Appendix 1. Post Market Monitoring of insect protected *Bt* maize MON 810 in Europe – Conclusions of a survey with Farmer Questionnaires in 2013

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 2013 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.

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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 [25]. Monitoring is supposed to confirm that any assumption regarding the occurrence and impact of potential adverse effects of the GMO or its use in the environmental risk assessment (ERA) is correct and to identify any adverse effect of the GMO and its use on human health or the environment which were 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 since 2006.

This biometrical report presents the outcomes of the statistical analysis of the farm questionnaires collected throughout European MON 810 cultivating countries in 2013. The questionnaires have been completed between December 2013 and March 2014. In the 2013 growing season 256 farmers have been surveyed.

2013 data indicates that in comparison to conventional maize plants, MON 810 plants

- received less insecticides caused by their inherent protection against certain lepidopteran pests,
- germinated more vigorously caused by the high quality germplasm,
- had less incidence of stalk/root lodging caused by the inherent protection against certain lepidopteran pests,
- had a longer time to maturity caused by the absence of pest pressure of certain lepidopteran pests,
- gave a higher yield caused by the better fitness of the plant,
- were less susceptible to diseases caused by hardly any insect feeding damage,
- controlled corn borers very well caused by the inherent protection against certain lepidopteran pests, and
- were less susceptible to pests, other than corn borers, especially lepidopteran pests caused by the inherent protection against certain lepidopteran pests and the resulting better fitness of the plants.

Moreover the animals fed with MON 810 performed slightly different compared to those fed with conventional maize. MON 810 fed animals were healthier resulting from a lower incidence of mycotoxins in the feed (due to lower ECB feeding damage on the plant).

The identified deviations have been 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.

Chapter 1

Introduction

According to Annex VII of Directive 2001/18/EC [25] of the European Parliament and of the Council on the deliberate release into the environment of genetically modified (GM) plants, the objective of the monitoring is to:

- confirm that any assumption regarding the occurrence and impact of potential adverse effects of the GMO or its use in the environmental risk assessment is correct, and
- 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 environmental risk assessment.

Upon approval of MON 810 (Commission Decision 98/294/EC [24]), Monsanto 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 of 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 on the market of MON 810 poses negligible risk to the environment. Any potential adverse effects of MON 810 on human health and the environment, which were not anticipated in the risk assessment, can be addressed under General Surveillance (GS). An important element of the GS, applied by Monsanto on a voluntary basis, is a farm questionnaire.

The objective of this biometrical report is to present the rationale behind the questionnaire approach and the analysis of the farm questionnaires used with farmers during the 2013 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.

Chapter 2

Methodology

2.1 Tool for general surveillance: the farm questionnaire

Structure of the farm questionnaire

Based on commonly defined protection goals, such as soil function, plant health, sustainable agriculture, etc. and derived areas of potential impact on these protection goals, a range of relevant monitoring characters for MON 810 GS has been identified (Table 2.1). These monitoring characters might be influenced by the cultivation of MON 810, but in an agricultural landscape other influencing factors (Table 2.3) exist which need to be taken into account as well, and therefore were also monitored.

For that purpose a farm questionnaire was designed to obtain data on monitoring characters and influencing factors (see Appendix B). Any unusual observations observed in monitoring characters would lead to a consideration of the information gathered to determine whether the effect 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. For example, they collect field-specific records of seeds, tilling methods, physical and chemical soil analysis, fertilizer application, crop protection measures, yields and quality. Additionally, farmers hold in their "farm files" 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 Center for Agriculture and Forestry (BBA, now JKI), maize breeders and statisticians in Germany (Wilhelm et al., 2004 [50]). Its questions were simplified to be easily understood by farmers and not to be too burdensome. Also, it had 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 year's experience 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 also 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 normal 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. For that reason, most questions are formulated to identify deviation from the situation with conventional maize. Farmer are asked to assesses the situation compared to conventional cultivation. If the 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) or $Minus$ (e.g. earlier, lower or less). High frequency (> 10 %) of $Plus$- or $Minus$-answers would indicate possible effects (see Section 2.4).

In addition, Monsanto used this questionnaire to check if farmers are in compliance with the MON 810 cultivation recommendations. For that purpose, the answers and free remarks in **Part 4** were evaluated.

Coding of personal data

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

2	0	1	3	-	0	1	-	M	A	R	-	E	S	-	0	1	-	0	1	-	0	1
year					event code			partner code				country code			interviewer code			farmer code			area code	

Codes:

Event:	01	MON 810
	02	...
Partner:	MON	Monsanto
	MAR	Markin
	AGR	Agro.Ges
	...	...

Country:	ES	Spain
	PT	Portugal
	RO	Romania
	...	...
Interviewer:	01	A
	02	B
	03	...
Farmer:	incremental counter within the interviewer	
Area:	incremental counter within the farmer	

(e.g. 2013-01-MAR-ES-01-01-01). The data were stored and handled in accordance with the Data Protection Directive 95/46/EC [23]. This is in order to ensure an honest response and to avoid competitive intelligence.

Training of the interviewers

To assist the interviewers in filling the questionnaires with the farmers, a 'user's manual' was developed. While questions have been carefully phrased to obtain accurate observations from farmers, previous 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 2.1 provides an overview on the monitored characters and the protection goals that are addressed by them.

Table 2.1: Monitoring characters and corresponding protection goals

Monitoring characters	Protection goals
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
Fertilizers application	Sustainable agriculture, soil function
Irrigation practice	Sustainable agriculture
Time of harvest	Sustainable agriculture, plant health
Germination vigor	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	Sustainable agriculture, plant health, biodiversity
Insect pest control (Ostrinia nubilalis, Sesamia spp.)	Plant health, sustainable agriculture
Pest susceptibility	Sustainable agriculture, plant health, biodiversity
Weed pressure	Sustainable agriculture, soil function, biodiversity
Occurrence of wildlife (insects, birds, mammals)	Sustainable agriculture, plant health, 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 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 is cultivating on his farm and using as comparator(s). The farmers additionally use their general experience of cultivating conventional maize and especially assessing the seasonal specifics. Farmers normally know if any observed differences are based on i.e. different FAO of the different varieties. 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 2.2).

Table 2.2: Monitoring characters and their categories

Monitoring characters - observations of MON 810	$Different$ $Minus$	$As\ usual$	$Different$ $Plus$
Time of planting	earlier	as usual	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
Fertilizer application	-	as usual	changed
Irrigation practice	-	as usual	changed
Time of harvest	earlier	as usual	later
Germination vigor	less	as usual	more
Time to emergence	accelerated	as usual	delayed
Time to male flowering	accelerated	as usual	delayed
Plant growth and development	accelerated	as usual	delayed
Incidence of stalk/root lodging	less	as usual	more
Time to maturity	accelerated	as usual	delayed
Yield	lower	as usual	higher
Occurrence of MON 810 volunteers	less	as usual	more
Disease susceptibility	less	as usual	more
Insect pest control (Ostrinia nubilalis)	weak	good	very good
Insect pest control (Sesamia spp.)	weak	good	very good
Pest susceptibility	less	as usual	more
Weed pressure	less	as usual	more
Occurrence of insects	less	as usual	more
Occurrence of birds	less	as usual	more
Occurrence of mammals	less	as usual	more
Performance of fed animals	-	as usual	different

2.3 Definition of influencing factors

Additionally, several possible influencing factors were surveyed to assess the local conditions and to determine the cause of potential effects in the monitoring characters (Table 2.3).

Table 2.3: 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

Normally - if there is no effect of MON 810 cultivation or other influencing factors, and the question being 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 Minus and Plus direction and to run up to approximately 5% (Figure 2.1). Therefore, the ***baseline*** for the analysis of monitoring characters with categories $As\ usual$ and $Different$ is 90% - 10%, where $Minus$- and $Plus$-answers are balanced and both are about 5%.

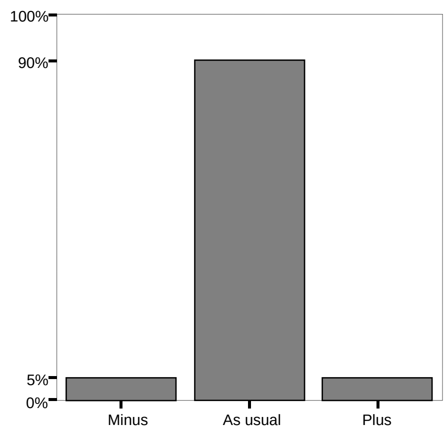

Figure 2.1: Balanced (expected) baseline distribution of the farmers' answers (no effect)

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 2.2 a and b). Graphically, an effect would be expressed by an unbalanced distribution (Figure 2.3 a and b).

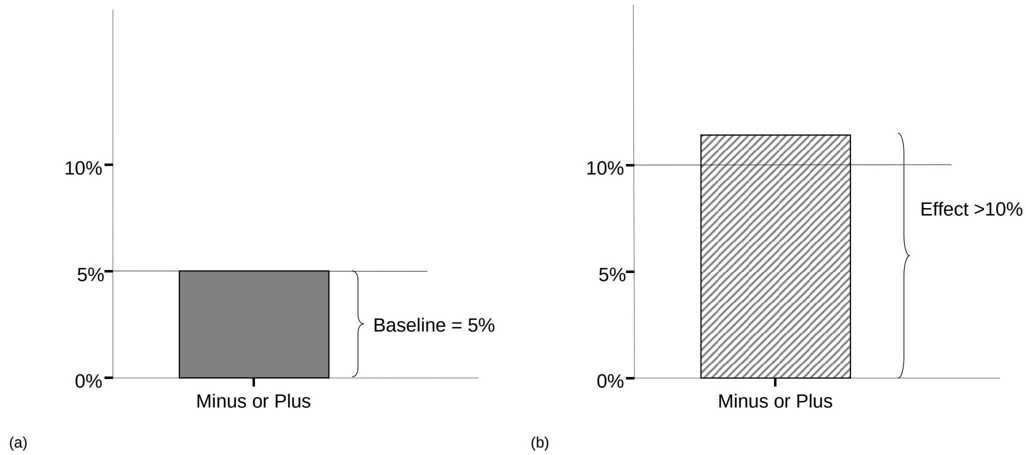

Figure 2.2: Definition of (a) baseline and (b) effect

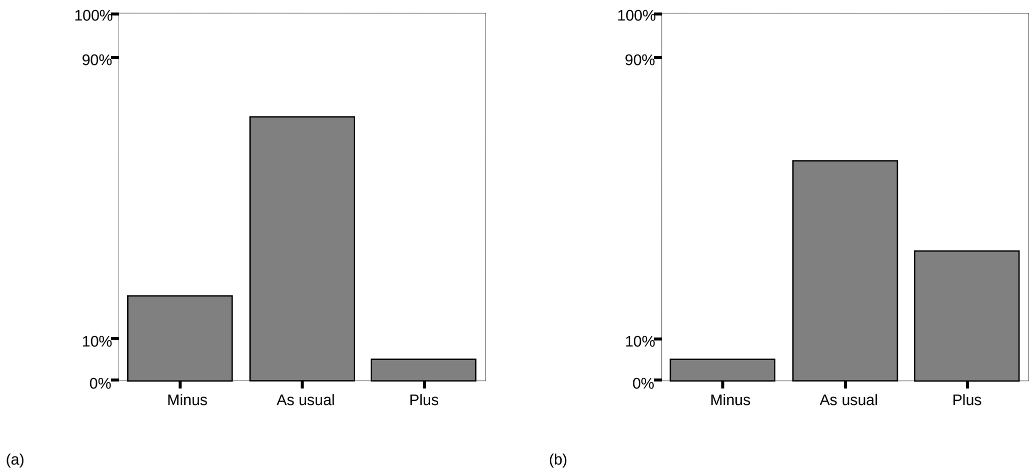

Figure 2.3: Examples for distributions of farmers' answers indicating an effect
(a) $> 10\%$ in category $Minus \rightarrow$ effect, (b) $> 10\%$ in category $Plus \rightarrow$ effect

Therefore, to identify an effect within the data means to test the frequencies of the $Plus$- or $Minus$-answers statistically against the threshold of 10%. The exact binomial test procedure is applied, but to keep the experiment-wise type I error rate a closed principle test procedure is performed by testing all three probabilities subsequently in descending order (Figure 2.4):

(1) Test of the probability $p_{As\ usual}$ (usually the largest probability)
Null hypothesis: GMP cultivation has an (adverse) effect, the probability of $As\ usual$-answers is smaller than 90% ($H_0 : p_{As\ usual} \leq 0.9$)

(2) Test of the major of the p_{Plus} and p_{Minus} probabilities
Null hypothesis: GMP cultivation has an (adverse) effect, the probability of $Plus$- or $Minus$-answers is larger than 10% ($H_0 : p_{Plus} \geq 0.1$ or $H_0 : p_{Minus} \geq 0.1$)

(3) Test of the minor of the p_{Plus} and p_{Minus} probabilities
Null hypothesis: GMP cultivation has an (adverse) effect, the probability of $Plus$- or $Minus$-answers is larger than 10% ($H_0 : p_{Plus} \geq 0.1$ or $H_0 : p_{Minus} \geq 0.1$)

This test procedure keeps 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: a erroneous rejection of the null hypothesis (1) (i.e. in reality $p_{As\ usual} \leq 0.9$) corresponds to a erroneous rejection of the null hypothesis (2) or (3) (i.e. in reality $p_{Plus} \geq 0.1$ or $p_{Minus} \geq 0.1$) (Marcus et al., 1976 [18], Maurer et al., 1995 [20]).

Hypothesis (2) and (3) represent the quintessential formulation of the PMEM objective.

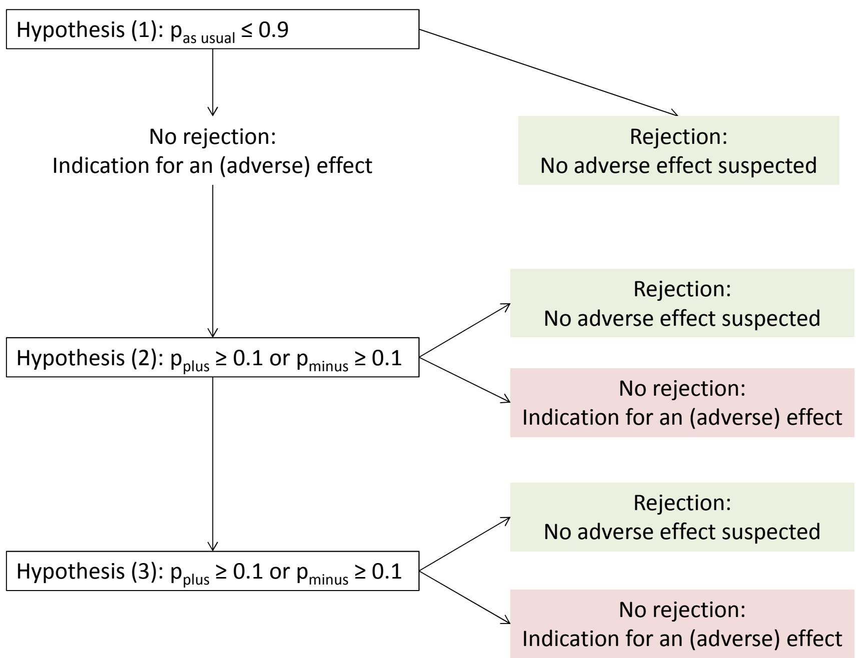

Figure 2.4: Closed principle test procedure for the three probabilities of $As\ usual$, $Plus$- and $Minus$-answers

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, these answers are accounted as missing values and therefore not considered valid. As a consequence, the "valid percentages" state the proportions of the several categories of an answer that are really known, 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 for illustrating the distribution function and for quality control reasons.

2. The frequencies of $As\ usual$-, $Plus$- and $Minus$-answers are statistically tested as described above. The resulting P values are compared to a level of significance $\alpha = 0.01$. If P is smaller than $\alpha = 0.01$, the corresponding null hypothesis ($p_{As\ usual} \leq 0.9$, $p_{Plus} \geq 0.1$ or $p_{Minus} \geq 0.1$) is rejected and thus no effect can be identified. In case of a P value larger than $\alpha = 0.01$, the null hypothesis cannot be rejected and an effect is indicated. In cases where the estimated probability is larger than 90% for $As\ usual$-answers or smaller than 10% for $Plus$- or $Minus$-answers, respectively, but the corresponding P value is larger than $\alpha = 0.01$ (and therefore the probability is not significant) the 99% confidence interval for the probability is also calculated to better assess the severity of such test decisions.

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 is ascertained (MON 810 cultivation, other influencing factors).

5. Identification of adverse effects potentially caused by MON 810 cultivation would require further examinations. (Such cases, however, have not been found in the 2013 data.)

2.5 Sample size determination and selection

The sample size determination of the survey was based on the exact binomial test. It depends on the threshold for the test, the error of the first kind α, the error of the second kind β and the effect size d (Rasch et al., 2007 [29]).

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 General Surveillance to identify any adverse 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 no one exists. This probability also should be as small as possible since this means to raise false alarm. The error of the second kind is also called producer's risk (Table 2.4).

The magnitude of the effect size d was chosen from experience in analyzing farm questionnaires in a pilot study in Germany 2001 - 2005 (Schmidt et al., 2008 [36]).

For determination of the sample size CADEMO light [7] was used as proposed by Rasch et al., 2007 [29] for a binomial test (Method 3/62/1005). Within this survey the accuracy demands $p = 0.1$ (threshold for adverse effects to be tested: 10% of $Minus$- (or $Plus$)-answers), $\alpha = 0.01$ (error of the first kind), $\beta = 0.01$ (error of the second kind), and $d = 3\%$ (effect size) should be met. Under this demands for a one sample problem, testing a probability against a threshold with a one-sided test, a sample size of 2436 questionnaires was calculated. To get this sample size even if the response rate is low or

Table 2.4: 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	
		$p \geq 10\%$ **indication for an effect**	$p < 10\%$ **no effect**
Test decision	**Acceptance** $H_0 : p \geq 10\%$	Correct decision with Probability $1 - \alpha = 99\%$	Wrong decision with Probability $\beta = 1\%$
	Rejection $H_0 : p \geq 10\%$	Wrong decision with Probability $\alpha = 1\%$	Correct decision with Probability $1 - \beta = 99\%$ $= POWER$

questionnaires have to be excluded from the survey because of low quality, this number was rounded to 2500 questionnaires.

Since the monitoring objects are the fields where genetically modified crops are cultivated, all fields within the EU being cultivated within the 10-years authorization period represent the total population from which the maximal 2500 fields have to be selected for GS survey. Sampling of these 2500 fields should ensure to reflect the range and distribution of plant production systems and environments exposed to GM plant cultivation. This range, on the one hand, is characterized by the growing season (year and its climatic, environmental conditions). On the other hand, it is characterized by the geographic regions where GM cultivation takes place. Regions may vary by 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 2500 monitoring objects is firstly subdivided equally into 250 objects per year. Splitting the number per year to the countries considers fluctuant adoption of the GM plant (grade of market maturity) and therefore is performed yearly for the actual situation.

Actually, the sampling procedure is afflicted by the problem that the total number of growers (and of fields and field sizes) is not known, but only the total cultivated area (in ha). Therefore the sampling frame for this survey cannot be based on the total population of fields with MON 810 cultivation in Europe. Instead of this, a quota considering the magnitude (ha planted per country/ ha planted in the EU) and product situation (average field size in the country) of MON810 cultivation will be applied, resulting in certain numbers of farmers to be monitored per year and country.

If fewer than 250 fields per year are cultivated, the maximum possible number of monitoring objects is surveyed.

The selection of farmers for the survey within the countries follows practical conditions. The total number of farmers cultivating MON 810 per country is not known, farmers are selected from public registers (Portugal, Romania) or customer lists of the seed selling companies (Czech Republic, Slovakia). The public registers do not necessarily contain the contact data of the farms so it is often very difficult to identify them. The customer lists of the seed selling companies do not completely cover all MON 810 cultivating farmers, so that some are missing. For example, in Spain there are no lists at all. Here, the interviewers identify MON 810 cultivating farmers by knowledge from previous surveys or search in the region. When buying the seed, farmers are informed to possibly be contacted for GS survey. In general, only a few farmers refuse to participate. Nevertheless, all refusals are recorded. The final number of farmers per country, that will be included in the biometrical analysis, will depend on their availability and willingness.

Consequently, cultivation areas with a high uptake of the GM plant will be over-represented by a high number of fields to be monitored. Within each stratum (per year and country) the determined number of monitoring units is selected randomly where each field has the same chance to be surveyed. The whole sampling procedure ensures that the monitoring area will be proportional to and representative of the total regional area under GM cultivation.

The surveys are performed after the planting season, the farmers are provided with a copy of the questionnaire at least two weeks before a telephone interview or interviewed face-to-face.

2.6 Power of the Test

The power of the test $p_{minus} \geq 0.1$ or $p_{plus} \geq 0.1$ is the probability to reject the null hypothesis of an effect where no one exists (correct decision). It is defined as $1 - \beta$ (β = error of the second kind) and is calculated as followed:

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

while:

$$F_U = \min_F \left(P \left(F \leq F_E | H_0 \right) > \alpha \right)$$

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

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

Figure 2.5 illustrates the power for an alternative hypothesis value of 0.07 (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 (0.07) 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 power of 99%.

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 field representatives or farmers were asked for clarification. 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. $Plus$/$As\ usual$/$Minus$) were defined and coded (and only the coded values taken).

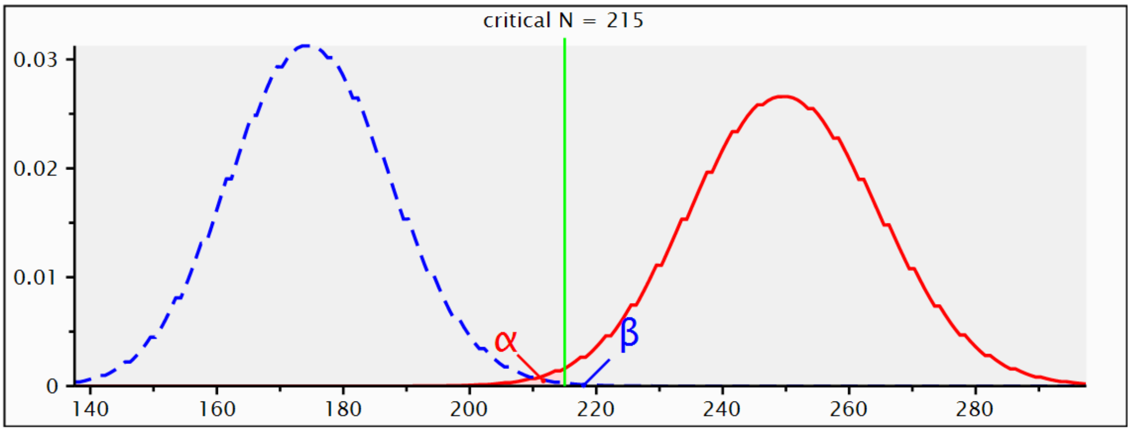

Figure 2.5: Null ($p = 0.1$) and alternative ($p = 0.7$) binomial distribution functions for a sample size of 2.500 type I and type II errors α and β both 0.01 (graph: G*Power Version 3.1.6)

High quality of the data is assured by training the interviewers initially in a workshop and for refreshment yearly by phone. In face-to-face interviews, the interviewers are instructed to check whether the farmer‘s answer corresponds to their documentation. When surveys are performed by phone, the farmers get the questionnaire about two weeks in advance to pick up the information from their documentation.

