize compared to conventional maize:

O As usual O More weeds O Less weeds

List the three most abundant weeds in your YieldGard® maize field:

1. ________________________________
2. ________________________________
3. ________________________________

Were there any unusual observations regarding the occurrence of weeds in YieldGard® maize? ____

____

3.7 Occurrence of wildlife in YieldGard® maize fields (compared to conventional maize)

General impression of the occurrence of wildlife (insects, birds, and mammals) in YieldGard® maize compared to conventional maize fields:

Occurrence of insects (arthropods):

O As usual O More O Less O Do not know

If the answer above is «More» or «Less», please specify your observation:

____

Occurrence of birds:

O As usual O More O Less O Do not know

If the answer above is «More» or «Less», please specify your observation:

____

____

Occurrence of mammals:

O As usual O More O Less O Do not know

If the answer above is «More» or «Less», please specify your observation:

____

____

3.8 Feed use of YieldGard® maize (if previous year experience with this event)

Did you use the YieldGard® maize harvest for animal feed on your farm?

O Yes O No

If “Yes”, please give your general impression of the performance of the animals fed YieldGard® maize compared to animals fed conventional maize.

O As usual O Different O Do not know

If the answer above is «Different», please specify your observation:

____

____

____

3.9 Any additional remarks or observations [e.g. from fields planted with event xxxx that were not selected for the survey]

____

____

____
____
____

4 Implementation of Bt-maize specific measures

4.1 Have you been informed on good agricultural practices for YieldGard® maize?

O Yes O No

Only if you answered “Yes”, would you evaluate these technical sessions as:

O Very useful O Useful O Not useful

4.2 Seed

Was the seed bag labelled with accompanying specific documentation indicating that the product is genetically modified maize YieldGard® maize?

O Yes O No

Did you comply with the label recommendations on seed bags?

O Yes
O No, because:____
____
____
____

4.3 Prevention of insect resistance

Did you plant a refuge in accordance to the technical guidelines?

O Yes
O No, because the surface of YieldGard® maize planted on the farm is < 5 ha
O No, because ____
____
____
____