All data are entered and controlled for their quality and plausibility.

A quality control check first checks the completeness of the data. Some data fields (especially the monitoring characters or comments in case of farmer's assessments differ from $As\ usual$) are defined to be obligatory, therefore missing values or unreadable entries are not accepted. Furthermore the values are checked for correctness (quantitative values within a plausible min-max range, qualitative values meeting only acceptable parameter values). Plausibility control checks the variable values for their contents, both to find 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 (interviewers get written queries from BioMath).

Chapter 3

Results

The questionnaires have been completed between December 2013 and March 2014. In the 2013 growing season 256 farm questionnaires have been collected. Quality and plausibility control confirmed that all 256 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 are identified.

An overview of numbers, percentages and levels of significance of the binomial tests of the data in 2013 is given in Table 3.1. The fields in the table highlighted in grey mark the cases for which the test against the 10% threshold resulted in P values greater than 0.01, so the null hypotheses (that these values are greater than 10% could not be rejected) and therefore indicate the occurrence of an effect.

Figure 3.1 shows the $As\ usual$ answer probabilities of all monitoring characters on the same graph, thereby forming an overall pattern and allowing the assessment of MON 810 effects at a glance. The vertical dashed line indicates the test threshold of 0.9 (biological relevance). No effect of MON 810 cultivation is indicated if the lower confidence bound is greater than the threshold, i.e. the whole confidence interval lies right to the dashed line.

Taken together, 2013 data indicates that in comparison to conventional maize plants, MON 810 plants

- received less insecticides,
- germinated more vigorously,
- had less incidence of stalk/root lodging,
- had a longer time to maturity,
- gave a higher yield,
- were less susceptible to diseases,
- controlled corn borers very well, and
- were less susceptible to pests other than corn borers, especially lepidopteran pests.

Moreover the animals fed with MON 810 performed slightly different compared to those fed with conventional maize.

In the following sections the detailed analysis of all parameters surveyed using the questionnaire in 2013 is described and the results are assessed scientifically.

Table 3.1: Overview on the results of the descriptive analysis of the monitoring characters in 2013

Monitoring characters[1]	N valid	$Minus^1$	P for $p_0 = 0.1$	$As\ usual^1$	P for $p_0 = 0.9$	$Plus^1$	P for $p_0 = 0.1$
Crop rotation	256			241 (94.1%)	< 0.01	15 (5.9%)	0.013[2]
Time of planting	256	0 (0.0%)	< 0.01	243 (94.9%)	< 0.01	13 (5.1%)	< 0.01
Tillage and planting technique	256			251 (98.0%)	< 0.01	5 (2.0%)	< 0.01
Insect control practices	256			214 (83.6%)	0.999	42 (16.4%)	0.999
Weed control practices	256			256 (100.0%)	< 0.01	0 (0.0%)	< 0.01
Fungal control practices	256			256 (100.0%)	< 0.01	0 (0.0%)	< 0.01
Maize Borer control practice	256			215 (84.0%)	0.998	41 (16.0%)	0.999
Fertilizer Application	256			250 (97.7%)	< 0.01	6 (2.3%)	< 0.01
Irrigation Practices	256			256 (100.0%)	< 0.01	0 (0.0%)	< 0.01
Time of harvest	256	0 (0.0%)	< 0.01	243 (94.9%)	< 0.01	13 (5.1%)	< 0.01
Germination vigor	256	2 (0.8%)	< 0.01	235 (91.8%)	0.143	19 (7.4%)	0.098
Time to emergence	256	0 (0.0%)	< 0.01	255 (99.6%)	< 0.01	1 (0.4%)	< 0.01
Time to male flowering	256	2 (0.8%)	< 0.01	253 (98.8%)	< 0.01	1 (0.4%)	< 0.01
Plant growth and development	256	3 (1.2%)	< 0.01	251 (98.0%)	< 0.01	2 (0.8%)	< 0.01
Incidence of stalk / root lodging	256	44 (17.2%)	1.0	212 (82.8%)	1.0	0 (0.0%)	< 0.01
Time to maturity	256	0 (0.0%)	< 0.01	224 (87.5%)	0.888	32 (12.5%)	0.921
Yield	256	5 (2.0%)	< 0.01	162 (63.3%)	1.0	89 (34.8%)	1.0
Occurrence of volunteers	250	10 (4.0%)	< 0.01	240 (96.0%)	< 0.01	0 (0.0%)	< 0.01
Disease susceptibility	255	32 (12.5%)	0.924	223 (87.5%)	0.892	0 (0.0%)	< 0.01
Insect pest control (*Ostrinia nubilalis*)	256	0 (0.0%)	< 0.01	28 (10.9%)	1.0	228 (89.1%)	1.0
Insect pest control (*Sesamia* spp.)	236	0 (0.0%)	< 0.01	27 (11.4%)	1.0	209 (88.6%)	1.0
Pest susceptibility	255	46 (18.0%)	1.0	208 (81.6%)	1.0	1 (0.4%)	< 0.01
Weed pressure	256	0 (0.0%)	< 0.01	255 (99.6%)	< 0.01	1 (0.4%)	< 0.01
Occurrence of insects	253	0 (0.0%)	< 0.01	253 (100.0%)	< 0.01	0 (0.0%)	< 0.01
Occurrence of birds	250	0 (0.0%)	< 0.01	250 (100.0%)	< 0.01	0 (0.0%)	< 0.01
Occurrence of mammals	250	1 (0.4%)	< 0.01	250 (99.6%)	< 0.01	0 (0.0%)	< 0.01
Performance of animals	26			24 (92.3%)	0.251	2 (7.7%)	0.511

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

[1] Monitoring characters and their categories are defined in section 2.2

[2] The first test hypothesis $p_{as\ usual} \leq 0.9$ was rejected, therefore here no effect is indicated.

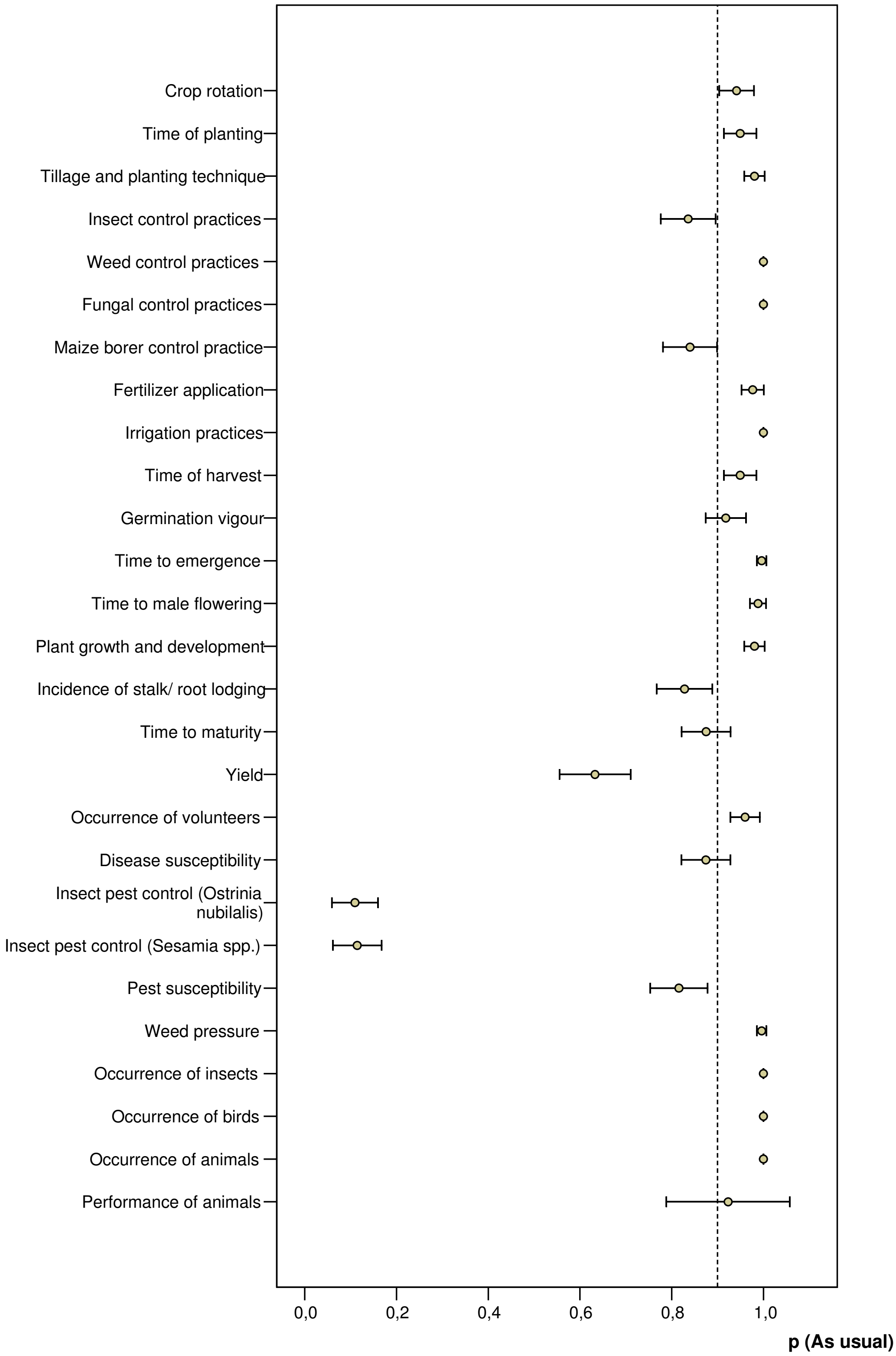

Figure 3.1: $As\ usual$ answer probabilities of all monitoring characters, point estimate (circle) and 95% confidence intervals (bars). Vertical dashed line indicates the test threshold of 0.9 (biological relevance)

3.1 Sampling and quality and plausibility control

The questionnaires have been completed between December 2013 and March 2014. In the 2013 growing season 256 farm questionnaires have been collected.

In Spain, the largest market, the surveys (190) were performed by Instituto Markin, SL [1], in Portugal the surveys (46) were performed by Agro.Ges - Sociedade de Estudos e Projectos [2]. These companies have an established experience in agricultural surveys. In the Czech Republic the surveys (18) were performed by the Czech Agriculture University [3]. In Romania (2) Monsanto's field representatives assisted the farmers in filling in the questionnaires.

Two farmers from the Czech Republic refused to participate in the survey, because they did not have time to fulfill a questionnaire. In all other countries all asked farmers responded to the questionnaire. This results in a response rate of 90% for Czech Republic and 100% for Spain, Portugal and Romania.

After the first quality and plausibility control, 8 farmers were contacted again to provide additional clarifications (2 from Spain, 4 from Portugal and 2 from Czech Republic). Examples of items that had to be clarified were incorrect variety names and missed answers (surrounding environment, weed and pest control practices in conventional maize). Two farmers were also asked to clarify some inconsistencies between weed and pest control practices in conventional maize compared to MON 810, and plant protection products used in MON 810. After including the corrections, the quality and plausibility control confirmed that all 256 questionnaires could be considered for analysis.

The good quality of the questionnaires also resulted from the interviewer training.

The database currently contains 2104 cases (questionnaires) for 8 field seasons: 251 for 2006, 291 for 2007, 297 for 2008, 240 for 2009, 271 for 2010, 249 for 2011, 249 for 2012 and 256 for 2013.

3.2 Part 1: Maize grown area

3.2.1 Location

In 2013, 256 questionnaires were surveyed in the cultivation areas of MON 810 in 4 European countries. On average, 6.8% of the total planted MON 810 surfaces were monitored during the 2013 survey (Table 3.2).

Figure 3.2 shows a geographical overview on the main cultivation areas of MON 810 in Europe in 2013 (grey areas) and the location of the monitoring sites (numbers).

[1] Instituto Markin, SL; c/ Caleruega, 60 4° D -28033 Madrid -Spain
[2] Agro.Ges -Sociedade de Estudos e Projectos, Av. da República, 412, 2750-475 Cascais -Portugal
[3] Czech Agricultural University, Kamýcká 129, Praha 6 -Suchdol, 165 21 Czech Republic

Table 3.2: MON 810 cultivation and monitored areas in 2013

Country	Total planted MON 810 surfaces (ha)	Monitored MON 810 surfaces (ha)	Monitored MON 810 surfaces / total planted MON 810 surfaces (%)
Czech Republic	2560	1733	67.7
Portugal	8171	2689	32.9
Romania	835	456	54.6
Slovakia	100	0	0.0
Spain	136962	5262	3.8
Total	148628	10139	6.8

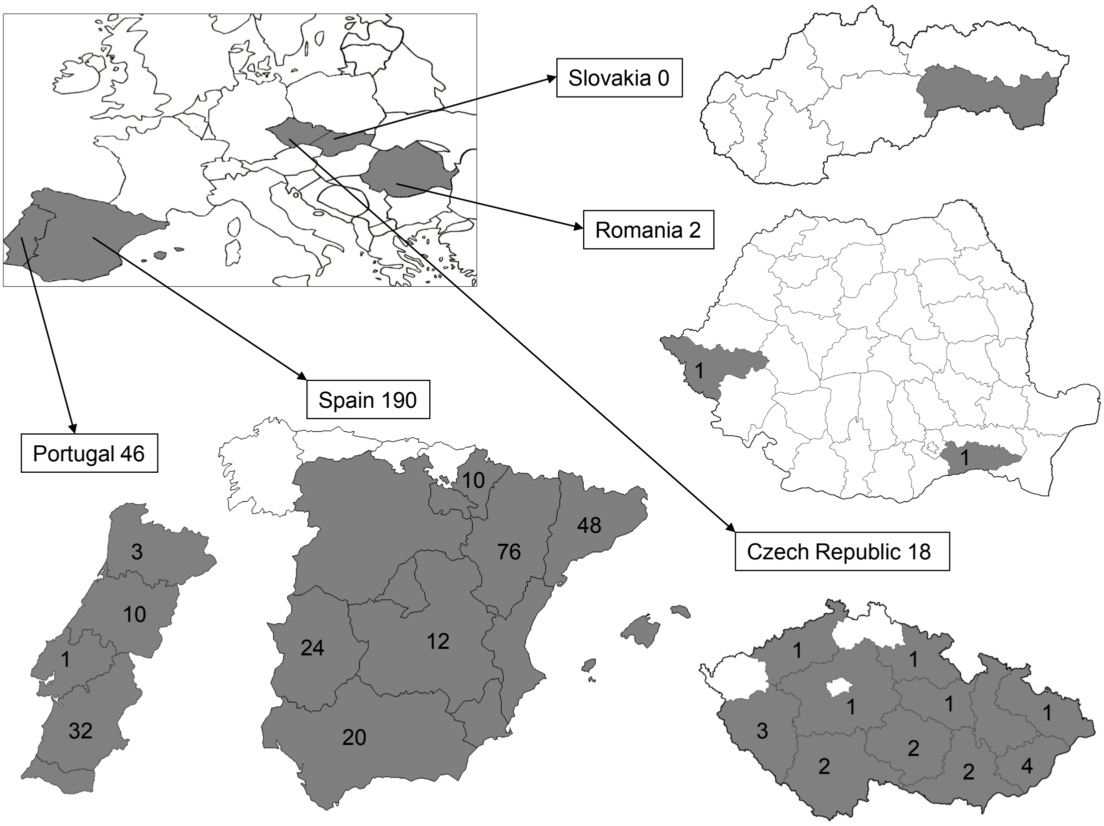

Figure 3.2: Number of sampling sites within the cultivation areas (grey) of MON 810 in Europe in 2013

3.2.2 Surrounding environment

The farmers were asked to describe the land usage in the surrounding of the areas planted with maize. Most of the fields (98.0%) are surrounded by farmland and only a few (2.0%) by other types of environment (Table 3.3, Figure 3.3).

Table 3.3: Land usage in the surrounding of the areas planted with MON 810 in Europe in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	Farmland	251	98.0	98.0	98.0
	Farmland and forest or wild habitat	4	1.6	1.6	99.6
	Farmland, forest or wild habitat and residential or industrial	1	0.4	0.4	100.0
Total		249	100.0	100.0	

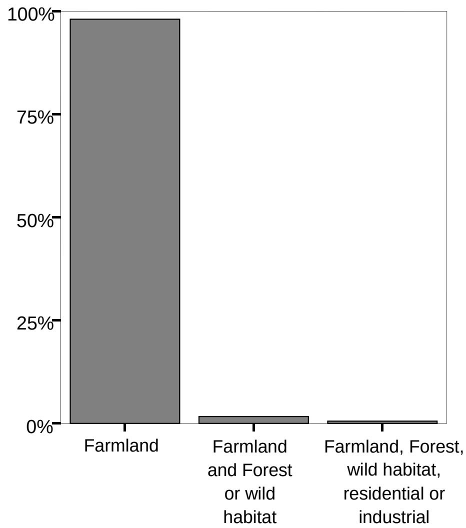

Figure 3.3: Land usage in the surrounding of the areas planted with MON 810 in Europe in 2013

3.2.3 Size and number of fields of the maize cultivated area

The size of the total maize area at the farms in 2013 ranged from 1.5 to 1300.0 hectares with an overall mean of 87.3 hectares. MON 810 was cultivated in 2013 on 39.6 hectares in average (minimum 1.0; maximum 700.0 hectares). Details for cultivation of maize in 2006 - 2013 by country can be found in Tables 3.4 and 3.5.

Table 3.4: 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	2500.0	433.8	89.3	1400.0	431.9	57.4	3000.0	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	1300.0	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	1110.0	239.5	20.0	1130.0	256.1	4.8	1470.0	-	-	-
	MON 810	17.3	1.0	50.0	43.0	0.5	166.0	51.6	0.2	200.0	-	-	-
Romania	all maize	-	-	-	1969.8	253.0	5616.0	591.4	5.4	6789.0	417.5	2.5	6869.0
	MON 810	-	-	-	61.4	0.5	216.0	149.0	2.0	2705.0	62.1	1.0	1114.0
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 3.5: 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	1000.0
	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	2000.0	409.9	45.0	900.0	492.2	8.4	2000.0	454.0	9.3	1300.0
	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	1700.0	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	1100.0	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	0.034	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	-	-	-	-	-	-

Figure 3.4 shows the mean percentage of MON 810 cultivation area within total maize area per farmer from 2006 to 2013.

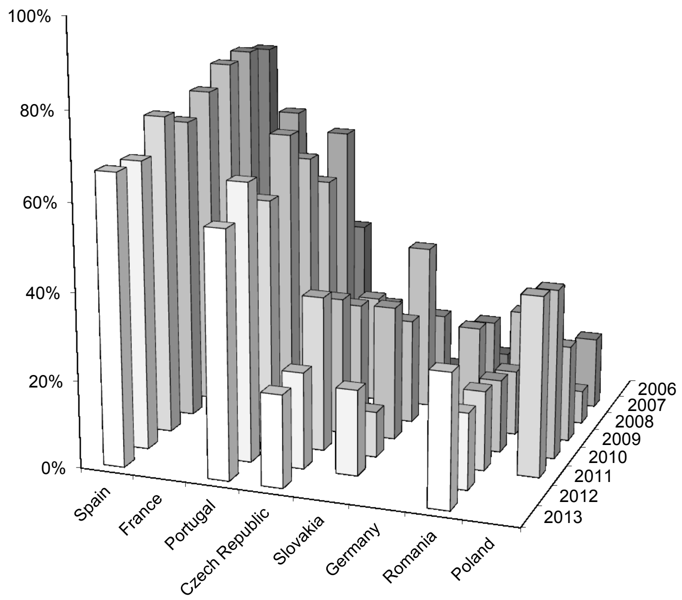

Figure 3.4: Mean percent of MON 810 cultivation area of total maize area per farmer in 2006 - 2013

In 2013 MON 810 was cultivated on one up to 60 fields per farm. In average every farmer cultivated MON 810 on nearly 5 fields (Table 3.6).

Table 3.6: Number of fields with MON 810 in 2013

Valid N	Mean	Minimum	Maximum	Sum
256	4.89	1	60	1251

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 that they cultivated in 2013 on their farm. 51 different MON 810 varieties and 109 different conventional maize varieties were listed. The most named varieties (at least 6 times) and the frequencies are listed in Table 3.7.

Table 3.7: Names of most cultivated MON 810 and conventional maize varieties in 2013

MON 810 maize		Conventional maize	
Variety	Frequency	Variety	Frequency
PR 33 Y 72	83	DKC 6717	44
PR 33 D 48	59	PR 33 Y 74	37
P 1758 Y	45	PR 32 T 16	29
DKC 6667 YG	43	P 1114	27
PR 35 A 56	24	P 1758	19
PR 34 A 27	20	PR 31 D 58	19
P 0725 YG (Aquamax)	19	DKC 6666	18
PR 33 W 86	19	PR 33 W 82	13
DKC 6451 YG	15	DKC 6815	10
Carella YG	11	P 0725	9
DKC 5590 YG	11	DKC 5276	8
HELEN BT	9	Sancia	8
DKC 5277 YG	8	SY Miami	8
LG 3711 YG	8	Carella	7
DKC 3512 YG	7	DKC 5542	6
PR 31 N 28	6	Guadiana	6
PR 32 G 49	6		
PR 33 P 67	6		
PR 36 V 78	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 carbon content were surveyed. Table 3.8 summarizes the reported soil types of the maize grown area.

Farmers responses regarding the quality of the soil of the area grown with maize are given in Table 3.9 and Figure 3.5. 96.1% (246/256) of the maize was grown on $normal$ or $good$ soil according to the response of the farmers. The highest percentages of $poor$ soil quality were found in Romania (100%, 2/2).

92 farmers were able to specify the humus content (not a commonly known measure all over Europe), which ranged from 0.6% to 6.5% with a mean of 1.6% (Table 3.10). 164 farmers did not specify the humus content: 100.0% (18/18) of the Czech and 76.8% (146/190) of the Spanish farmers.

Table 3.8: Predominant soil type of maize grown area in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	very fine (clay)	5	2.0	2.0	2.0
	fine (clay, sandy clay, silty clay)	49	19.1	19.1	21.1
	medium (sandy clay loam, clay loam, sandy silt)	129	50.4	50.4	71.5
	medium-fine (silty clay loam, silt loam)	21	8.2	8.2	79.7
	coarse (sand, loamy sand, sandy loam)	22	8.6	8.6	88.3
	no predominant soil type	30	11.7	11.7	100.0
Total		256	100.0	100.0	

Table 3.9: Soil quality of the maize grown area as assessed by the farmers in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	above average - good	100	39.1	39.1	39.1
	average - normal	146	57.0	57.0	96.1
	below average - poor	10	3.9	3.9	100.0
Total		256	100.0	100.0	

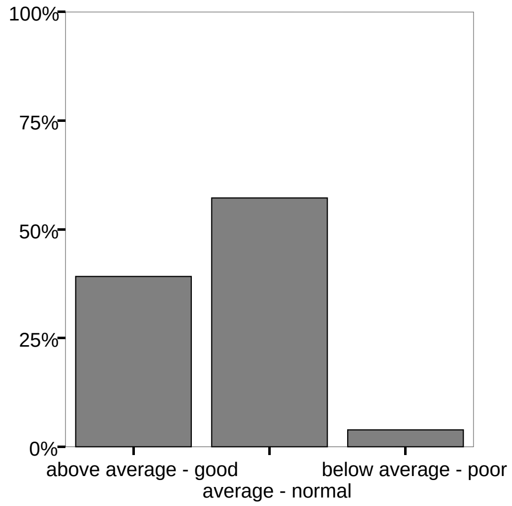

Figure 3.5: Soil quality of the maize grown area as assessed by the farmers in 2013

Table 3.10: Humus content (%) in 2013

Valid N	Mean	Minimum	Maximum	Missing N
92	1.6	0.6	6.5	164

3.2.6 Local disease, pest and weed pressure in maize

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

Local disease pressure as assessed by the farmers

The local disease pressure (fungal, viral) in maize was assessed to be low or $as\ usual$ by 93.4% (239/256) of the farmers (Table 3.11, Figure 3.6). From the 104 farmers who assessed the pressure to be low, 70.2% (73/104) came from Spain and 25.0% (26/104) came from Portugal. 6.6% (17/256) stated the local disease pressure as $high$, where 70.6% (12/17) of them came from Spain and 29.4% (5/17) from Portugal.

Table 3.11: Farmers assessment of the local disease pressure (fungal, viral) in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	low	104	40.6	40.6	40.6
	as usual	135	52.7	52.7	93.4
	high	17	6.6	6.6	100.0
Total		256	100.0	100.0	

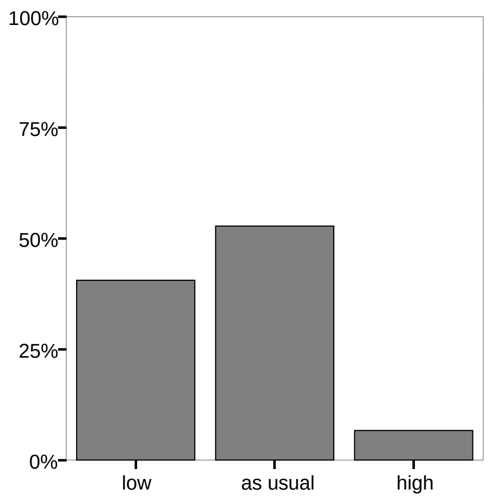

Figure 3.6: Farmers assessment of the local disease pressure (fungal, viral) in 2013

Local pest pressure as assessed by the farmers

Regarding the local pest pressure (insects, mites, nematodes), 94.1% (241/256) of the farmers evaluated it to be low or $as\ usual$ and 5.9% (15/256) evaluated it to be $high$ (Table 3.12, Figure 3.7). 72.7% (72/99) of the farmers assessing low pest pressure came from Spain, 93.3% (14/15) of the farmers with $high$ pest pressure also came from Spain.

Table 3.12: Farmers assessment of the local pest pressure (insects, mites, nematodes) in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	low	99	38.7	38.7	38.7
	as usual	142	55.5	55.5	94.1
	high	15	5.9	5.9	100.0
Total		256	100.0	100.0	

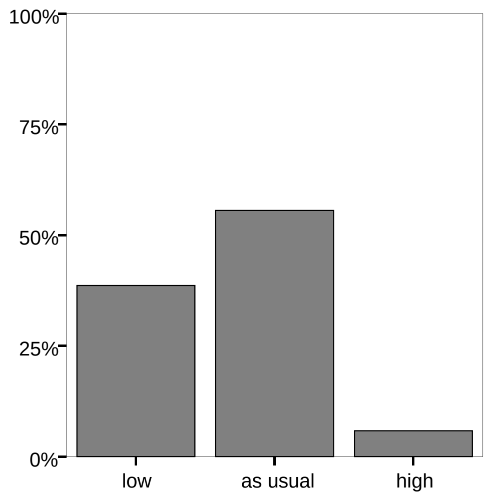

Figure 3.7: Farmers assessment of the local pest pressure (insects, mites, nematodes) in 2013

Local weed pressure as assessed by the farmers

82.8% (212/256) assessed the local weed pressure to be low or $as\ usual$ and 17.2% (44/256) evaluated it to be $high$ (Table 3.13, Figure 3.8). 92.9% (26/28) of the farmers with low weed pressure came from Spain. 72.7% (32/44) who evaluated it to be $high$ also came from Spain.

Table 3.13: Farmers assessment of the local weed pressure in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	low	28	10.9	10.9	10.9
	as usual	184	71.9	71.9	82.8
	high	44	17.2	17.2	100.0
Total		256	100.0	100.0	

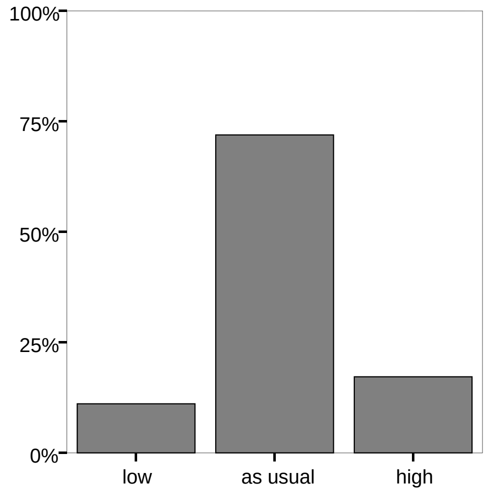

Figure 3.8: Farmers assessment of the local weed pressure in 2013

3.3 Part 2: Typical agronomic practices to grow maize

3.3.1 Irrigation of maize grown area

92.2% (236/256) irrigated their fields (Table 3.14): 100% (190/190) of the Spanish and 100% of the Portuguese (46/46). In Czech Republic and Romania the farmers did not irrigate their maize grown area. The irrigation of the maize grown area is a productivity factor. These data reflect the general practices in Europe. The irrigation depends on the weather conditions, even though it could be relevant for the analysis of GM maize specific effects.

Table 3.14: Irrigation of maize grown area in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	yes	236	92.2	92.2	92.2
	no	20	7.8	7.8	100.0
Total		256	100.0	100.0	

The most of the irrigating farmers used Gravity (44.9%) followed by Sprinkler (30.9%) and Pivot (17.8%). Some of them used more than one of the named or other types of irrigation (Table 3.15).

Table 3.15: Type of irrigation in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	Gravity	106	44.9	44.9	44.9
	Sprinkler	73	30.9	30.9	75.8
	Pivot	42	17.8	17.8	93.6
	other	7	3.07	3.0	96.6
	Gravity and Sprinkler	1	0.4	0.4	97.0
	Sprinkler and Pivot	3	1.3	1.3	98.3
	Pivot and other	3	1.3	1.3	99.6
	Sprinkler, Pivot and other	1	0.4	0.4	100.0
Total		236	100.0	100.0	

3.3.2 Major rotation of maize grown area

The main crop rotation within three years is $maize - maize - maize$ followed by $maize - cereals - maize$, $cereals - cereals - maize$ and $cereals - maize - maize$. Some other crop rotations were mentioned, but all with low occurrence (Table 3.16). The group of Legumes contains peas, beans, vetch (Vicia) and Lucerne (Alfalfa).

Table 3.16: Major rotation of maize grown area before 2013 planting season (two years ago and previous year) sorted by frequency

	Two years ago	Previous year	Frequency	Percent	Valid percentages	Accumulated percentages
Valid	maize	maize	117	45.7	45.7	45.7
	maize	cereals	29	11.3	11.3	57.0
	cereals	cereals	18	7.0	7.0	64.1
	cereals	maize	15	5.9	5.9	69.9
	legumes	legumes	9	3.5	3.5	73.4
	maize	cotton	9	3.5	3.5	77.0
	maize	vegetables	8	3.1	3.1	80.1
	oil plants	cereals	8	3.1	3.1	83.2
	vegetables	vegetables	6	2.3	2.3	85.5
	cereals	legumes	4	1.6	1.6	87.1
	legumes	maize	4	1.6	1.6	88.7
	legumes	vegetables	4	1.6	1.6	90.2
	maize	legumes	3	1.2	1.2	91.4
	vegetables	maize	3	1.2	1.2	92.6
	cotton	vegetables	2	0.8	0.8	93.4
	maize	oil plants	2	0.8	0.8	94.1
	no cultivation	maize	2	0.8	0.8	94.9
	oil plants	legumes	2	0.8	0.8	95.7
	oil plants	maize	2	0.8	0.8	96.5
	vegetables	oil plants	2	0.8	0.8	97.3
	cereals	oil plants	1	0.4	0.4	97.7
	cereals	vegetables	1	0.4	0.4	97.7
	legumes	cereals	1	0.4	0.4	98.0
	no cultivation	no cultivation	1	0.4	0.4	98.4
	no cultivation	vegetables	1	0.4	0.4	98.8
	oil plants	vegetables	1	0.4	0.4	99.2
	vegetables	legumes	1	0.4	0.4	99.6
Total			256	100.0	100.0	

3.3.3 Soil tillage practices

The farmers were asked to answer whether they performed soil tillage. 97.7% (250/256) said yes (Table 3.17) while 2.3% (6/256) answered no. Five farmers who answered no (83.3%) came from Spain, one (16.6%) from Czech Republic.

Table 3.17: Soil tillage practices in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	yes	250	97.7	97.7	97.7
	no	6	2.3	2.3	100.0
Total		256	100.0	100.0	

All farmers who said yes specified the time of tillage. 72.8% (182/250) performed it in $winter$, 26.4% (66/250) in $spring$ and 0.8% (2/250) in $winterandspring$ (Table 3.18, Figure 3.9).

Table 3.18: Time of tillage in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	winter	182	72.8	72.8	72.8
	spring	66	26.4	26.4	99.2
	winter & spring	2	0.8	0.8	100.0
Total		250	100.0	100.0	

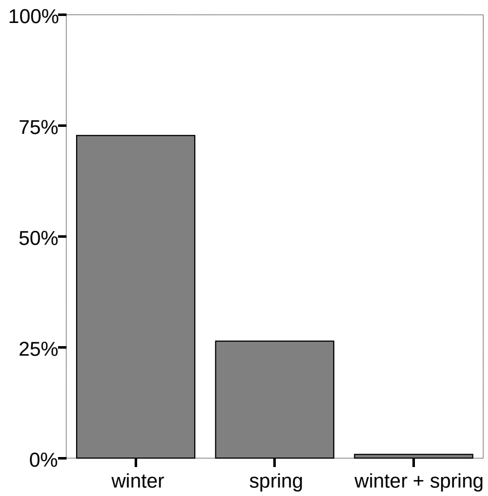

Figure 3.9: Time of tillage in 2013

3.3.4 Maize planting technique

88.7% (227/256) of the farmers used $conventional$ maize planting techniques, 7.0% (18/256) $mulch$ and 2.3% (6/256) used $directsowing$. Five of the farmers used two different of the above mentioned maize planting techniques on different fields (Table 3.19, Figure 3.10).

Table 3.19: Maize planting technique in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	conventional planting	227	88.7	88.7	88.7
	mulch	18	7.0	7.0	95.7
	direct sowing	6	2.3	2.3	98.0
	conventional & mulch sowing	4	1.6	1.6	99.6
	conventional & direct sowing	1	0.4	0.4	100.0
Total		256	100.0	100.0	

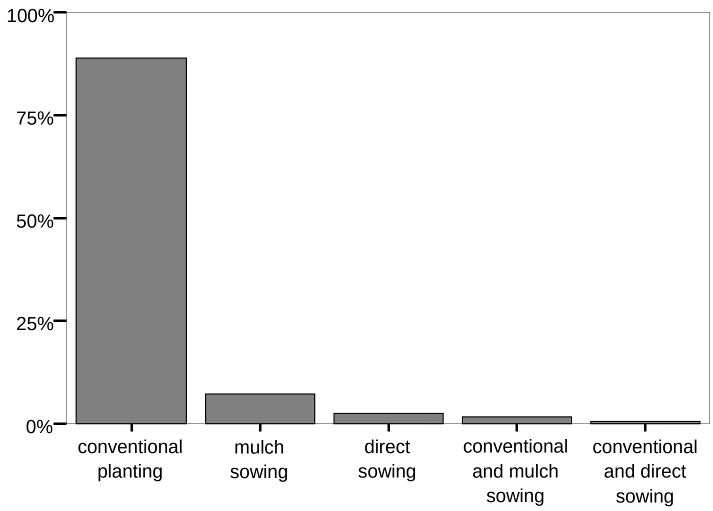

Figure 3.10: Maize planting technique in 2013

3.3.5 Typical weed and pest control practices in maize

Farmers were asked to specify the typical weed and pest control practices in maize at their farms. In conventional maize 92.6% of all farmers (237/256) apply $insecticides$ and 17.3% (41/237) of them apply also $insecticidesagainstcornborers$. One farmer (0.4%) uses $biocontroltreatments$, all of them (100.0%, 256/256) use $herbicides$, 24.6% (63/256) use $mechanicalweedcontrol$ and 7.4% (19/256) use $fungicides$ (Table 3.20) in conventional maize.

Table 3.20: Typical weed and pest control practices in maize in 2013

Insecticide(s)		Frequency	Percent
	yes	237	92.6
	No	19	7.4
Total		256	100.0
Insecticide(s) against corn borers		Frequency	Percent
	yes	41	17.3
	No	196	82.7
Total		237	100.0
Use of biocontrol treatments		Frequency	Percent
	yes	1	0.4
	No	255	99.6
Total		256	100.0
Herbicide(s)		Frequency	Percent
	yes	256	100.0
	no	0	0.0
Total		256	100.0

Mechanical weed control		Frequency	Percent
	yes	63	24.6
	No	193	75.4
Total		256	100.0
Fungicide(s)		Frequency	Percent
	yes	19	7.4
	No	237	92.6
Total		256	100.0

3.3.6 Application of fertilizer to maize grown area

All farmers (100%, 256/256) applied fertilizer to the maize grown area (Table 3.21).

Table 3.21: Application of fertilizer to maize grown area in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	yes	256	100.0	100.0	100.0
	no	0	0.0	0.0	100.0
Total		256	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 1 March 2013 to 30 July 2013 (Table 3.22).

Table 3.22: Typical time of maize sowing in 2013

	Earliest date	Latest date	Mean	Valid N
Sowing from	01.03.13	10.06.13	10.04.13	256
Sowing till	15.03.13	30.07.13	30.04.13	256

3.3.8 Typical time of maize harvest

The question on the typical time of harvest was also asked for quality control and to see if the collected data are within a plausible range. The time of harvest for maize grain ranged from 15 August 2013 to 30 December 2013 and for maize forage from 20 July 2013 to 5 November 2013 (Table 3.23).

Table 3.23: Typical time of maize harvest in 2013

	Earliest date	Latest date	Mean	Valid N
Harvest grain maize from	15.08.13	15.12.13	11.10.13	239
Harvest grain maize till	10.09.13	30.12.13	02.11.13	239
Harvest forage maize from	20.07.13	02.11.13	15.09.13	42
Harvest forage maize till	30.07.13	05.11.13	02.10.13	42

3.4 Part 3: Observations of MON 810

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

Crop rotation

The crop rotation for MON 810 was specified to be $as\ usual$ in 94.1% (241/256) of the cases (Table 3.24). (93.3%) of the farmers who $changed$ their crop rotation came from Spain and 1 (6.7%) from Czech Republic. 5 farmers planted MON 810 after potato instead of cotton, 4 farmers planted MON 810 after potato instead of maize, in each case 2 farmers planted MON 810 after potato instead of onion or after cereals instead of maize and in each case one farmer planted MON 810 after potato instead of beans or after maize instead of cereals. The individual explanations are listed in Appendix A, in Table A.1.

Table 3.24: Crop rotation for MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	as usual	241	94.1	94.1	94.1
	changed	15	5.9	5.9	100.0
Total		256	100.0	100.0	

(1) The valid percentage of $as\ usual$ crop rotation (94.1%) is significantly greater than 90%. The resulting P value is less than the level of significance $\alpha = 0.01$ (Table 3.25) and therefore, the null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 56.81%.

(2) The valid percentage of $changed$ crop rotation (5.9%) is less than 10% but the resulting P value is greater than the level of significance $\alpha = 0.01$ (Table 3.25). The null hypothesis $p_{changed} \geq 0.1$ can not be rejected. The lower 99% confidence interval limit is 0.021, the upper limit is 0.096.

No effect on crop rotation is indicated.

Table 3.25: Results of the binomial test for crop rotation for MON 810 compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
256			241 (94.1%)	< 0.01	15 (5.9%)	0.013

Planting time

The planting time of MON 810 was specified to be $as\ usual$ compared to conventional maize by 94.9% (243/256) of the farmers (Table 3.26, Figure 3.11). The individual specifications for $later$ planting of MON 810 are given in Appendix A, Table A.2.

(1) The valid percentage of $as\ usual$ planting time (94.9%) is significantly greater than 90%. The resulting P value is less than the level of significance $\alpha = 0.01$ (Table 3.27) and therefore, the null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 76.83%.

Table 3.26: Planting time of MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	earlier	0	0.0	0.0	0.0
	as usual	243	94.9	94.9	94.9
	later	13	5.1	5.1	100.0
Total		256	100.0	100.0	

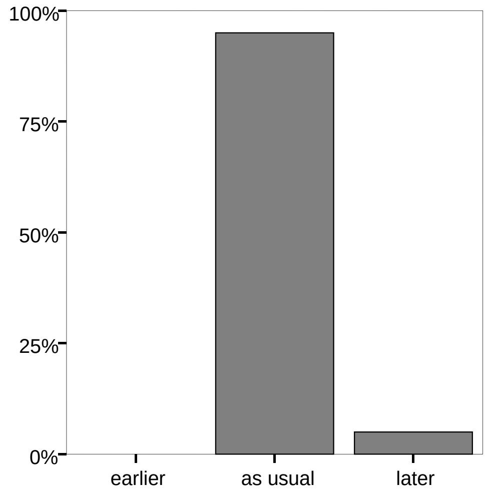

Figure 3.11: Planting time of MON 810 compared to conventional maize in 2013

(2) The valid percentage of $later$ planting (5.1%) is significantly less than 10% since the resulting P value is less than the level of significance $\alpha = 0.01$ (Table 3.27). Therefore, the null hypothesis $p_{later} \geq 0.1$ is rejected with a power of 67.78% for later planting.

(3) The percentage of $earlier$ planting (0.0%) is significantly smaller than 10%.

No effect on time of planting is indicated.

Table 3.27: Results of the binomial test for planting time for MON 810 compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
256	0 (0.0%)	< 0.01	243 (94.9%)	< 0.01	13 (5.1%)	< 0.01

Tillage and planting techniques

The majority of the farmers did not change the tillage and planting technique of MON 810 compared to that used in conventional maize, as reflected in Table 3.28. Only 5 farmers (2.0%, all from Spain) indicated a change. All 5 stated that they changed their maize planting technique for planting MON 810. The individual specifications for $changed$ tillage and planting technique of MON 810 are given in Appendix A, Table A.3.

Table 3.28: Tillage and planting techniques for MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	as usual	251	98.0	98.0	98.0
	changed	5	2.0	2.0	100.0
Total		256	100.0	100.0	

(1) The valid percentage of $as\ usual$ tillage and planting techniques (98.0%) is significantly greater than 90%. The resulting P value is less than the level of significance $\alpha = 0.01$ (Table 3.29) and therefore, the null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 100%.

(2)The valid percentage for $changed$ tillage and planting techniques (2.0%) is significantly less than 10% since the resulting P value is less than the level of significance $\alpha = 0.01$ (Table 3.29). Therefore, the null hypothesis $p_{changed} \geq 0.1$ is rejected with a power of 99.98%.

No effect on tillage and planting techniques is indicated.

Table 3.29: Results of the binomial test for tillage and planting techniques for MON 810 compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
256			251 (98.0%)	< 0.01	5 (2.0%)	< 0.01

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.4. MON 810 received insecticide treatments mainly through seed coatings. Clotianidin, Fipronil and Thiametoxam were used for that purpose. Abamectin is the most used active ingredient for spraying. Chlorpyrifos is registered for use as granules and spray, but during 2013 season it was used mostly as spray.

All farmers were asked to describe their insect control practice in MON 810 compared to conventional maize in 2013. 83.6% (214/256) specified no change in practice, while 16.4% (42/256) used a $different$ program (Table 3.30).

Table 3.30: Use of insect control in MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	similar	214	83.6	83.6	83.6
	different	42	16.4	16.4	100.0
Total		256	100.0	100.0	

(1) The valid percentage of $as\ usual$ insect control practice (83.6%) is less than 90%. The resulting P value is greater than the level of significance $\alpha = 0.01$ (Table 3.31) and therefore, the null hypothesis $p_{as\ usual} \leq 0.9$ can not be rejected.

(2) The valid percentage of $different$ insect control practice (16.4%) is greater than 10%. The resulting P value is greater than the level of significance $\alpha = 0.01$ (Table 3.31) and therefore, the null hypothesis $p_{different} \geq 0.1$ is not to reject.

An effect on insect control practice is indicated.

Table 3.31: Results of the binomial test for insect control practice in MON 810 compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
256			214 (83.6%)	0.999	42 (16.4%)	0.999

The difference arises from farmers using less insecticide applications in general (Table 3.32) as well as from farmers not controlling corn borers any more with conventional insecticide applications (Table 3.33). All individual explanations are given in Appendix A, Table A.5.

Table 3.32: Insect control practice compared to conventional maize in the context of the general use of insecticides in 2013

		Insect control practice in MON 810		
		similar	different	Total
Do you usually use insecticides? (section 3.3.5)	Yes	195	42	237
	No	19	0	19
Total		214	42	256

Table 3.33: Corn Borer control practice compared to conventional maize in the context of the general use of insecticides against Corn Borer in 2013

		Corn borer control practice in MON 810		
		similar	different	Total
Do you usually use insecticides against corn borer? (section 3.3.5)	Yes	0	41	41
	No	196	0	196
Total		196	41	237

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.

The difference in the use of general insecticide applications (less was used on MON 810 fields) was reported by farmers as the reduced need for general insecticide treatments in MON 810 fields. This could be explained by the fact that, compared with conventional maize, MON 810 is also less susceptible to Lepidopteran pests other than *Ostrinia nubilalis* and *Sesamia* spp. as described in section 3.4.5. This results in a reduced need for more general insecticide applications.

Weed control practice

The herbicides applied in MON 810 fields are listed in Appendix A, Table A.6. A wide number of herbicides and actives were used. The main actives of herbicides that were cited by the farmers are:

- Terbuthylazine
- S-Metolachlor
- Nicosulfuron
- Mesotrione
- Acetochlor
- Dicamba
- Isoxadifen-ethyl
- Fluroxypyr
- Bromoxynil
- Foramsulfuron

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

The farmers were asked to describe their weed control practice in MON 810 in 2013 compared to conventional maize. No farmer used a $different$ weed control in MON 810 compared to conventional maize (Table 3.34).

Table 3.34: Use of weed control in MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	similar	256	100.0	100.0	100.0
	different	0	0.0	0.0	100.0
Total		256	100.0	100.0	

No effect on weed control practice is indicated.

Fungal control practice

Fungicides are generally not applied in maize, but all maize usually receives a fungicide seed treatment. In the 2013 survey, as reported in section 3.3.5, 7.4% (19/256) of the farmers stated that fungicides were used for seed treatment in maize, and in some cases they could give information on what kind of fungicide was used. The actives of fungicides that were cited by the farmers are:

- Fludioxonil
- Mefenoxam

All named fungicides are commonly used for treatment of maize seed.

No farmer did change the fungicide program of MON 810 compared to that of conventional maize (Table 3.35).

No effect on fungal control practice is indicated.

Table 3.35: Use of fungicides on MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	similar	256	100.0	100.0	100.0
	different	0	0.0	0.0	100.0
Total		256	100.0	100.0	

Fertilizer application practice

All farmers answered the question regarding the fertilizer application in MON 810. 6 farmers (2.3%) used a $changed$ program (Table 3.36). The farmers stated that they used less fertilizer in MON 810 or changed the fertilizer from basal dressing to Nitrogen. The individual specifications for changed tillage and planting technique of MON 810 are given in Appendix A, Table A.7.

Table 3.36: Fertilizer application practice in MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	similar	250	97.7	97.7	97.7
	changed	6	2.3	2.3	100.0
Total		256	100.0	100.0	

(1) The valid percentage for $as\ usual$ fertilizer application practice (97.7%) is significantly greater than 90% since the resulting P value is less than the level of significance $\alpha = 0.01$ (Table 3.37). Therefore, the null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 99.96%.

(2) The valid percentage for $changed$ fertilizer application practice (2.3%) is significantly less than 10% since the resulting P value is less than the level of significance $\alpha = 0.01$ (Table 3.37). Therefore, the null hypothesis $p_{changed} \geq 0.1$ is rejected with a power of 99.88%.

No effect on fertilizer application practice is indicated.

Table 3.37: Results of the binomial test for fertilizer application practice in MON 810 compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
256			250 (97.7%)	< 0.01	6 (2.3%)	< 0.01

Irrigation practice

All farmers answered the question regarding the irrigation practice in MON 810, no farmer $changed$ the practice (Table 3.38).

No effect on irrigation practice is indicated.

Table 3.38: Irrigation practice in MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	similar	256	100.0	100.0	100.0
	changed	0	0.0	0.0	100.0
Total		256	100.0	100.0	

Harvest of MON 810

The farmers were asked whether they harvested MON 810 earlier or later than conventional maize or as usual. 243 of them (94.9%) responded that no change in harvesting date was applied for MON 810. Only 5.1% (13/256) stated that they harvested MON 810 $later$ (Table 3.39, Figure 3.12). The main reason given for $later$ harvest of MON 810 is increased flexibility (cropping system, logistics, channeling/coexistence). The full individual feedback of the farmers for later harvesting time is given in Appendix A, Table A.8.

Table 3.39: Harvest of MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	earlier	0	0.0	0.0	0.0
	as usual	243	94.9	94.9	94.9
	later	13	5.1	5.1	100.0
Total		256	100.0	100.0	

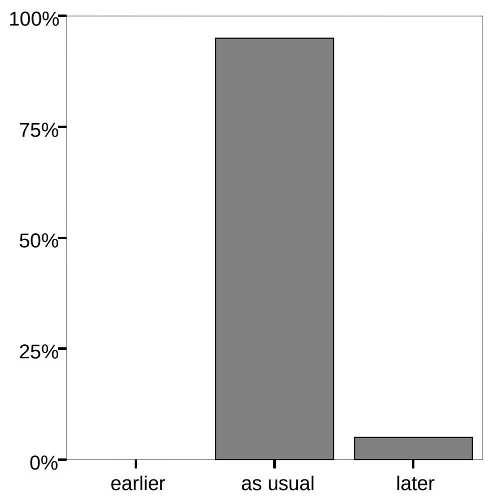

Figure 3.12: Harvest of MON 810 compared to conventional maize in 2013

(1) The valid percentage of $as\ usual$ harvest (94.9%) is significantly greater than 90%. The resulting P value is less than the level of significance $\alpha = 0.01$ (Table 3.40) and therefore, the corresponding null hypothesis $p_{as\ usual} \leq 0.9$ could be rejected with a power of 76.83%.

(2) The valid percentage of $later$ harvest (5.1%) does not exceed the 10% threshold and the resulting P value is not greater than the level of significance $\alpha = 0.01$ (Table 3.40). Therefore, the corresponding null hypothesis $p_{later} \geq 0.1$ could be rejected with a power of 67.78%.

(3) The valid percentage of $earlier$ harvest (0.0%) is significantly smaller than 10%.

No effect on the harvest time is indicated.

Table 3.40: Results of the binomial tests for different harvesting time of MON 810 compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
256	0 (0.0%)	< 0.01	243 (94.9%)	< 0.01	13 (5.1%)	< 0.01

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

Agricultural practice in MON 810 (compared to conventional maize) were not changed with regard to crop rotation, planting time, tillage and planting techniques, weed control, fungal control, fertilizer application, irrigation and harvest time of MON 810. Differences exist in the aspect insect and corn borer control of MON 810.

The difference in insect and corn borer control arises from farmers not controlling corn borers any more with conventional insecticide applications, because MON 810 is specifically designed to control corn borers as *Ostrinia nubilalis* and *Sesamia* spp. Furthermore, less insecticides were used in general since MON 810 is also less susceptible to several Lepidopteran pests other than *Ostrinia nubilalis* and *Sesamia* spp.

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

Germination vigor

7.4% (19/256) of all farmers assessed the germination of MON 810 to be $more\ vigorous$, two farmers (0.8%) assessed it to be $less\ vigorous$ (Table 3.41, Figure 3.13). Individual explanations for the observations of the farmers are given in Appendix A, Table A.9.

Table 3.41: Germination of MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less vigorous	2	0.8	0.8	0.8
	as usual	235	91.8	91.8	92.6
	more vigorous	19	7.4	7.4	100.0
Total		256	100.0	100.0	

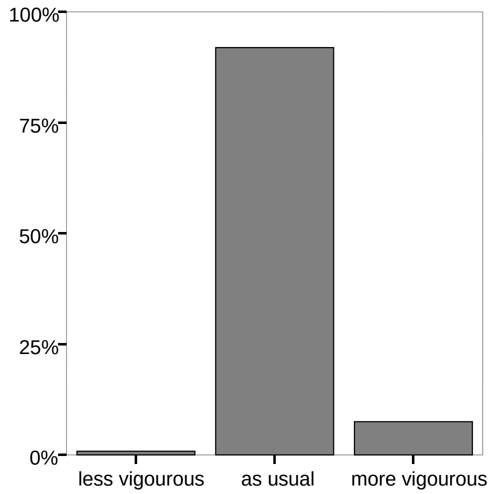

Figure 3.13: Germination of MON 810 compared to conventional maize in 2013

(1) The valid percentage for $as\ usual$ germination (92.6%) is greater than 90% but the resulting P value exceeds the level of significance $\alpha = 0.01$ (Table 3.42), i.e. the null hypothesis $p_{as\ usual} \leq 0.9$ could not be rejected. The lower 99% confidence interval limit is 0.874, the upper limit is 0.962.

(2) The valid percentage for $more\ vigorous$ germination (7.4%) does not exceed the 10% threshold, but the P value does exceed the level of significance $\alpha = 0.01$ (Table 3.42), i.e. the null hypothesis for $p_{more\ vigourous} \geq 0.1$ could not be rejected. The lower 99% confidence interval limit is 0.032, the upper limit is 0.116.

(3) The valid percentage of $less\ vigorous$ germination (0.8%) does not exceed the 10% threshold. The P value does not exceed the level of significance $\alpha = 0.01$ (Table 3.42), i.e. the null hypothesis for $p_{less\ vigorous} \geq 0.1$ could be rejected with a power of 100%.

An effect on the germination vigor is indicated.

Table 3.42: Results of the binomial tests for germination vigor of MON 810 compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
256	2 (0.8%)	< 0.01	235 (91.8%)	0.143	19 (7.4%)	0.098

Time to emergence

One farmer (0.4%, 1/256) indicated the time to emergence to be $delayed$ (Table 3.43, Figure 3.14). The individual explanation for this observation is given in Appendix A, Table A.9.

Table 3.43: Time to emergence of MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	accelerated	0	0.0	0.0	0.0
	as usual	255	99.6	99.6	99.6
	delayed	1	0.4	0.4	100.0
Total		256	100.0	100.0	

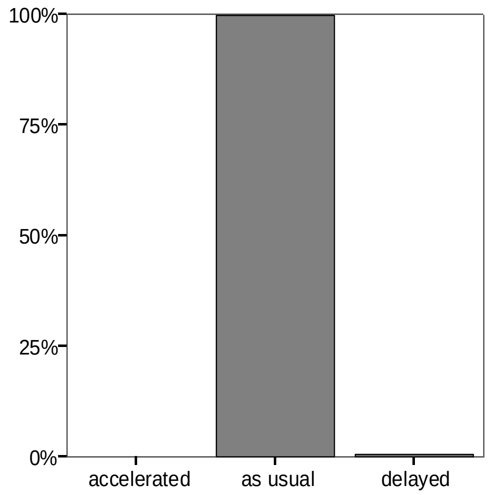

Figure 3.14: Time to emergence of MON 810 compared to conventional maize in 2013

(1) Valid percentage for $as\ usual$ 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 3.44), so the null hypothesis $p_{as\ usual} \leq 0.9$ could be rejected with a power of 100%.

(2) Valid percentage for $delayed$ time to emergence (0.4%) does not exceed the 10% threshold. The resulting P value is less than the level of significance $\alpha = 0.01$ (Table 3.44), so the hypothesis $p_{delayed} \geq 0.1$ could be rejected with a power of 100%.

(3) Valid percentage for $accelerated$ time to emergence (0.0%) is significantly smaller than 10%.

No effect on time to emergence is indicated.

Table 3.44: Results of the binomial tests for time to emergence of MON 810 compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
256	2 (0.0%)	< 0.01	255 (99.6%)	< 0.01	1 (0.4%)	< 0.01

Time to male flowering

Time to male flowering was assessed to be $accelerated$ in 0.8% (2/256) and to be $delayed$ in 0.4% (1/256) of all cases (Table 3.45, Figure 3.15). Individual explanations for these observations are given in Appendix A, Table A.9.

Table 3.45: Time to male flowering of MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	accelerated	2	0.8	0.8	0.8
	as usual	253	98.8	98.8	99.6
	delayed	1	0.4	0.4	100.0
Total		256	100.0	100.0	

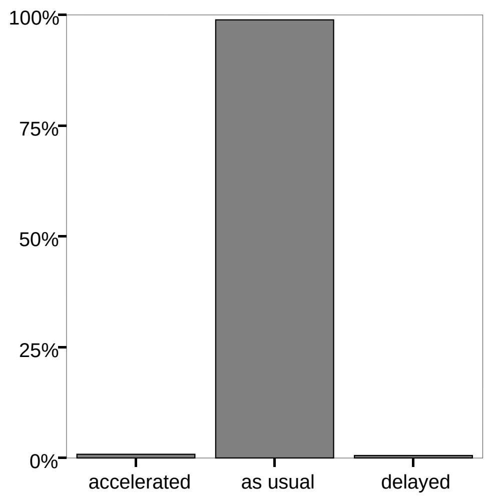

Figure 3.15: Time to male flowering of MON 810 compared to conventional maize in 2013

(1) The valid percentage of $as\ usual$ time to male flowering (98.9%) is significantly greater then 90% and the resulting P value is less than the level of significance $\alpha = 0.01$ (Table 3.46). The null hypothesis $p_{as\ ususal} \leq 0.9$ could be rejected with a power of 99.99%.

(2) The valid percentage of $accelerated$ time to male flowering (0.8%) does not exceed the 10% threshold and the resulting P value is less than the level of significance $\alpha = 0.01$ (Table 3.46). The null hypothesis $p_{accelerated} \geq 0.1$ could be rejected with a power of 99.99%.

(3) The valid percentage of $delayed$ time to male flowering (0.4%) does not exceed the 10% threshold and the resulting P value is less than the level of significance $\alpha = 0.01$ (Table 3.46). The null hypothesis $p_{delayed} \geq 0.1$ could be rejected with a power of 100%.

No effect on time to male flowering is indicated.

Table 3.46: Results of the binomial tests for time to male flowering of MON 810 compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
256	2 (0.8%)	< 0.01	253 (98.8%)	< 0.01	1 (0.4%)	< 0.01

Plant growth and development

Plant growth and development was $accelerated$ in 1.2% (3/256) and $delayed$ in 0.8% (2/256) of all cases (Table 3.47, Figure 3.16). Individual explanations for these observations are given in Appendix A, Table A.9.

Table 3.47: Plant growth and development of MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	accelerated	3	1.2	1.2	1.2
	as usual	251	98.0	98.0	99.2
	delayed	2	0.8	0.8	100.0
Total		256	100.0	100.0	

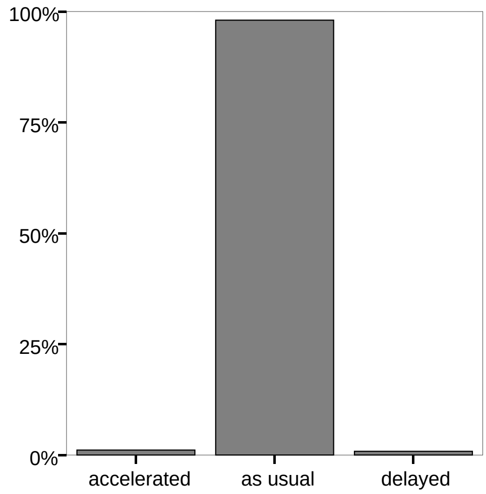

Figure 3.16: Plant growth and development of MON 810 compared to conventional maize in 2013

(1) The valid percentage for $as\ usual$ plant growth and development (98.0%) is significantly greater than 90%. The resulting P value is less than the level of significance $\alpha = 0.01$ (Table 3.48). Therefore the null hypothesis $p_{as\ usual} \leq 0.9$ can be rejected with a power of 99.99%.

(2) The valid percentage for $accelerated$ plant growth and development (1.2%) is significantly less than the 10% threshold. The resulting P value is less than the level of significance $\alpha = 0.01$ (Table 3.48). Therefore the null hypothesis $p_{accelerated} \geq 0.1$ can be rejected with a power of 99.99%.

(3) The valid percentage for $delayed$ plant growth and development (0.8%) is significantly less than the 10% threshold. The resulting P value is less than the level of significance $\alpha = 0.01$ (Table 3.48). Therefore the null hypothesis $p_{delayed} \geq 0.1$ can be rejected with a power of 99.99%.

No effect on plant growth and development is indicated.

Table 3.48: Results of the binomial tests for plant growth and development of MON 810 compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
256	3 (1.2%)	< 0.01	251 (98.0%)	< 0.01	2 (0.8%)	< 0.01

Incidence of stalk/root lodging

Incidence of stalk/root lodging was assessed to be $less$ in MON 810 compared to conventional maize in 17.2% (44/256) of all cases (Table 3.49, Figure 3.17). Individual explanations for these observations are given in Appendix A, Table A.9.

Table 3.49: Incidence of stalk/root lodging of MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less	44	17.2	17.2	17.2
	as usual	212	82.8	82.8	100.0
	more	0	0.0	0.0	100.0
Total		256	100.0	100.0	

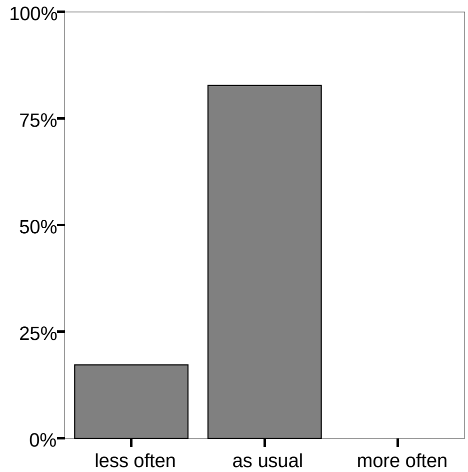

Figure 3.17: Incidence of stalk/root lodging of MON 810 compared to conventional maize in 2013

(1) The valid percentage of $as\ usual$ incidence of stalk/root lodging (82.8%) is less than 90%. The resulting P value is larger than the level of significance $\alpha = 0.01$ (Table 3.50) 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 (17.2%) does exceed the 10% threshold. The resulting P value is greater than the level of significance $\alpha = 0.01$ (Table 3.50) and therefore, the corresponding null hypothesis $p_{less} \geq 0.1$ could not be rejected.

(3) The valid percentage of $more$ incidence of stalk/ root lodging (0.0%) is significantly smaller than 10%.

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

Table 3.50: Results of the binomial tests for incidence of stalk/root lodging of MON 810 compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
256	44 (17.2%)	1.0	212 (82.8%)	1.0	0 (0.0%)	< 0.01

Time to maturity

12.5% (32/256) of the farmers assessed the time to maturity to be $delayed$ for MON 810 (Table 3.51, Figure 3.18). Individual explanations for these observations are given in Appendix A, Table A.9.

Table 3.51: Time to maturity of MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	accelerated	0	0.0	0.0	0.0
	as usual	224	87.5	87.5	87.5
	delayed	32	12.5	12.5	100.0
Total		256	100.0	100.0	

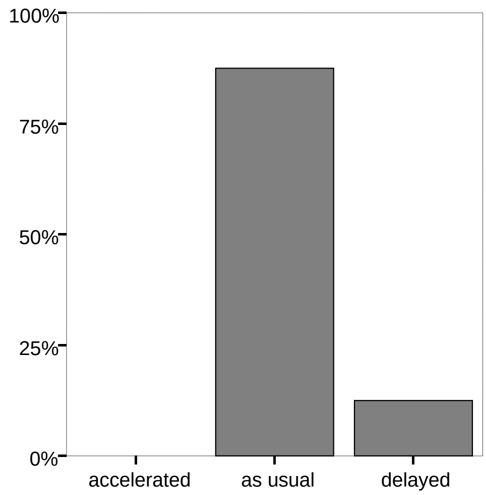

Figure 3.18: Time to maturity of MON 810 compared to conventional maize in 2013

(1) The valid percentage of $as\ usual$ time to maturity (87.5%) is not greater than 90%. The resulting P value is exceeds the level of significance $\alpha = 0.01$ (Table 3.52) and the null hypothesis $p_{as\ usual} \leq 0.9$ can not be rejected.

(2) The valid percentage of $delayed$ time to maturity (12.5%) exceeds the 10% threshold. The resulting P value is greater than level of significance $\alpha = 0.01$ (Table 3.52) and therefore, the corresponding null hypothesis $p_{delayed} \geq 0.1$ could not be rejected.

(3) The percentage of $accelerated$ time to maturity (0.0%) is significantly smaller than 10%.

An effect on the time to maturity of MON 810 is clearly indicated.

Table 3.52: Results of the binomial tests for time to maturity of MON 810 compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
256	0 (0.0%)	< 0.01	224 (87.5%)	0.888	32 (12.5%)	0.921

Yield

Yield was $higher$ in 34.8% (89/256) and $lower$ in 2.0% (5/256) of all cases (Table 3.53, Figure 3.19). Individual explanations for these observations are given in Appendix A, Table A.9.

Table 3.53: Yield of MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	lower yield	5	2.0	2.0	2.0
	as usual	162	63.3	63.3	65.2
	higher yield	89	34.8	34.8	100.0
Total		256	100.0	100.0	

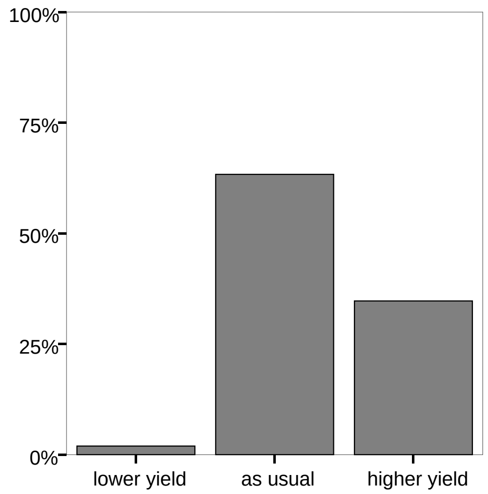

Figure 3.19: Yield of MON 810 compared to conventional maize in 2013

(1) The valid percentage of $as\ usual$ yield (63.3%) is not greater than 90%. The resulting P value is greater the than level of significance $\alpha = 0.01$ (Table 3.54) and therefore, the corresponding null hypothesis $p_{as\ usual} \leq 0.9$ could not be rejected.

(2) The valid percentage of $higher$ yield (34.8%) exceeds the 10% threshold. The resulting P value is greater the than level of significance $\alpha = 0.01$ (Table 3.54) and therefore, the corresponding null hypothesis $p_{higher} \geq 0.1$ could not be rejected.

(3) The valid percentage of $lower$ yield (2.0%) does not exceed the 10% threshold. The resulting P value is smaller the than level of significance $\alpha = 0.01$ (Table 3.54) and therefore, the corresponding null hypothesis $p_{lower} \geq 0.1$ could be rejected with a power of 99.98%.

An effect on yield of MON 810 is clearly indicated.

Table 3.54: Results of the binomial tests for yield of MON 810 compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
256	5 (2.0%)	< 0.01	162 (63.3%)	1.0	89 (34.8%)	1.0

Occurrence of volunteers

The occurrence of volunteers was assessed to be $less$ frequent for MON 810 than for conventional maize in 4.0% (10/250) of the valid cases (Table 3.55, Figure 3.20). Individual explanations for these observations are given in Appendix A, Table A.9.

Table 3.55: Occurrence of MON 810 volunteers compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less	10	3.9	4.0	4.0
	as usual	240	93.8	96.0	100.0
	more	0	0.0	0.0	100.0
	Total	250	97.7	100.0	
Missing	no statement	6	2.3		
Total		256	100.0		

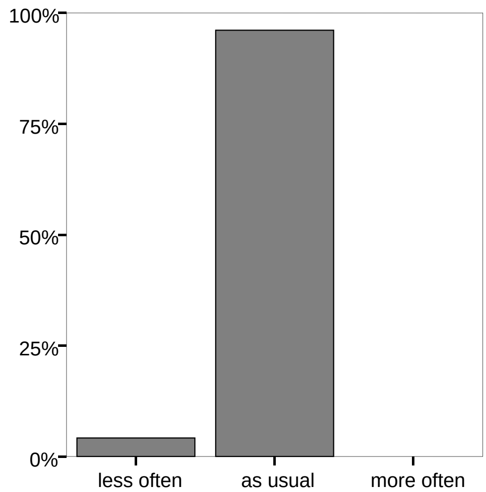

Figure 3.20: Occurrence of MON 810 volunteers compared to conventional maize in 2013

(1) The valid percentage of $as\ usual$ occurrence of volunteers (96.0%) is significantly greater than 90%.

The resulting P value is smaller than the level of significance $\alpha = 0.01$ (Table 3.56) and therefore, the corresponding null hypothesis $p_{as\ usual} < 0.9$ could be rejected with a power of 95.48%.

(2) The valid percentage of $less$ occurrence of volunteers (4.0%) does not exceed the 10% threshold. The resulting P value is smaller than the level of significance $\alpha = 0.01$ (Table 3.56) and therefore, the corresponding null hypothesis $p_{less} \geq 0.1$ could be rejected, with a power of 92.08%.

(3) The percentage of $more$ occurrence of volunteers (0.0%) is significantly smaller than 10%.

No effect on occurrence of MON 810 volunteers is indicated.

Table 3.56: Results of the binomial tests for occurrence of MON 810 volunteers compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
250	10 (4.0%)	< 0.01	240 (96.0%)	< 0.01	0 (0.0%)	< 0.01

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

A summary of these results for the characteristics of MON 810 in the field compared to conventional maize shows:

- **a slightly more vigorous germination,**
- **an unchanged time to emergence,**
- **an unchanged time to male flowering,**
- **an unchanged plant growth and development,**
- **a lower incidence of stalk/root lodging,**
- **a delayed time to maturity,**
- **a higher yield and**
- **an unchanged occurrence of MON 810 volunteers.**

The lack of differences in these characters underlines the substantial equivalence of MON 810 to comparable conventional lines, as evidenced by recent genomic and proteomic analyses (Coll et al. 2008 [8], 2009 [9], 2010 [10], 2011 [11]).

The more vigorous germination is likely associated to the quality of the germplasm.

Corn borer damage affects maturation and especially yield negatively, therefore the differences in these monitoring characters can be explained by the absence of corn borer damage.

The difference in the incidence of stalk/root lodging can also be explained this way. Therefore, differences in these parameters are anticipated and only underline the effectiveness of corn borer control.

The longer time to maturity might also be an effect of corn borer control: in the presence of pests, plants need to reach maturity faster. In the absence of pest pressure, plants can maximize the output of biomass and have a longer period of seed set and ripening. This could explain the longer time to maturity reported for MON 810 by 12.5% of farmers. The low percentage indicates that this phenomenon is restricted to areas of pest pressure. If this was a more general effect, the valid percentage of farmers reporting on this would be much higher.

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

Farmers assessed MON 810 to be $less\ susceptible$ to diseases in 12.5% (32/249) of the valid cases (Table 3.57, Figure 3.21).

Table 3.57: Disease susceptibility in MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less susceptible	32	12.5	12.5	12.5
	as usual	223	87.1	87.5	100.0
	more susceptible	0	0.0	0.0	100.0
	Total	255	99.6	100.0	
Missing	no statement	1	0.4		
Total		256	100.0		

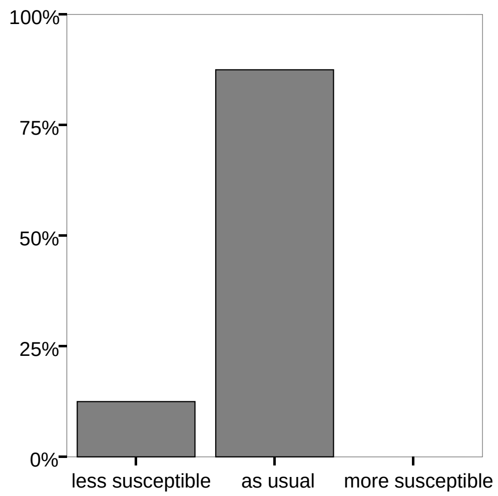

Figure 3.21: Disease susceptibility in MON 810 compared to conventional maize in 2013

(1) The valid percentage of $as\ ususal$ disease susceptibility (87.5%) is less than 90%. The resulting P value is greater than the level of significance $\alpha = 0.01$ (Table 3.58) and therefore, the corresponding null hypothesis $p_{as\ ususal} \leq 0.9$ could not be rejected.

(2) The valid percentage of lower disease susceptibility (12.5%) exceeds the 10% threshold. The resulting P value is greater than the level of significance $\alpha = 0.01$ and therefore, the corresponding null hypothesis $p_{less\ susceptible} \geq 0.1$ could not be rejected.

(3) The valid percentage of $more$ disease susceptibility (0.0%) is significantly smaller than 10%.

An effect on disease susceptibility is clearly indicated.

The 32 farmers that answered different from $as\ usual$ were asked to specify the difference in disease susceptibility by listing the diseases with an explanation. Table 3.59 lists the reported diseases with an assessment of the disease susceptibility of MON 810, compared to conventional maize. This list shows that the lower disease susceptibility was predominantly attributed to a lower susceptibility to

Table 3.58: Results of the binomial tests for disease susceptibility of MON 810 compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
255	32 (12.5%)	0.924	223 (87.1%)	0.892	0 (0.0%)	< 0.01

Fusarium spp. (6.7%, 17/255), *Ustilago maydis* (5.5%, 14/255); to a lesser extent, a lower susceptibility to *Helminthosporium* spp. (2.7%, 7/255), as well as some other fungal, bacterial and viral diseases that also were mentioned.

Table 3.59: Specification of differences in disease susceptibility in MON 810 compared to conventional maize in 2013

Group	Species	Less
Fungus	*Fusarium* spp.	17
	Ustilago maydis	14
	Helminthosporium spp.	7
	Cephalosporium spp.	4
	Sphacelotheca reiliana	2
	Puccinia sorghi	2
	Rhizoctonia solani	2
	Hongos generos Fusarium	1
Bacteria	*Erwinia*	4

Additional comments on disease susceptibility are given in Appendix A, Table A.11.

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

The differences were indicated to have been observed for a number of different fungal species, most notably *Fusarium* spp., *Ustilago maydis* and *Helminthosporium* spp.

This observation is not surprising, since it has been well established that feeding holes and tunnels of the corn borer serve as entry points for secondary fungal infections, especially of the *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 et al., 1999 [21]; Dowd, 2000 [12]; Bakan et al., 2002 [1]; Hammond et al., 2003 [16]; Wu, 2006 [52]). The farmers' testimony (Appendix A, Table A.11) thus corroborate previous findings.

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

The insect pest control of *Ostrinia nubilalis* (European corn borer) was assessed to be $very\ good$ or $good$ in 100.0% (256/256) of the cases (Table 3.60, Figure 3.22).

Table 3.60: Insect pest control of *Ostrinia nubilalis* in MON 810 in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	weak	0	0.0	0.0	0.0
	good	28	10.9	10.9	10.9
	very good	228	89.1	89.1	100.0
Total		256	100.0	100.0	

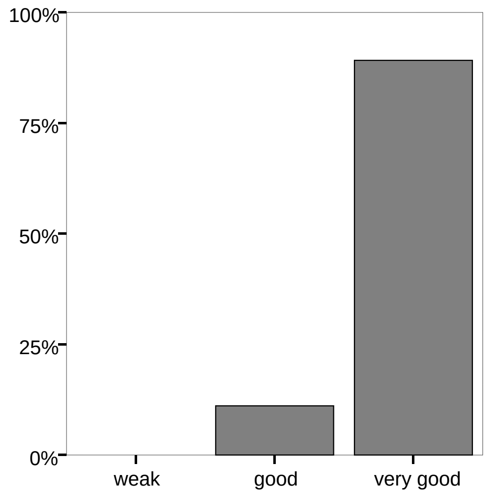

Figure 3.22: Insect pest control of *Ostrinia nubilalis* in MON 810 in 2013

(1) The percentages for $good$ insect pest control of *Ostrinia nubilalis* (10.9%) is less than 90%. The resulting P value is greater than the level of significance $\alpha = 0.01$ (Table 3.61). The null hypothesis $p_{good} \leq 0.9$ can not be rejected.

(2) The percentages for $very\ good$ insect pest control of *Ostrinia nubilalis* (89.1%) is greater than 10%. The resulting P value is greater than the level of significance $\alpha = 0.01$ (Table 3.61). The null hypothesis $p_{very\ good} \leq 0.1$ can not be rejected.

(3) The valid percentage of $weak$ insect pest control of *Ostrinia nubilalis* (0.0%) is significantly smaller than 10%.

This clearly indicates an effect that is expected because MON 810 is genetically modified to be protected against this pest.

Table 3.61: Results of the binomial tests for Insect pest control of *Ostrinia nubilalis* in MON 810 in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
256	0 (0.0%)	< 0.01	28 (10.9%)	0.267	228 (89.1%)	1.0

100.0% (236/236) of the farmers who gave a valid answer attested a $good$ or $very\ good$ control of *Sesamia* spp. (Table 3.62, Figure 3.23). The high percentage of missing values in efficacy of MON 810 against *Sesamia* spp. (Pink Borer) resulted from the fact that this question was not answered in the

Czech Republic and Romania since the pest is just not present in these countries.

Table 3.62: Insect pest control of *Sesamia* spp. in MON 810 in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	weak	0	0.0	0.0	0.0
	good	27	10.5	11.4	11.4
	very good	209	81.6	81.6	100.0
	Total	236	92.1	100.0	
Missing	No statement	20	7.8		
Total		256	100.0		

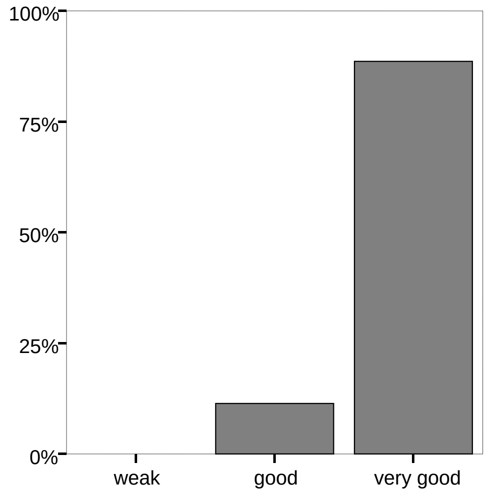

Figure 3.23: Insect pest control of *Sesamia* spp. in MON 810 in 2013

(1) The percentages for $good$ insect pest control of *Sesamia* spp. (11.4%) is less than 90%. The resulting P value is greater than the level of significance $\alpha = 0.01$ (Table 3.61). The null hypothesis $p_{good} \leq 0.9$ can not be rejected.

(2) The percentages for $very\ good$ insect pest control of *Sesamia* spp. (81.6%) is greater than 10%. The resulting P value is greater than the level of significance $\alpha = 0.01$ (Table 3.61). The null hypothesis $p_{very\ good} \leq 0.1$ can not be rejected.

(3) The valid percentage of $weak$ insect pest control of *Sesamia* spp. (0.0%) is significantly smaller than 10%.

This clearly indicates an effect that is expected because MON 810 is genetically modified to be protected against this pest.

Table 3.63: Results of the binomial tests for Insect pest control of *Sesamia* spp. in MON 810 in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
236	0 (0.0%)	< 0.01	27 (10.5%)	0.196	209 (81.6%)	1.0

Additional comments on insect pest control are listed in Appendix A, Table A.12.

Assessment of insect pest control in MON 810 fields (compared to conventional maize)

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 18.0% (46/255) of all valid cases (Table 3.64, Figure 3.24). One farmer (0.4%) assessed the MON 810 plants to be more susceptible to pests.

Table 3.64: Pest susceptibility of MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less susceptible	46	18.0	18.0	18.0
	as usual	208	81.3	81.6	99.6
	more susceptible	1	0.4	0.4	100.0
	Total	255	99.6	100.0	
Missing	No statement	1	0.4		
Total		256	100.0		

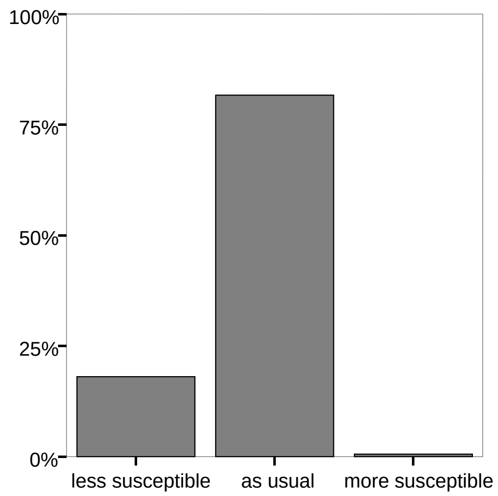

Figure 3.24: Pest susceptibility of MON 810 compared to conventional maize in 2013

(1) The valid percentage of $as\ usual$ pest susceptibility (81.6%) is less than 90%. The resulting P value is greater than the level of significance $\alpha = 0.01$ (Table 3.65) and therefore, the corresponding null hypothesis $p_{as\ usual} \leq 0.9$ could not be rejected.

(2) The valid percentage of lower pest susceptibility (18.0%) exceeds the 10% threshold. The resulting P value is greater than the level of significance $\alpha = 0.01$ (Table 3.65) and therefore, the corresponding null hypothesis $p_{less\ susceptible} \geq 0.1$ could not be rejected.

(3) The valid percentage of higher pest susceptibility (0.4%) does not exceed the 10% threshold and the resulting P value is smaller than the level of significance $\alpha = 0.01$ (Table 3.65), i.e. the null hypothesis $p_{more\ susceptible} \geq 0.1$ could be rejected with a power of 100%.

An effect on pest susceptibility is clearly indicated.

Table 3.65: Results of the binomial tests for pest susceptibility in MON 810 compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
255	46 (18.0%)	1.0	208 (81.6%)	1.0	1 (0.4%)	< 0.01

The 46 farmers that answered different from $as\ usual$ were asked to specify the difference in pest susceptibility by listing the pests with an explanation. Table 3.66 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 3.66: Specification of differences in pest susceptibility in MON 810 compared to conventional maize in 2013

Order	Name	different	less	more
Lepidoptera	*Agrotis* spp.	38	38	-
	Spodoptera spp.	9	9	-
	Mythimna spp.	3	2	1
	Heliotis	1	1	-
Arachnida	*Tetranychus* spp.	10	10	-
Coleoptera	*Diabrotica* spp.	14	14	-
	Agriotes spp.	2	2	-
Hemiptera	Aphids	2	2	-

If the answers concerning Lepidopteran pests are removed the pest susceptibility is $as\ usual$ in 88.5% of the left valid cases (Table 3.67, Figure 3.25).

Table 3.67: Pest susceptibility of MON 810 compared to conventional maize in 2013 when Lepidopteran pests are removed

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less susceptible	27	11.4	11.5	11.5
	as usual	208	88.1	88.5	100.0
	more susceptible	0	0	0	100.0
	Total	235	99.6	100.0	
Missing	No statement	1	0.4		
Total		236	100.0		

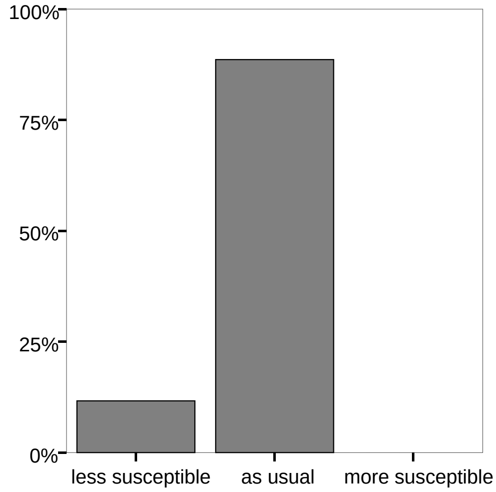

Figure 3.25: Pest susceptibility of MON 810 compared to conventional maize in 2013 when Lepidopteran pests are removed

The data on susceptibility to other pests than Lepidoptera were analyzed separately for each order of pests (Table 3.68).

(1) Here the percentages of $as\ usual$ susceptibility are greater than 90% for all three orders of pests, but the resulting P value for Coleoptera is greater than the level of significance $\alpha = 0.01$. For the probability of $as\ usual$ susceptibility to Coleoptera the lower 99% confidence interval limit is 0.890, the upper limit is 0.974.

(2) The percentages of lower susceptibility do not exceed the threshold of 10% for all three orders of pests, but the resulting P value for Coleoptera is greater than the level of significance $\alpha = 0.01$. For the probability of $less$ susceptibility to Coleoptera the lower 99% confidence interval limit is 0.026, the upper limit is 0.110.

(3) The percentages for higher susceptibility are significantly smaller than 10% for all three orders of pests.

An effect is indicated on susceptibility to Coleoptera, i.e. *Diabrotica* spp. and *Agriotes* spp. To all other orders of pests no effect is indicated.

Table 3.68: Results of the binomial tests for single order susceptibilities of MON 810 compared to conventional maize in 2013 when Lepidopteran pests are removed

	N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
Arachnida	235	10 (4.3%)	< 0.01	225 (95.7%)	< 0.01	0 (0.0%)	< 0.01
Coleoptera	235	16 (6.8%)	0.058	219 (93.2%)	0.035	0 (0.0%)	< 0.01
Hemipthera	235	2 (0.9%)	< 0.01	233 (99.1%)	< 0.01	0 (0.0%)	< 0.01

Additional comments on other pest (other than *Ostrinia nubilalis* and *Sesamia* spp.) are given in Appendix A, Table A.13.

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

The data show that the susceptibility to other pests in MON 810 is unchanged, except for those belonging to the order of Lepidoptera and Coleoptera, i.e. *Diabrotica* spp. and *Agriotes* spp.

The reduced susceptibility of MON 810 to Lepidoptera is not surprising, given the plethora of scientific studies on 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 they specifically have toxic properties (Marvier et al., 2007 [19]; Wolfenbarger et al., 2008 [51]). The monitoring data thus corroborate the conclusions drawn during the environmental risk assessment and ongoing research.

The farmers indicated a reduced susceptibility of MON 810 to Coleoptera, i.e. *Diabrotica* spp. and *Agriotes* spp. These secondary pests are exposed to the Cry1Ab in MON 810, but are not negatively affected by it, which is why they are commonly used in tri-trophic feeding experiments as a means to expose predators to Cry-proteins [15]. Its reported reduction in MON 810 fields can be attributed to (i) the proven selectivity of MON 810 towards the European corn borer and (ii) the consequently reported reduced application of insecticides against the target pest, which together lead to (iii) an enhanced complex of bio-control organisms preying upon the *Diabrotica* spp. and *Agriotes* spp. population (and other pests) in the field. Populations of both pests and predators fluctuate from year to year, and the populations of predators and parasitoids typically take time to develop stable populations of higher densities. The populations depend upon each other and the trophic network needs time to adapt to the new environmental conditions (i.e. no insecticide sprays). It is therefore not surprising that increasingly more farmers report a reduction of *Diabrotica* spp. and *Agriotes* spp. in MON 810 fields over the last years. These observations and interpretations are in line with the scientific literature that clearly shows the compatibility of Bt-plants with biological control in the field (Musser & Shelton, 2003 [22]; Romeis et al., 2006 [31]; Romeis et al., 2009 [32]; Lundgren et al., 2009 [17]).

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

One farmer (0.4%) observed $more\ weeds$ in MON 810 fields compared to conventional fields (Table 3.69, Figure 3.26).

Table 3.69: Weed pressure in MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less weeds	0	0.0	0.0	0.0
	as usual	255	99.6	99.6	99.6
	more weeds	1	0.4	0.4	100.0
Total		256	100.0	100.0	

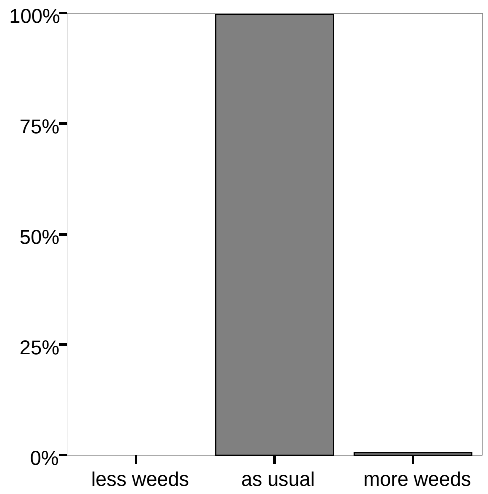

Figure 3.26: Weed pressure MON 810 compared to conventional maize in 2013

(1) The percentage of $as\ usual$ weed pressure (99.6%) is significantly greater than 90%. The resulting P value is smaller than the level of significance $\alpha = 0.01$ (Table 3.70), i.e. the null hypothesis $p_{as\ usual} \leq 0.9$ is rejected with a power of 100%.

(2) The percentage of $more\ weeds$ (0.4%) is significantly smaller than the threshold of 10% and the corresponding P value is smaller than the level of significance $\alpha = 0.01$ (Table 3.70), i.e. the null hypothesis $p_{more} \geq 0.1$ is rejected with a power of 100%.

(3) The percentage of $less\ weeds$ (0.0%) is significantly smaller than 10%.

No effect on weed pressure is indicated.

Table 3.70: Results of the binomial tests for weed pressure in MON 810 compared to conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
256	0 (0.0%)	< 0.01	255 (99.6%)	< 0.01	1 (0.4%)	< 0.01

The farmers were asked to name the three most abundant weeds in their MON 810 fields. The six most named weeds are

- *Sorghum halapense*
- *Abutilon theophrasti*
- *Echinocloa* spp.
- *Xanthium* spp.
- *Amaranthus* spp.
- *Chenopodium* spp.

All named weeds and the corresponding frequencies of nomination are listed in Appendix A, Table A.15.

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 to be 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)

Occurrence of non target insects

Farmers assessed the occurrence of non target insects in MON 810 fields to be $as\ usual$ in 100.0% (253/253) of the valid cases (Table 3.71).

Table 3.71: Occurrence of non target insects in MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less	0	0.0	0.0	0.0
	as usual	253	98.8	100.0	100.0
	more	0	0.0	0.0	100.0
	Total	253	98.8	100.0	
Missing	do not know	3	1.2		
Total		256	100.0		

Occurrence of birds

Farmers assessed the occurrence of birds in MON 810 fields to be *as usual* in 100.0% (250/250) of the valid cases (Table 3.72).

Table 3.72: Occurrence of birds in MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less	0	0.0	0.0	0.0
	as usual	250	97.7	100.0	100.0
	more	0	0.0	0.0	100.0
	Total	250	97.7	100.0	
Missing	do not know	6	2.3		
Total		256	100.0		

Occurrence of mammals

Farmers assessed the occurrence of mammals in MON 810 fields to be *as usual* in 100.0% (250/250) of the valid cases (Table 3.73).

Table 3.73: Occurrence of mammals in MON 810 compared to conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	less	0	0.0	0.0	0.0
	as usual	250	97.7	100.0	100.0
	more	0	0.0	0.0	100.0
	Total	250	97.7	100.0	
Missing	do not know	6	2.3		
Total		256	100.0		

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.
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 is limited. Studies have shown that no impact on mammals caused by the consumption of MON 810 is to be expected (Shimada et al., 2003 [41], 2006a [42], 2006b [43]; Stumpff et al., 2007 [46]; Bondzio et al., 2008 [5]).

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

11.7% (30/256) of the asked farmers used the harvest of MON 810 to feed their animals (Table 3.74). These data reflect only the range of feeding. We assume that only farmers that cultivate silage maize feed them to their livestock. That could be the reason why only 11.7% of the surveyed farmers fed MON 810, but there are no strong data supporting this assumption.

Table 3.74: Use of MON 810 harvest for animal feed in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	yes	30	11.7	11.7	11.7
	no	226	88.3	88.3	100.0
Total		256	100.0	100.0	

7.7% (2/26) of the farmers who gave a valid answer to the question on the performance of the animals fed MON 810 observed a $different$ performance of them compared to the animals fed conventional maize (Table 3.75, Figure 3.27).

Table 3.75: Performance of the animals fed MON 810 compared to the animals fed conventional maize in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	as usual	24	80.0	92.3	92.3
	different	2	6.7	7.7	100.0
	Total	26	86.7	100.0	
Missing	do not know	4	13.3		
Total		30	100.0		

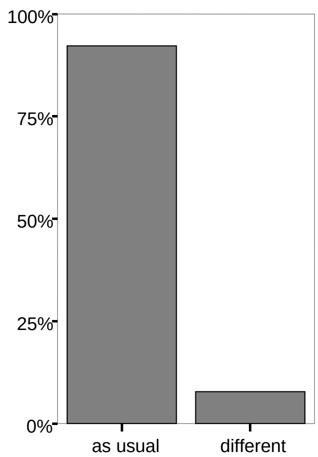

Figure 3.27: Performance of the animals fed MON 810 compared to the animals fed conventional maize in 2013

(1) The valid percentage for $as\ usual$ performance of the animals fed MON 810 (92.3%) is greater than 90%, but the P value is greater than the level of significance $\alpha = 0.01$ (Table 3.76). The null hypothesis for $p_{as\ usual} \leq 0.9$ can not be rejected. The lower 99% confidence interval limit is 0.788, the upper limit is 1.058.

(2) The valid percentage for $different$ performance of the animals fed MON 810 (7.7%) does not exceed the 10% threshold, but the resulting P value is greater than the level of significance $\alpha = 0.01$ (Table 3.76). The null hypothesis for $p_{different} \geq 0.1$ cannot be rejected. The lower 99% confidence interval limit is -0.058, the upper limit is 0.212.

An effect on performance of animals fed MON 810 is indicated.

Table 3.76: Results of the binomial test for performance of the animals fed MON 810 compared to the animals fed conventional maize in 2013

N valid	$Minus$	P for $p_0 = 0.1$	$As\ usual$	P for $p_0 = 0.9$	$Plus$	P for $p_0 = 0.1$
26			24 (92.3%)	0.251	2 (7.7%)	0.511

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

One farmer from Czech Republic and one from Romania (Appendix A, Table A.16) reported a better health of their animals when fed MON 810, because of a lower incidence of mycotoxins in the feed (due to lower ECB feeding damage on the plant).

Mycotoxin contaminated animal feed leads to food refusal, lower food conversion, increased disease in animals, lower weight gain and overall diminished health of animals. A reduction of the incidence and level of mycotoxins in MON 810 is thus beneficial to the animals and led to a difference in animal performance (Steinke et al., 2010 [45]; Buzoianu et al., 2012 [6]; Walsh et al., 2012 [47]).

3.4.9 Any additional remarks or observations

In this 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

98.4% (252/256) of the farmers reported to have been informed about the good agricultural practices applicable to MON 810 (Table 3.77).

95.6% (241/256) of the farmers considered the training sessions to be either $useful$ or $very\ useful$ (Table 3.78). This information indicates that the great majority of the farmers had been exposed to a valuable training concerning MON 810.

Table 3.77: Information on good agricultural practices in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	yes	252	98.4	98.4	98.4
	no	4	1.6	1.6	100.0
Total		256	100.0	100.0	

Table 3.78: Evaluation of training sessions in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	very useful	72	28.1	28.6	28.6
	useful	169	66.0	67.1	95.6
	not useful	11	4.3	4.3	100.0
	Total	252	98.4	100.0	
Missing	No statement	4	1.6		
Total		256	100.0		

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 all 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 (91.4%) reported that they are following the label recommendations on the seed bags (Table 3.79). 22 farmers (8.6%) from Spain admitted that they did not follow the label recommendation, in the most cases they didn't plant a refuge. Deviations from the label recommendations are listed in Appendix A, Table A.17.

Table 3.79: Compliance with label recommendations in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	yes	234	91.4	91.4	91.4
	no	22	8.6	8.6	100.0
Total		256	100.0	100.0	

3.5.3 Prevention of insect resistance

While 5.9% (15/256) of the farmers did not plant a refuge because they had less than 5 ha of maize in the farm (the Insect Resistance Management Plan states that no refuge is required if less than 5 hectares are planted), 85.5% (219/256) did plant a refuge (Table 3.80). 8.6% (22/256) of the farmers reported that they did not plant a refuge. So 91.4% (234/256) of the farmers did follow the label recommendations, which corresponds to the 91.4% (234/256) of all farmers claiming to be compliant with them (Table 3.79).

Table 3.80: Plant refuge in 2013

		Frequency	Percent	Valid percentages	Accumulated percentages
Valid	yes	219	85.5	85.5	85.5
	no, because the surface *Bt* maize is < 5 ha	15	5.9	5.9	91.4
	no	22	8.6	8.6	100.0
Total		256	100.0	100.0	

In Spain in 2013, among the farmers who were required to plant a refuge (i.e. farm growing more than 5 ha of maize), 87.4% of them (153/175) did it (Table 3.81).

Table 3.81: Refuge implementation per country in 2013

	Country	Yes	No, because the surface of *Bt* maize is < 5 ha	No	Total
Valid	Spain	153	15	22	190
	Portugal	46	0	0	46
	Czech Republic	18	0	0	18
	Romania	2	0	0	2
Total		219	15	22	256

Due to the continuous and intensive training of farmers about implementing a refuge the allover compliance this year is on a high level. In Spain 12.5% (22/175) of the farmers, who were required to, did not plant a refuge. The farmers gave mainly two reasons for not planting a refuge. The first is that the farmer had no or not enough information about the technical guidelines (4/22, 18.2%), the second is that the sowing is complicate by planting a refuge (18/22, 81.8%). All individual reasons for not planting a refuge are listed in Appendix A, Table A.18.

Chapter 4

Conclusions

The analysis of 256 questionnaires from a survey of farmers cultivating MON 810 in 2013 in four European countries did not reveal any unexpected adverse effects that could be associated with 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 2013 conditions.

The statistically significant effects reported in Part 3 were neither unexpected nor adverse. The corresponding observations mostly 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 2013 growing seasons. Currently, the database contains data of 2104 valid questionnaires. The survey will be conducted year after year with new entries generated in following season's questionnaires to provide a long term analysis of the effects of cultivation of MON 810 in Europe.

As shown in Tables 4.1 and 4.2 the frequency patterns of farmers' answers in 2013 are similar to those of the previous years. In general the same effects have been observed.

After eight years of farmers surveys no unexpected adverse effects are indicated. Compared to the cultivating practices in conventional maize farmers use nearly the same practices for cultivating MON 810. Because there are no damages of corn borers on the plant, it is healthier overall and therefore it gives more yield.

The data of the influencing factors differ between the years, but the data of the monitoring characters show nearly the same effects every year.

Table 4.1: Overview on the frequency of $Minus$[1] answers of the monitoring characters in 2006 - 2013 in percent [%]

Monitoring characters[1]	2006	2007	2008	2009	2010	2011	2012	2013
Time of planting	1.6	3.4	2.7	2.9	1.8	1.2	0.0	0.0
Time of harvest	2.4	3.8	3.4	2.1	2.2	0.4	0.0	0.0
Germination vigor	6.0	4.1	1.7	0.8	0.0	0.0	0.4	0.8
Time to emergence	6.9	3.1	6.4	5.4	4.1	0.8	0.8	0.0
Time to male flowering	0.4	1.7	4.7	2.1	3.7	0.0	0.8	0.8
Plant growth and development	6.5	6.9	9.8	5.9	7.0	0.8	1.6	0.0
Incidence of stalk / root lodging	58.9	36.2	38.6	31.9	35.1	24.5	28.1	17.2
Time to maturity	2.0	4.8	4.3	2.9	4.1	0.0	0.0	0.0
Yield	2.4	3.9	4.4	1.7	1.8	0.0	2.4	2.0
Occurrence of volunteers	33.9	8.4	11.1	10.8	8.2	6.9	4.2	4.0
Disease susceptibility	36.1	21.7	34.7	29.2	25.6	19.7	17.3	12.5
Insect pest control (ECB)	0.4	0.0	0.4	0.4	0.4	0.0	0.0	0.0
Insect pest control (PB)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pest susceptibility	11.1	5.9	18.5	17.2	18.6	17.7	21.3	18.0
Weed pressure	0.4	2.1	1.7	2.1	4.8	0.0	0.0	0.0
Occurrence of wildlife[3]	2.9	6.1	7.7					
Occurrence of non target insects[2]				0.9	0.8	0.9	0.0	0.0
Occurrence of birds[2]				0.4	1.2	0.4	0.0	0.0
Occurrence of mammals[2]				0.9	1.1	0.4	0.4	0.0

For grey highlighted frequency values the test against the 10% threshold resulted in P values greater than 0.01, so the null hypotheses could not be rejected.

[1] Monitoring characters and their categories are defined in section 2.2.

[2] These characters are surveyed since the 2009 season.

[3] The question on wildlife was asked until 2008. In 2009 it was split into three questions (non target insects, birds, mammals).

Table 4.2: Overview on the frequency of $Plus^1$ answers of the monitoring characters in 2006 - 2013 in percent [%]

Monitoring characters[1]	2006	2007	2008	2009	2010	2011	2012	2013
Crop rotation[2]				0.8	1.8	0.8	4.4	5.9
Time of planting	6.0	3.8	2.7	1.3	4.1	1.6	3.6	5.1
Tillage and planting technique	0.0	0.7	0.0	0.4	0.4	0.0	2.0	2.0
Insect control practices	48.0	11.9	22.2	18.3	16.26	24.9	17.3	16.4
Maize Borer control practice[3]			9.8	22.9	15.5	22.9	18.1	16.0
Weed control practices	0.4	0.3	0.3	0.0	0.4	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
Fertilizer application	0.8	0.3	0.0	0.4	0.4	0.0	0.0	2.3
Irrigation Practices	1.6	0.0	0.0	0.0	0.4	0.0	0.0	0.0
Time of harvest	24.1	18.6	13.8	7.9	6.6	4.4	4.0	5.1
Germination vigor	8.0	6.9	11.4	14.6	16.2	5.6	5.6	7.4
Time to emergence	5.6	3.8	2.0	0.8	0.4	0.0	0.4	0.4
Time to male flowering	1.6	7.7	3.7	1.7	2.6	2.0	1.2	0.4
Plant growth and development	1.6	4.8	2.7	2.1	3.7	0.8	2.0	0.8
Incidence of stalk / root lodging	1.6	0.3	0.3	0.0	2.2	0.0	0.0	0.0
Time to maturity	30.9	25.9	24.0	14.6	16.2	15.9	16.1	12.5
Yield	68.7	44.8	52.7	56.9	49.8	43.4	43.0	34.8
Occurrence of volunteers	0.0	1.7	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
Insect pest control (ECB)	96.4	86.3	86.3	93.7	85.6	86.6	91.1	89.1
Insect pest control (PB)	91.0	83.9	85.4	99.3	84.5	86.0	90.7	88.6
Pest susceptibility	1.2	1.4	0.7	1.3	0.0	0.0	0.4	0.4
Weed pressure	0.0	0.3	0.3	0.0	0.4	0.0	0.0	0.4
Occurrence of wildlife[4]	2.1	2.9	2.4					
Occurrence of non target insects[2]				0.9	0.4	0.4	0.0	0.0
Occurrence of birds[2]				0.0	0.8	0.0	0.0	0.0
Occurrence of mammals[2]				1.3	1.1	0.4	0.0	0.0
Performance of animals	0.0	6.7	4.9	8.9	12.3	10.5	10.3	7.7

For grey highlighted frequency values the test against the 10% threshold resulted in P values greater than 0.01, so the null hypotheses could not be rejected.

[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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Appendix A

Tables of free entries

Table A.1: Specifications for *changed* crop rotation before planting MON 810 (Section 3.4.1)

Country	Quest. Nr.	Crop rotation	Comments
Spain	3902	Changed	I sow YieldGard maize in the fields where before I grow cereal since in these fields there are more ECB problems.
Spain	3988	Changed	I sow YieldGard maize after cereal and conventional after maize.
Spain	4022	Changed	I sow YieldGard maize after potato and conventional after cotton.
Spain	4027	Changed	I sow YieldGard maize after potato.
Spain	4028	Changed	I sow YieldGard maize later, after potato.
Spain	4029	Changed	I sow YieldGard maize after potato in order to grow two crops by year.
Spain	4030	Changed	I sow short cycle YieldGard maize after potato.
Spain	4032	Changed	I sow YieldGard maize after potato and conventional after maize.
Spain	4033	Changed	I sow YieldGard maize after potato and conventional after maize.
Spain	4035	Changed	I sow YieldGard maize after water melon or potato and conventional after beans.
Spain	4036	Changed	I sow short cycle YieldGard maize after potato.
Spain	4038	Changed	I sow YieldGard maize after potato.
Spain	4039	Changed	I sow YieldGard maize after potato and conventional after onion.
Spain	4041	Changed	I sow YieldGard maize after potato.
Czech Republic	4053	Changed	after maize

Table A.2: Specifications for different planting time of MON 810 (Section 3.4.1)

Country	Quest. Nr.	Planting time	Comments aggregate	Comments
Spain	3988	later	flexibility	I sow before conventional maize in order to avoid virus problems.
Spain	4022	later	flexibility	Because YieldGard maize has a shorter cycle than conventional maize.
Spain	4027	later	flexibility	I sow YieldGard maize after have harvested potato, I have to wait for potato harvest is completed.
Spain	4028	later	flexibility	Because YieldGard maize has a shorter cycle than conventional maize.
Spain	4029	later	flexibility	Because YieldGard and conventional maize have different cycles.
Spain	4030	later	flexibility	YieldGard is a short cycle maize and I sow it later than conventional maize.
Spain	4032	later	flexibility	YieldGard is a short cycle maize and I sow it in June after potato.
Spain	4033	later	flexibility	I sow short cycle YieldGard maize after potato harvest.
Spain	4036	later	flexibility	YieldGard is a short cycle maize and I sow it after potato.
Spain	4038	later	flexibility	YieldGard is a short cycle maize and conventional is a long cycle maize.
Spain	4039	later	flexibility	YieldGard is a short cycle maize and I sow it after potato.
Spain	4041	later	flexibility	YieldGard is a short cycle maize and I sow it when potato is finished.
Czech Republic	4052	later	flexibility	Sowing started after conventional silage hybrids.

Table A.3: Specifications for *changed* tillage and planting technique of MON 810 (Section 3.4.1)

Country	Quest. Nr.	Tillage and planting technique	Comments aggregate	Comments
Spain	3988	changed	planting technique	I sow YieldGard maize doing direct drilling after cereal. I sow conventional maize doing conventional drilling after maize.
Spain	4022	changed	planting technique	For YieldGard maize skim ploughing in Spring.
Spain	4029	changed	planting technique	For YieldGard maize skim ploughing and for conventional maize deep tillage.
Spain	4030	changed	planting technique	In the YieldGard maize fields skim ploughing in Spring.
Spain	4032	changed	planting technique	I sow YieldGard maize in June doing skim ploughing. To sow conventional maize I do deep tillage in Winter.

Table A.4: Insecticides applied in MON 810 (Section 3.4.1) differentiated by their use

Active	**Insecticide as cited by the farmer**	**Spain**	**Portugal**	**Romania**	**Total**
Seed treatment					
Thiametoxam	Cruiser	4	0	2	6
Clotianidin	Poncho	138	46	0	184
Fipronil	Regent TS	30	0	0	30
Total		172	46	2	220
Spray					
Abamectin	Apache	35	0	0	35
Beta-Cyfluthrin	Bulldock 2.5 SC	2	0	0	2
Clorpirifos	Chas 48, Clorifos 48 EC, Clorpirifos 48, Closar 48, Inaclor 48 EC	22	0	0	22
Cypermethrin	Cipermetrin 10%, Saditrina ULV Micro	4	0	0	4
Deltametrin	Decis expert	1	3	0	4
Dimetoato	Dimetoato 40%	2	0	0	2
Imidachloprid	Confidor Generico 20LS, Imidacloprid 10%	2	0	0	2
Lambda Cyhalotrin	Judo, Karate King, Karate Zeon	5	32	0	37
Total		73	35	0	108
Granules					
Clorpirifos	Clorpirifos 5G, Gu-Fos, Pison	17	0	0	17
Total		17	0	0	17
Total		262	81	2	345

Table A.5: Explanations for for $changed$ insect and corn borer control practice in MON 810 (Section 3.4.1)

Country	Quest. Nr.	Insecticides in conv. maize	Insect control practice in MON 810	Explanation of differences in insect control practice	Insecticides against corn borers in conv. maize	Corn borer control in MON 810	Explanation of differences in corn borer control practice
Spain	3902	yes	changed	YieldGard seeds are treated with Regent TS but not conventional seeds because YieldGard maize fields have more soil insect problems	no	similar	no statement
Spain	3930	yes	changed	I treat conventional maize against ECB but not YieldGard maize.	yes	changed	I do one insecticide treatment against ECB in conventional maize, in YieldGard maize is not necessary since is resistant to ECB.
Spain	3936	yes	changed	I treat conventional maize with Clorpirifos 48% against ECB but not YieldGard maize.	yes	changed	I don't need to treat YieldGard maize against ECB but conventional maize yes.
Spain	3938	yes	changed	I treat conventional maize against ECB but not YieldGard maize.	yes	changed	I treat conventional maize against ECB. In YieldGard maize is not necessary since is resistant to ECB.
Spain	3983	yes	changed	I don't treat YieldGard maize against ECB but conventional maize yes.	yes	changed	I treat conventional maize with Karate Zeon against ECB, in YieldGard maize is not necessary.

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Country	Quest. Nr.	Insecticides in conv. maize	Insect control practice in MON 810	Explanation of differences in insect control practice	Insecticides against corn borers in conv. maize	Corn borer control in MON 810	Explanation of differences in corn borer control practice
Spain	3988	yes	changed	I don't treat YieldGard maize against ECB but conventional maize yes.	yes	changed	I treat conventional maize with Inaclor 48 EC (Clorpirifos 48%) but not YieldGard maize since is resistant to ECB.
Spain	4033	yes	changed	I treat conventional maize against ECB, in YieldGard maize is not necessary.	yes	changed	YieldGard maize is resistant to ECB. In conventional maize I treat with Clorpirifos.
Czech Republic	4046	yes	changed	no treatment in YG	yes	changed	no treatment in YG
Czech Republic	4052	yes	changed	YG was not treated	yes	changed	YG was not treated
Czech Republic	4053	yes	changed	no treatment	yes	changed	no treatment
Czech Republic	4055	yes	changed	no treatment	yes	changed	no treatment
Portugal	4060	yes	changed	The farmer made one less insecticide treatments in the GM fields.	yes	changed	The farmer strictly didn't make any treatments for the control of maize borer in the GM fields.

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Country	Quest. Nr.	Insecticides in conv. maize	Insect control practice in MON 810	Explanation of differences in insect control practice	Insecticides against corn borers in conv. maize	Corn borer control in MON 810	Explanation of differences in corn borer control practice
Portugal	4061	yes	changed	The farmer made one less insecticide treatments in the GM fields compared with the conventional maize.	yes	changed	The farmer didn't absolutely make any treatments for the control of maize borer in the GM fields because it wasn't necessary.
Portugal	4062	yes	changed	The farmer made one less insecticide treatments in the GM fields.	yes	changed	The farmer didn't make any treatments for the control of maize borer in the GM fields.
Portugal	4064	yes	changed	The farmer made less one (1) or even two (2) insecticide treatments in the transgenic maize (GM) because it wasn't necessary	yes	changed	absolutely no treatments for the control of maize borer in the GM fields.
Portugal	4065	yes	changed	The farmer made less at least two (2) insecticide treatments in the GM dry maize.	yes	changed	didn't apply any treatments for the control of maize borer in the GM fields.
Portugal	4066	yes	changed	fewer (less) insecticide treatments in the GM fields compared with the conventional fields.	yes	changed	Had no need to make any treatments for the control of maize borer in the GM maize fields.
Portugal	4067	yes	changed	The farmer made less two (2) insecticide treatments in the transgenic maize (GM).	yes	changed	absolutely no treatments for the control of maize borer in the GM fields.

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Country	Quest. Nr.	Insecticides in conv. maize	Insect control practice in MON 810	Explanation of differences in insect control practice	Insecticides against corn borers in conv. maize	Corn borer control in MON 810	Explanation of differences in corn borer control practice
Portugal	4068	yes	changed	The farmer made less one (1) or even two (2) insecticide treatments in the transgenic maize (GM) depending on the needs	yes	changed	no need to control with treatments the maize borer in the GM fields.
Portugal	4069	yes	changed	The farmer made less one (1) or even two (2) insecticide treatments in the transgenic maize	yes	changed	absolutely no treatments for the control of maize borer in the GM maize.
Portugal	4070	yes	changed	The farmer made an average of less 2 insecticide treatments in the GM maize	yes	changed	absolutely no treatments to control the maize borer in the GM fields.
Portugal	4071	yes	changed	The farmer made an average of less 2 insecticide treatments in the GM maize	yes	changed	no need to make any treatments to control the maize borer in the GM fields.
Portugal	4072	yes	changed	The farmer made less insecticide treatments in the GM maize	yes	changed	didn't make any treatments for the control of the maize borer in the GM fields.
Portugal	4073	yes	changed	The farmer made less one insecticide treatments in the GM maize compared with the conventional maize	yes	changed	Simply didn't make any treatments for the control of maize borer in the GM maize fields.

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Country	Quest. Nr.	Insecticides in conv. maize	Insect control practice in MON 810	Explanation of differences in insect control practice	Insecticides against corn borers in conv. maize	Corn borer control in MON 810	Explanation of differences in corn borer control practice
Portugal	4074	yes	changed	The farmer made less insecticide treatments in the GM maize compared with the conventional one	yes	changed	The farmer didn't make any treatments for the control of maize borer in the GM fields.
Portugal	4075	yes	changed	The farmer made an average of less 2 insecticide treatments in the GM maize	yes	changed	absolutely no treatments to control the maize borer in the GM fields.
Portugal	4076	yes	changed	The farmer made at least less one insecticide treatments in the GM maize	yes	changed	Simply didn't make any treatments for the control of maize borer in the GM maize field.
Portugal	4077	yes	changed	The farmer made an average less of one or two insecticide treatments at least in the GM dry maize.	yes	changed	The farmer didn't make rigorously any treatments for the control of maize borer in the GM fields.
Portugal	4078	yes	changed	The farmer made less insecticide treatments in the GM dry maize	yes	changed	The farmer didn't make rigorously any treatments for the control of maize borer in the GM fields.
Portugal	4079	yes	changed	The farmer made less insecticide treatments in the plots of GM dry maize.	yes	changed	The farmer did not make any kind of treatments for the control of maize borer in the GM fields.

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Country	Quest. Nr.	Insecticides in conv. maize	Insect control practice in MON 810	Explanation of differences in insect control practice	Insecticides against corn borers in conv. maize	Corn borer control in MON 810	Explanation of differences in corn borer control practice
Portugal	4080	yes	changed	The farmer made less insecticide treatments in the plots of GM dry maize.	yes	changed	The farmer didn't make absolutely any kind of treatments for the control of maize borer in the GM fields.
Portugal	4087	yes	changed	the farmer made less insecticide treatments, one treatment specifically, in the GM fields compared with the conventional fields	yes	changed	The farmer didn't make any treatments for the control of maize borer in the GM fields.
Portugal	4088	yes	changed	The farmer made always less insecticide treatments in the GM fields depending on their needs.	yes	changed	because he had no need for such procedure with the GM maize.
Portugal	4089	yes	changed	no treatment in GM maize	yes	changed	no treatment in GM maize.
Portugal	4090	yes	changed	The farmer made one less insecticide treatments in the transgenic maize (GM)	yes	changed	absolutely no treatments for the control of maize borer in the GM fields.
Portugal	4091	yes	changed	The farmer made one less insecticide treatments in the transgenic maize (GM).	yes	changed	absolutely no treatments to control the maize borer in the GM fields.
Portugal	4092	yes	changed	farmer made less insecticide treatments, one treatment specifically, in the GM fields	yes	changed	farmer didn't make any treatments for the control of maize borer in the GM fields.

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Country	Quest. Nr.	Insecticides in conv. maize	Insect control practice in MON 810	Explanation of differences in insect control practice	Insecticides against corn borers in conv. maize	Corn borer control in MON 810	Explanation of differences in corn borer control practice
Portugal	4099	yes	changed	The farmer made one less insecticide treatments in the transgenic maize (GM)	yes	changed	It wasn't necessary to apply any treatments for the maize borer in the transgenic (GM) fields of maize.
Portugal	4100	yes	changed	The farmer made less one insecticide treatments in the GM maize compared with the conventional maize.	yes	changed	The farmer didn't make strictly any treatments for the control of maize borer in the GM fields.
Portugal	4101	yes	changed	no treatment in GM maize	yes	changed	no treatment in GM maize.
Portugal	4104	yes	changed	the farmer made less insecticide treatments in the GM fields compared with the conventional fields	yes	changed	Didn't make any treatments for the control of maize borer in the GM fields because it wasn't necessary.
Portugal	4105	yes	changed	The farmer made one less insecticide treatments in the transgenic maize (GM)	yes	changed	The farmer had no need to make any treatments to control the maize borer in the GM fields.

Table A.6: Herbicides applied in MON 810 (Section 3.4.1)

Active	Herbicides as stated by the farmers	Spain	Portugal	Czech Republic	Romania	Total
Nicosulfuron	Chaman, Elite M, Elite Plus 6 OD, Milagro, Nic-4, Nico M, Nicogan, Nicosulfuron 4%, Nicozea, Sajon, Samson, U-46	105	28	3	0	136
Acetochlor, Terbutilazin	Acetopron Doble, Acetopron Extra, Harness GTZ	77	0	0	0	77
Mesotrion, S-Metolachlor	Camix	51	2	0	0	53
S-Metolachlor, Terbutilazin	Primextra Liquido Gold Twin, Tyllanex Magnum	41	7	0	0	48
Mesotrion, S-Metolachlor, Terbutylazin	Gardoprim Gold Plus, Lumax	0	42	4	0	46
Dicamba	Banvel D	45	0	0	0	45
Mesotrion	Callisto	21	12	3	0	36
Fluroxipir	Starane 20, Tomahawk	25	0	0	0	25
Bromoxinil	Bromotril 24 EC, Buctril	22	0	0	0	22
Foramsulfuron, Isoxadifen-ethyl	Option	0	20	0	0	20
2.4D, Florasulam	Mustang	15	0	1	0	16
Acetochlor	Acetocloro 84, Acetopron, Combo, Guardian, Guardian Safe Max, Harness Plus	12	0	1	2	15
Glyphosate	Glifosato 36%, Roundup plus, Roundup presiembra, Roundup Rapid	14	0	0	0	14
Isoxaflutol	Adengo, Spade	4	0	7	0	11

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Active	**Herbicides as stated by the farmers**	**Spain**	**Portugal**	**Czech Republic**	**Romania**	**Total**
Sulcotrion	Mikado, Pentagon, Sudoku, Sulcogan, Zeus	2	8	1	0	11
Dimethenamid-P	Outlook, Spectrum	3	0	5	0	8
Isoxadifen-ethyl, Tembotrione	Laudis	3	5	0	0	8
Nicosulfuron, Terbutylazin	Nicoter, Winner Top	0	7	0	0	7
Aclonifen, Isoxaflutol	Lagon	5	0	0	0	5
Flufenacet, Terbuthylazin	Aspect	0	5	0	0	5
Pethoxamid, Terbutylazin	Bolton Duo, Koban T	1	0	4	0	5
MCPA	Herpan 40, MCPA 40%	3	0	0	0	3
Pendimetalina	Stomp Aqua	3	0	0	0	3
Pethoxamid	Successor 600	2	0	1	0	3
Bentazon	Laddok	0	2	0	0	2
Dicamba, Titrosulfron	Arrat	0	0	2	0	2
Acetochlor, Atrazin, Diclormid	Trophy Super	1	0	0	0	1
Bentazon, Nicosulfron	Kelvin pack	1	0	0	0	1
Bentazon, Terbutilazin	Asteca mays	0	1	0	0	1
Dicamba, Topramezon	Stellar	0	0	1	0	1
Foramsulfuron, Iodosulfronmethyl, Isoxadifen-ethyl	MaisTer	0	0	1	0	1
Mecoprop-P 28	Herbimur Forte	1	0	0	0	1
Rimsulfuron	Titus	0	0	1	0	1
Trifluralin	Bonanza	0	1	0	0	1
Total		457	140	35	2	634

Table A.7: Specifications for *changed* fertilizer application in MON 810 (Section 3.4.1)

Country	**Quest. Nr.**	**Fertilizer application**	**Comments**
Spain	4022	changed	I fertilize YieldGard maize less than conventional maize since I sow YieldGard after potato.
Spain	4027	changed	I fertilize YieldGard maize with less urea than conventional maize.
Spain	4029	changed	I fertilize YieldGard maize with less urea than conventional maize.
Spain	4030	changed	I fertilize YieldGard maize only with nitrogen and for conventional maize I carry out basal dressing.
Spain	4032	changed	I fertilize YieldGard maize only with nitrogen and for conventional maize I carry out basal dressing.
Spain	4033	changed	I sow YieldGard maize after potato and it needs only nitrogen. I carry out basal dressing in conventional maize.

Table A.8: Explanations for different harvest time of MON 810 (Section 3.4.1)

Country	Quest. Nr.	Harvest	Comments aggregate	Comments
Spain	3988	later	plant development, plant health, stay green effect, maturity (water content)	YieldGard maize has some humidity degree more than conventional maize then I harvest YieldGard maize later.
Spain	4022	later	desired flexibility (cropping system, logistics, channeling/ coexistence)	YieldGard maize is shorter cycle, I sow it later and I harvest it later than conventional maize.
Spain	4027	later	desired flexibility (cropping system, logistics, channeling/ coexistence)	YieldGard maize is harvested later because it is sowed later.
Spain	4028	later	desired flexibility (cropping system, logistics, channeling/ coexistence)	YieldGard maize is shorter cycle, I sow it later and I harvest it later than conventional maize.
Spain	4029	later	desired flexibility (cropping system, logistics, channeling/ coexistence)	YieldGard is short cycle maize and I harvest it when the crop is green to ensilage after conventional maize.
Spain	4030	later	desired flexibility (cropping system, logistics, channeling/ coexistence)	YieldGard maize is harvested later because it is sowed later.
Spain	4032	later	desired flexibility (cropping system, logistics, channeling/ coexistence)	YieldGard maize is shorter cycle, I sow it later and I harvest it later than conventional maize.
Spain	4033	later	desired flexibility (cropping system, logistics, channeling/ coexistence)	I sow YieldGard maize later (June) after potato and I harvest it later (December).
Spain	4036	later	desired flexibility (cropping system, logistics, channeling/ coexistence)	YieldGard maize is harvested later because it is sowed later.
Spain	4038	later	desired flexibility (cropping system, logistics, channeling/ coexistence)	I sow YieldGard maize later and I harvest it later.
Spain	4039	later	desired flexibility (cropping system, logistics, channeling/ coexistence)	YieldGard maize is harvested later because it is sowed later.
Spain	4041	later	desired flexibility (cropping system, logistics, channeling/ coexistence)	I sow YieldGard maize later than conventional maize and I harvest it later too.
Czech Republic	4052	later	desired flexibility (cropping system, logistics, channeling/ coexistence)	harvested as CCM

Table A.9: Explanations for characteristics of MON 810 different from *As usual* (Section 3.4.2)

Country	Quest. Nr.	Germination	Emergence	Male flowering	Plant growth	Stalk/-root lodging	Maturity	Yield	Volunteers	Comments
Spain	3855	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize has not ECB damages, it does not fall down and it produces more than conventional maize.
Spain	3860	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize is healthier since it has not ECB damages, it does not fall down and it produces more than conventional maize.
Spain	3861	as usual	as usual	as usual	as usual	less often	delayed	higher yield	less often	YieldGard maize is resistant to ECB, it does not fall down, there are not volunteers following season, it maturates a few later and it produces more than conventional maize.
Spain	3863	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	YieldGard maize has not ECB damages and it produces more than conventional maize.
Spain	3868	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	YieldGard maize is resistant to ECB and it produces more than conventional maize.
Spain	3870	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	YieldGard maize is healthier, without ECB damages, it produces more than conventional maize.
Spain	3872	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize does not fall down since it has not ECB attack and it produces more than conventional maize.

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Country	Quest. Nr.	Germination	Emergence	Male flowering	Plant growth	Stalk/-root lodging	Maturity	Yield	Volunteers	Comments
Spain	3873	as usual	as usual	as usual	as usual	less often	as usual	higher yield	less often	YieldGard maize has not ECB damages, the plants and the ears don't fall down, there are not volunteers following season and it produces more than conventional maize.
Spain	3882	as usual	as usual	as usual	as usual	less often	delayed	higher yield	as usual	YieldGard maize is healthier, it maturates a few later, it does not fall down since it has not ECB attack and it gives higher yield than conventional maize.
Spain	3883	as usual	as usual	as usual	as usual	less often	as usual	higher yield	less often	YieldGard maize is resistant to ECB, the plants and the ears don't fall down, there are less volunteers following season and all production is harvested.
Spain	3884	as usual	as usual	as usual	as usual	less often	delayed	higher yield	as usual	YieldGard maize has not ECB damages, it is healthier, it is greener, it matured one week later and it produces more than conventional maize since the plants and the ears don't fall down.
Spain	3885	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize has not ECB damages, it is healthier, it does not fall down and it gives more yield than conventional maize.
Spain	3887	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize is resistant to ECB, it is healthier, it does not fall down, there are less volunteers and it is more productive than conventional maize.

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Country	Quest. Nr.	Germination	Emergence	Male flowering	Plant growth	Stalk/-root lodging	Maturity	Yield	Volunteers	Comments
Spain	3888	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize is resistant to ECB, it does not fall down and all production is harvested.
Spain	3889	as usual	as usual	as usual	as usual	less often	as usual	higher yield	less often	YieldGard maize has not ECB damages, it is healthier, the plants and the ears don't fall down, there are less volunteers and it produces more than conventional maize.
Spain	3890	as usual	as usual	as usual	as usual	less often	delayed	higher yield	less often	YieldGard maize has not ECB damages, it maturates a few later, it does not fall down, there are less volunteers the following season and it produces more than conventional maize.
Spain	3896	as usual	as usual	as usual	as usual	less often	as usual	higher yield	less often	YieldGard maize is resistant to ECB, the ears does not fall down, there are less volunteers following season and all production is harvested.
Spain	3898	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize does not fall down since it has not ECB damages and all yield is harvested.
Spain	3899	as usual	as usual	as usual	as usual	less often	as usual	higher yield	less often	YieldGard maize is healthier, without ECB damages, it does not fall down, there are less volunteers and it is more productive than conventional maize.
Spain	3900	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize is resistant to ECB, the plants and the ears don't fall down and all production is harvested.

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Country	Quest. Nr.	Germination	Emergence	Male flowering	Plant growth	Stalk/-root lodging	Maturity	Yield	Volunteers	Comments
Spain	3901	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize has not ECB damages, the plants and the ears don't fall down and it produces more than conventional maize.
Spain	3902	as usual	as usual	as usual	as usual	as usual	delayed	higher yield	as usual	YieldGard maize maturates one week later than conventional maize since it is healthier, it is greener and it is more productive.
Spain	3909	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	YieldGard maize produces more than conventional maize including the seasons with a poor ECB attack like this year.
Spain	3912	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	YieldGard maize is healthier, without ECB damages and it produces a few more than conventional maize.
Spain	3935	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize has not ECB damages, it does not fall down and it produces more than conventional maize.
Spain	3936	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize is resistant to ECB, it is healthier, the plants does not fall down, all yield is harvested and it produces more than conventional maize.
Spain	3939	as usual	as usual	as usual	as usual	as usual	delayed	higher yield	as usual	YieldGard maize is resistant to ECB, it is healthier, the grain has more humidity, it maturates a few later and it gives more yield than conventional maize.

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Country	**Quest. Nr.**	**Germi-nation**	**Emer-gence**	**Male flower-ing**	**Plant growth**	**Stalk/-root lodging**	**Maturity**	**Yield**	**Volun-teers**	**Comments**
Spain	3941	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	YieldGard maize is more productive than conventional maize including years with a poor ECB attack.
Spain	3942	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize is resistant to ECB, it does not fall down, all yield is harvested without losses and it produces more than conventional maize.
Spain	3943	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	YieldGard maize produces more than conventional maize including the seasons with a poor ECB attack like this year.
Spain	3944	as usual	as usual	as usual	as usual	less often	delayed	higher yield	as usual	YieldGard maize has not ECB damages, it is greener, it maturates one week later, it does not fall down and it produces more than conventional maize.
Spain	3945	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize is resistant to ECB, the plants and the ears don't fall down, all yield is harvested and it is more productive than conventional maize.
Spain	3946	as usual	as usual	delayed	as usual	less often	delayed	higher yield	less often	YieldGard maize flowers 2 - 3 days later, it is greener and it maturates a few later, it does not fall down since has not ECB damages, there are less volunteers and it produces more than conventional maize.

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Country	Quest. Nr.	Germination	Emergence	Male flowering	Plant growth	Stalk/-root lodging	Maturity	Yield	Volunteers	Comments
Spain	3947	less vigorous	as usual	as usual	delayed	as usual	delayed	higher yield	as usual	YieldGard maize is less vigorous, it grows more slowly and maturates 5 - 7 days later, it produces more than conventional maize since the grain has more humidity and because it has not ECB damages.
Spain	3948	as usual	as usual	as usual	as usual	less often	as usual	higher yield	less often	YieldGard maize does not fall down since it is resistant to ECB, there are less volunteers following season and it produces more than conventional maize.
Spain	3949	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize falls down less and produces more than conventional maize, including the seasons with poor ECB attack like this year.
Spain	3983	as usual	as usual	as usual	as usual	less often	delayed	higher yield	as usual	YieldGard maize is more productive because it has not ECB damages, it is greener, it maturates a few later, it does not fall down, it is healthier than conventional maize.
Spain	3984	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize does not fall down and it is more productive than conventional maize since it has not ECB damages.
Spain	3985	as usual	as usual	as usual	accelerated	as usual	delayed	higher yield	as usual	YieldGard maize is healthier, it grows more quickly, it is greener, it maturates one week later and it produces more than conventional maize.

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Country	**Quest. Nr.**	**Germination**	**Emergence**	**Male flowering**	**Plant growth**	**Stalk/-root lodging**	**Maturity**	**Yield**	**Volunteers**	**Comments**
Spain	3986	as usual	as usual	as usual	as usual	as usual	delayed	as usual	as usual	YieldGard maize is greener, with more humidity and it maturates some days later than conventional maize.
Spain	3987	as usual	as usual	as usual	as usual	less often	delayed	lower yield	as usual	YieldGard maize is healthier, it is greener, it does not fall down, it maturates a few later but it is less productive than conventional maize when there are not ECB attacks (10% less productive).
Spain	3988	as usual	as usual	as usual	as usual	less often	delayed	higher yield	as usual	YieldGard maize has not ECB damages, it does not fall down, it maturates later and it is more productive than conventional maize.
Spain	3989	as usual	as usual	as usual	as usual	as usual	delayed	as usual	as usual	YieldGard maize is greener and with more humidity, it maturates a few later than conventional maize.
Spain	3990	as usual	as usual	as usual	as usual	as usual	delayed	higher yield	as usual	YieldGard maize is healthier, without ECB damages, it is greener, with more humidity, it maturates a few later and it produces more than conventional maize.
Spain	3991	as usual	as usual	as usual	as usual	less often	delayed	higher yield	less often	YieldGard maize is resistant to ECB, it does not fall down and there are not volunteers following season, it is greener, it is healthier, it maturates one week later and it gives more yield than conventional maize.

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Country	Quest. Nr.	Germi-nation	Emer-gence	Male flower-ing	Plant growth	Stalk/-root lodging	Maturity	Yield	Volun-teers	Comments
Spain	3992	as usual	as usual	as usual	as usual	as usual	delayed	as usual	as usual	YieldGard maize is greener, it is healthier, with more humidity, it maturates one week later than conventional maize.
Spain	3993	as usual	as usual	as usual	as usual	less often	delayed	higher yield	as usual	YieldGard maize is resistant to ECB, it does not fall down, it maturates a few later and it produces more than conventional maize.
Spain	3994	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	YieldGard maize is more productive than conventional maize including years with a poor ECB attack.
Spain	3995	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	YieldGard maize produces more than conventional maize including the seasons with a poor ECB attack like this year since it is healthier.
Spain	3996	as usual	as usual	as usual	as usual	as usual	delayed	higher yield	as usual	YieldGard maize is healthier, without ECB damages, it has more humidity, it maturates a few later and it produces more than conventional maize.
Spain	3997	as usual	delayed	as usual	as usual	as usual	delayed	higher yield	as usual	YieldGard emerged a few later, without ECB damages, it is healthier, with one degree more of humidity, it maturates later and it produces more than conventional maize.
Spain	4002	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	YieldGard maize is resistant to ECB, it is healthier and it produces more than conventional maize.
Spain	4003	as usual	as usual	as usual	as usual	as usual	as usual	as usual	as usual	There was not ECB attack and there were not differences between YieldGard and conventional maize.

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Country	Quest. Nr.	Germi-nation	Emer-gence	Male flower-ing	Plant growth	Stalk/-root lodging	Maturity	Yield	Volun-teers	Comments
Spain	4004	as usual	as usual	accel-erated	as usual	as usual	delayed	higher yield	as usual	YieldGard maize flowers before, it is greener and maturates one week later, it is healthier without ECB damages and it is more productive than conventional maize.
Spain	4006	as usual	as usual	as usual	as usual	as usual	as usual	lower yield	as usual	YieldGard maize is less productive than conventional maize the years without ECB attacks.
Spain	4007	more vigor-ous	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize is healthier, it is more vigorous, without ECB damages, it does not fall down and it produces more than conventional maize.
Spain	4009	as usual	as usual	as usual	delayed	less often	delayed	as usual	as usual	YieldGard maize grows more slowly, it is greener and it maturates later and it does not fall down.
Spain	4010	as usual	as usual	as usual	as usual	less often	as usual	as usual	as usual	YieldGard maize is healthier and the plants and the ears don't fall down.
Spain	4011	more vigor-ous	as usual	as usual	accel-erated	less often	delayed	higher yield	as usual	YieldGard maize is more vigorous, it grows more quickly, it is greener and it maturates a few later, it has no ECB damages, it does not fall down, there are not volunteers and it produces more than conventional maize.
Spain	4012	as usual	as usual	as usual	as usual	less often	delayed	higher yield	as usual	YieldGard maize is more productive than conventional maize because it has not ECB damages, it does not fall down, it is greener, it is healthier and maturates a few later.

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Country	Quest. Nr.	Germi-nation	Emer-gence	Male flower-ing	Plant growth	Stalk/-root lodging	Maturity	Yield	Volun-teers	Comments
Spain	4013	more vigor-ous	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	YieldGard maize is more vigorous, it is healthier, without ECB damages and it produces more than conventional maize.
Spain	4015	as usual	as usual	accel-erated	as usual	as usual	delayed	higher yield	as usual	YieldGard maize flowers some days before, with-out ECB damages, it is greener, maturation delayed one week and it is more productive than conven-tional maize.
Spain	4016	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize is resistant to ECB, it does not fall down and it produces more than conventional maize.
Spain	4017	as usual	as usual	as usual	as usual	less often	delayed	higher yield	as usual	YieldGard maize has not ECB damages, it does not fall down, it is healthier, it is greener, it maturates a few later and it produces more than conventional maize.
Spain	4019	as usual	as usual	as usual	as usual	as usual	delayed	higher yield	as usual	YieldGard maize is resistant to ECB, it is greener, it has more humidity and it maturates some days later and it produces more than conventional maize.
Spain	4020	more vigor-ous	as usual	as usual	accel-erated	less often	delayed	lower yield	as usual	YieldGard maize is more vigorous and it grows more quickly, it does not fall down since it is re-sistant to ECB, it maturates some days later but it produces less than conventional maize.

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Country	Quest. Nr.	Germination	Emergence	Male flowering	Plant growth	Stalk/-root lodging	Maturity	Yield	Volunteers	Comments
Spain	4023	as usual	as usual	as usual	as usual	as usual	delayed	as usual	as usual	YieldGard maize is greener, with more humidity and it maturates some days later than conventional maize.
Spain	4025	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	YieldGard maize has not ECB damages and it produces more than conventional maize.
Spain	4026	as usual	as usual	as usual	as usual	as usual	as usual	lower yield	as usual	YieldGard maize less productive than conventional maize this season since there was not ECB attacks.
Spain	4037	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	YieldGard maize has not ECB damages, it does not fall down and it produces more than conventional maize.
Portugal	4060	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	Greater germination vigor of GM plants, better sanity of GM maize, Environmental factors like climate, type of soils,plots and varieties were important to consider. In this last campaign the average yields of 14 900 kg/ha in the transgenic (GM) maize, dry maize, were similar compared with the conventional maize.

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Country	Quest. Nr.	Germi-nation	Emer-gence	Male flower-ing	Plant growth	Stalk/-root lodging	Maturity	Yield	Volun-teers	Comments
Portugal	4061	more vigor-ous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	Greater germination vigor of GM plants and better sanity of the GM maize. In this last campaign the average yields of 13 200 kg/ha in the transgenic maize (GM), dry maize, were more than 1000 kg/ha higher in GM maize yields compared with the con-ventional maize.
Portugal	4062	more vigor-ous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	Fantastic germination vigor of GM plants and exem-plar sanity of the GM maize. In this last campaign the average yields of 12 700 kg/ha in the transgenic (GM) maize, dry maize, and the average yields of 64 000 kg/ha (15 ha) in the transgenic (GM) maize, forage maize, were similar compared with the con-ventional maize.
Portugal	4065	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	Better sanity of the GM maize. In this last campaign the average yields of 13 200 kg/ha in the transgenic maize (GM), dry maize, were mostly 1500 kg/ha higher in GM maize yields compared with the con-ventional maize.

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Country	Quest. Nr.	Germination	Emergence	Male flowering	Plant growth	Stalk/-root lodging	Maturity	Yield	Volunteers	Comments
Portugal	4066	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	In this last campaign the average yields were 16 700 kg/ha in the GM dry maize. An average increased between 1000-1500 kg/ha higher compared with conventional maize. Great advantage of the GM maize. All the others field characteristics were normal. Excellent response of the GM maize to the rigorous and aggressive weather (cold, rains and strong wind) noted in this last campaign.
Portugal	4067	more vigorous	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	Very good germination vigor of GM plants. In this last campaign the average yields were 13 500 kg/ha in the GM dry maize, an average of 1000 / 1250 kg/ha higher compared with conventional maize. Excellent response of the GM maize to adverse weather conditions (cold, rains and strong wind) verified in this last campaign.
Portugal	4068	more vigorous	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	In this last campaign the average yields were 14 500 kg/ha in the GM dry maize, an average of 800 / 1000 kg/ha higher compared with conventional maize. Great germination vigor of GM plants and very good quality of the GM maize.

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Country	Quest. Nr.	Germi-nation	Emer-gence	Male flower-ing	Plant growth	Stalk/-root lodging	Maturity	Yield	Volun-teers	Comments
Portugal	4069	more vigor-ous	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	In this last campaign the average yields were 14 300 kg/ha in the GM dry maize, an average of 1000 kg/ha higher compared with conventional maize. High sanity and quality of GM maize, great germination vigor of GM plants.
Portugal	4070	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	The average yields between 15 750 and 16 000 kg/ha in the GM dry maize, an average of 1500 kg/ha higher compared with conventional maize. Great advantage of the GM maize. Huge resistance of the GM maize to adverse weather conditions (cold, rain and strong wind) verified in this last campaign.
Portugal	4071	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	Fantastic response of the GM maize to adverse weather conditions (cold, rains and strong wind) verified in this last campaign. In that last campaign the farmer could ensure that the average yields of 13 500 kg/ha in the GM dry maize, were 800 kg/ha higher compared with conventional maize.
Portugal	4072	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	Excellent year in which productivity concerns, the average yields of 16 250 kg/ha in the GM dry maize were an average of 1500 kg/ha higher compared with conventional maize. All the others field characteristics were similar.

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Country	Quest. Nr.	Germination	Emergence	Male flowering	Plant growth	Stalk/-root lodging	Maturity	Yield	Volunteers	Comments
Portugal	4073	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	Huge sanity and quality of GM maize, the average yields of 14 500 kg/ha in the GM dry maize, was an average of 500 - 600 kg/ha higher compared with conventional maize. The others field characteristics were similar.
Portugal	4074	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	The GM maize resisted better to adverse weather conditions like cold and strong wind verified in this last campaign. In that campaign the average yields of 15 500 - 16 000 kg/ha in the GM dry maize, were an average 1000 - 1500 kg/ha higher compared with conventional maize.
Portugal	4075	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	Quite good year of which productivity concerns, in this last campaign an average yields of 16 800 kg/ha in the GM dry maize, were an average 1000 kg/ha higher compared with conventional maize.
Portugal	4076	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	In that last campaign the farmer obtained an average yields of 13 000 kg/ha in the GM dry maize, were 750 kg/ha higher compared with conventional maize. The GM maize resisted better to adverse weather conditions like cold, rains and strong wind verified in this last campaign.

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Country	**Quest. Nr.**	**Germination**	**Emergence**	**Male flowering**	**Plant growth**	**Stalk/-root lodging**	**Maturity**	**Yield**	**Volunteers**	**Comments**
Portugal	4077	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	Good campaign in witch productivity concerns. The average yields of 14 250 kg/ha in the GM dry maize were an average of 1500 kg/ha higher in GM maize yields compared with the conventional maize.
Portugal	4078	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	Great sanity and quality of GM maize, the average yields of 14 000 kg/ha in the GM dry maize, was an average of 500 - 1000 kg/ha higher compared with conventional maize. The others field characteristics were equal.
Portugal	4079	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	The last campaign was quite good in witch productivity concerns. The average yields of 15 000 kg/ha in the GM dry maize were an average of 1000 kg/ha higher in GM maize yields compared with the conventional maize.
Portugal	4080	more vigorous	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	The vigor and sanity of GM maize were quite evident and higher. The average yields of 60 000 kg/ha in the GM maize, forage maize, were an average of 2000 - 3000 kg/ha higher compared with the conventional maize.

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Country	Quest. Nr.	Germination	Emergence	Male flowering	Plant growth	Stalk/-root lodging	Maturity	Yield	Volunteers	Comments
Portugal	4084	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	In this last campaign the two major advantages of the GM maize were the amazing sanity of the GM plant and the increase of production. The average yields of 14 000 kg/ha in the GM dry maize were an average of 1000 kg/ha higher in GM maize yields compared with the conventional one.
Portugal	4085	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	In this last campaign the major advantage of the GM maize was the increase of production. The average yields of 13 800 kg/ha in the GM dry maize were an average of 750 kg/ha higher in GM maize yields compared with the conventional maize. All the other features were equal.
Portugal	4086	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	Greater germination vigor of GM plants. In this last campaign the farmer did not check differences in terms of productivity. The average yields were 13 260 kg/ha in the transgenic (GM) maize, dry maize, were similar compared with the conventional maize.
Portugal	4087	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	In this last campaign the average yields of 72 300 kg/ha in the GM maize, forage maize, were similar compared with the conventional maize. The fantastic sanity of GM maize, the great quality of the forage maize and the excellent germination vigor were evident and real.

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Country	Quest. Nr.	Germination	Emergence	Male flowering	Plant growth	Stalk/-root lodging	Maturity	Yield	Volunteers	Comments
Portugal	4088	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	Huge sanity and vigor of the GM maize. In this last campaign the average yields were 13 750 kg/ha in the GM dry maize and were 57 750 kg/ha in GM forage maize, both were mostly equal compared with the conventional maize.
Portugal	4089	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	By the farmer's experience and despite only had planted GM maize in this campaign the farmer knows that the sanity of GM plants and the vigor were a great advantage for the farmers. In that campaign the average yields were 14 300 kg/ha in the GM dry maize and 60 000 kg/ha in the GM forage maize.
Portugal	4090	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	Good strength and vigor of the GM maize. The average yields were 15 000 kg/ha in the GM dry maize and 60 000 kg/ha in the GM forage maize both were equal compared with the conventional maize.
Portugal	4092	more vigorous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	The average yields in this last campaign were 13 000 kg/ha in the GM dry maize, were similar compared with the conventional maize. The huge sanity of the GM plant, the GM plant great vigor and also the amazing quality of the GM maize were qualities of the GM maize.

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Country	Quest. Nr.	Germination	Emergence	Male flowering	Plant growth	Stalk/-root lodging	Maturity	Yield	Volunteers	Comments
Portugal	4096	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	Very good year of which productivity concerns, great advantage of the GM maize. In this campaign obtained an average yields of 16 750 kg/ha in the GM dry maize, were an average of 2000 kg/ha higher compared with conventional maize. The GM maize resisted better to adverse weather conditions like cold, rains and strong wind verified in this campaign.
Portugal	4097	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	Better productivity in the GM maize in this last campaign. The average yields were 11 500 kg/ha in the GM dry maize, were mostly 500-1000 kg/ha higher compared with conventional maize. The GM maize resisted better to adverse weather conditions like (cold, wind and rains).
Portugal	4100	more vigorous	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	The GM plant is vigorous, the grain quality of GM maize was quite good, had a strong stem, high sanity of the GM maize. The farmer obtained average yields of 13 000 kg/ha in the transgenic maize (GM), dry maize, were mostly 500 kg/ha higher compared with conventional maize.

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Country	Quest. Nr.	Germi-nation	Emer-gence	Male flower-ing	Plant growth	Stalk/-root lodging	Maturity	Yield	Volun-teers	Comments
Portugal	4101	more vigor-ous	as usual	as usual	as usual	as usual	as usual	as usual	as usual	The quality and the sanity of the GM maize made all the difference, were the great advantage of the GM maize. Great vigor of GM maize. The farmer had quite good average yields of 16 500 - 17 000kg/ha in the transgenic (GM) maize, dry maize.
Portugal	4104	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	In this last campaign the average yields were 15 000 kg/ha in the GM dry maize , 500 kg/ha mostly higher compared with the conventional maize. All the others field characteristics and agronomic be-havior were also mostly the same.
Czech Republic	4042	as usual	as usual	as usual	as usual	as usual	as usual	as usual	as usual	Bad weather after sowing of maize
Czech Republic	4044	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	the plants were healthy
Czech Republic	4046	less vigor-ous	as usual	as usual	as usual	as usual	as usual	lower yield	as usual	Poor seed germination and by 15% poorer yield compared to conventional hybrids.
Czech Republic	4051	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	YG has a higher yield - the plants are not damaged
Czech Republic	4052	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	YG had higher yield because it was grown on more fertile fields and fertilized with organic fertilizers.

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Country	**Quest. Nr.**	**Germi-nation**	**Emer-gence**	**Male flower-ing**	**Plant growth**	**Stalk/-root lodging**	**Maturity**	**Yield**	**Volun-teers**	**Comments**
Czech Republic	4054	as usual	as usual	as usual	as usual	as usual	delayed	higher yield	as usual	time of maturity is longer because the plants mature uniformly (no attack by corn borer). The yield is higher because the plants are nor attacked by corn borer.
Czech Republic	4056	as usual	as usual	as usual	as usual	as usual	delayed	higher yield	no state-ment	general healthier vegetation
Czech Republic	4057	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	The plants were healthy.
Czech Republic	4059	as usual	as usual	as usual	as usual	as usual	as usual	higher yield	as usual	The plants were healthy
Romania	3850	as usual	as usual	as usual	as usual	less often	as usual	higher yield	as usual	+ 470 kg/ha

Table A.10: Additional observation during plant growth (Section 3.4.2)

Country	Quest. Nr.	Additional observations during plant growth
Spain	3853	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3854	When there are not ECB attacks, there are not differences between YieldGard and Conventional maize.
Spain	3856	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3857	There are not differences between YieldGard and conventional maize because this year there was not ECB attacks.
Spain	3858	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3865	There are not differences between YieldGard and conventional maize because this year there was not ECB attacks.
Spain	3867	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3871	There are not differences between YieldGard and conventional maize because this year there was not ECB attacks.
Spain	3876	When there are not ECB attacks, there are not differences between YieldGard and Conventional maize.
Spain	3878	When there are not ECB attacks, there are not differences between YieldGard and Conventional maize.
Spain	3879	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3894	When there are not ECB attacks, there are not differences between YieldGard and Conventional maize.
Spain	3895	There are not differences between YieldGard and conventional maize because this year there was not ECB attacks.
Spain	3902	YieldGard grain has two degrees more of humidity in the harvest time than conventional maize.
Spain	3903	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3905	When there are not ECB attacks, there are not differences between YieldGard and Conventional maize.
Spain	3906	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3911	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3912	This year the ECB attack has been very weak.
Spain	3913	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3914	YieldGard maize is greener, it is healthier than conventional maize including the years without ECB attacks.

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Country	Quest. Nr.	Additional observations during plant growth
Spain	3916	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3917	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3922	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3925	When there are not ECB attacks, there are not differences between YieldGard and Conventional maize.
Spain	3926	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3927	There are not differences between YieldGard and conventional maize because this year there was not ECB attacks.
Spain	3929	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3932	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3937	When there is a weak ECB attack there are not differences between YieldGard and conventional maize.
Spain	3938	When there is a weak ECB attack there are not differences between YieldGard and conventional maize.
Spain	3950	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3951	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3954	When there are not ECB attacks, there are not differences between YieldGard and Conventional maize.
Spain	3956	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3958	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3960	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3962	There are not differences between YieldGard and conventional maize because this year there was not ECB attacks.
Spain	3963	There are not differences between YieldGard and conventional maize because this year there was not ECB attacks.
Spain	3964	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3967	There are not differences between YieldGard and conventional maize because this year there was not ECB attacks.
Spain	3970	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.

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Country	Quest. Nr.	Additional observations during plant growth
Spain	3974	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3977	When there are not ECB attacks, there are not differences between YieldGard and Conventional maize.
Spain	3980	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3982	This year there was not ECB attacks and there are not differences between YieldGard and conventional maize.
Spain	3983	YieldGard grain has more humidity than conventional grain.
Spain	3987	YieldGard grain has 3 degrees of humidity more in the harvest time than conventional grain.
Spain	3992	YieldGard grain has one degree of humidity more than conventional grain.
Spain	3999	When there are not ECB attacks, there are not differences between YieldGard and Conventional maize.
Spain	4008	There are not differences between YieldGard and conventional maize because this year there was not ECB attacks.
Spain	4017	YieldGard maize has more humidity, 1 or 2 degrees more than conventional maize.
Spain	4024	When there are not ECB attacks, there are not differences between YieldGard and Conventional maize.
Spain	4026	The soil quality of fields where I sow YieldGard maize is worse than the fields where I sow conventional maize.
Romania	3851	total lack of Fusariosis

Table A.11: Additional comments on disease susceptibility (Section 3.4.3)

Country	Quest. Nr.	Disease susceptibility	Comments
Czech Republic	4055	no statement	not monitored
Spain	3861	less susceptible	YieldGard maize is healthier, without ECB damages and it has less *Ustilago* attack than conventional maize.
Spain	3863	less susceptible	YieldGard maize has not ECB damages, it is healthier, it is more vigorous and it has less *Ustilago* and *Fusarium* attack.
Spain	3990	less susceptible	YieldGard maize healthier, without ECB damages, the grain has not *Fusarium* attack. Conventional grain has *Fusarium* attack.
Spain	4009	less susceptible	YieldGard maize is healthier and Fusarium attack it less than conventional maize.
Spain	4011	less susceptible	YieldGard maize is healthier and it is less sensitive to Fusarium, it could be too by the variety.
Spain	4017	less susceptible	YieldGard maize is healthier, without ECB wounds and it is less sensitive to *Fusarium* and *Ustilago* attack than conventional maize.
Spain	4020	less susceptible	YieldGard maize has less attack of *Fusarium*, *Ustilago* and *Sphacelotheca* than conventional maize since it has not ECB wound.
Portugal	4060	less susceptible	Large presence in the region of production of diverse diseases.The sanity of the GM plants were high and amazing. There were less entry points for diseases in the GM plants (Fewer Gateways - Input ports). Also the huge and largest sanity of GM maize made GM plants more resistant to the diseases (less susceptible to diseases).
Portugal	4061	less susceptible	Huge presence in the region of production of different diseases. GM plants were more resistant to the diseases (less susceptible to diseases), it was a great advantage of GM plants.
Portugal	4062	less susceptible	Great asset and great advantage of GM maize. GM plants were more resistant to the diseases (less susceptible to diseases).
Portugal	4063	less susceptible	High presence in the region of production of different diseases. GM plants were more resistant to the diseases (less susceptible to diseases), the farmer reported a less susceptibility on diseases of the GM maize in this campaign mainly in the *Helminthosporium*. Great advantage of GM maize.
Portugal	4064	less susceptible	GM plants were more resistant to the diseases (less susceptible to diseases), the farmer reported a less susceptibility on diseases of the GM maize in this campaign. Excellent sanity and quality of GM maize.

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Country	Quest. Nr.	Disease susceptibility	Comments
Portugal	4068	less susceptible	Historical and high presence in the region of production of *Cefalosporium*. The farmer verified a less susceptibility on disease of the GM maize in this campaign mainly in the *Cefalosporium* spp. because of the higher sanity of the GM plant.
Portugal	4073	less susceptible	It was a year of strong attack of this disease, mostly the GM plants were more resistant to the attack of the different other disease (*Cefalosporium* spp.).
Portugal	4077	less susceptible	The huge and largest sanity of GM maize made GM plants more resistant to the diseases (less susceptible to diseases).
Portugal	4084	less susceptible	There were less entry points for diseases in the GM plants (Fewer Gateways - Input ports). The sanity of the GM plants were completely amazing. The GM plants were more resistant to the attack of the different other disease (*Cefalosporium* spp.).
Portugal	4085	less susceptible	The largest sanity of GM maize made GM plants more resistant to the diseases (less susceptible to diseases).
Portugal	4086	less susceptible	Despite the region of production had a lower incidence of diseases the farmer verified a less susceptibility on diseases of the GM maize in this last campaign mainly in the *Erwinia Zea* but also in the others diseases.
Portugal	4087	less susceptible	GM plants were more resistant to the diseases (less susceptible to diseases), the farmer reported a less susceptibility on diseases of the GM maize in this campaign despite the lower incidence of diseases in the region of production. Excellent quality of GM maize and great sanity.
Portugal	4100	less susceptible	Despite the region of production had a lower incidence of diseases the farmer verified a less susceptibility on diseases of the GM maize in this last campaign mainly in the *Ustilago maydis* but also in the others diseases.
Czech Republic	4044	less susceptible	the plats of maize were healthy
Czech Republic	4045	less susceptible	the plants were healthy
Czech Republic	4056	less susceptible	its not possible to monitor individual diseases
Czech Republic	4057	less susceptible	The plants were healthy.

Table A.12: Additional comments on insect pest control (Section 3.4.4)

Country	**Quest. Nr.**	***Ostrinia nubilalis***	***Sesamia* spp.**	**Comments**
Portugal	4062	very good	very good	Excellent!
Portugal	4065	very good	very good	Absolutely fantastic and overall effectiveness!
Portugal	4069	very good	very good	Fantastic combat in the control of maize borer in the GM maize.
Portugal	4074	very good	very good	Excellent control of the maize borers.
Portugal	4076	very good	very good	Overall Effectiveness.
Portugal	4093	very good	very good	Excellent and complete control of the maize borers.
Portugal	4096	very good	very good	Overall effectiveness in the control of maize borer in GM maize.
Portugal	4097	very good	very good	Complete and effective control of the maize borers.
Portugal	4099	very good	very good	Was the great advantage of the GM maize.
Portugal	4100	very good	very good	Was the great and main asset of the GM maize.
Portugal	4101	very good	very good	Excellent!
Portugal	4104	very good	very good	Excellent!
Romania	3850	very good	no statement	not one plant with *Ostrinia* attack

Table A.13: Additional comments on pest susceptibility (Section 3.4.5)

Country	Quest. Nr.	Pest susceptibility	Order of insect pest	Comments
Czech Republic	4055	no statement		not monitored
Spain	3988	more susceptible	*Mythimna* spp.	YieldGard maize has more *Mythimna* attack than conventional maize.
Spain	3854	less susceptible	Red Spider	YieldGard maize has less Red Spider attack than conventional maize.
Spain	3900	less susceptible	*Heliotis zea*	YieldGard maize has not *Heliotis* attack and conventional maize has it.
Spain	3984	less susceptible	*Mythimna* spp.	YieldGard maize has not *Mythimna* attack and conventional maize has it.
Spain	3993	less susceptible	*Mythimna* spp.	YieldGard maize has not *Mythimna* attack and conventional maize has it.
Spain	4017	less susceptible	Red Spider, Aphids, *Agrotis* spp.	YieldGard maize is healthier, without ECB damages, more vigorous and it has less attacks of other insects than conventional maize.
Spain	4019	less susceptible	*Spodoptera* spp.	YieldGard maize has not *Spodoptera* attack but the conventional maize has it.
Spain	4020	less susceptible	Aphids	YieldGard maize has less Aphids attack than conventional maize.
Portugal	4060	less susceptible	*Agrotis* spp.	The main problem in this campaign was the attack of the maize borer. However the plots of GM maize were also attacked by other pests (*Agrotis Ipsilon*) but the GM maize was more resistant to the attack. The farmer noted that the GM plants were better protected and resisted against the attack of other pests.
Portugal	4061	less susceptible	*Agrotis* spp.	The great problem in this last campaign was the attack of the maize borer. However the plots of GM maize were also attacked by pests (*Agrotis Ipsilon*) but the GM maize was more resistant to the attack. The farmer noted that the GM plants were better protected and resisted.
Portugal	4062	less susceptible	*Agrotis* spp.	The GM maize was more resistant to the attack of the different other pests like *Agrotis Ipsilon*. It was less clear compared with the maize borer resistant but the plots of GM maize were also attacked by other pests in effect the GM maize was more resistant to the attack.

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Country	**Quest. Nr.**	**Pest susceptibility**	**Order of insect pest**	**Comments**
Portugal	4064	less susceptible	*Agrotis* spp.	Although the GM event was specific for the maize borer and not for other pests, mostly the GM plants were less susceptible from he attacks of other pests.
Portugal	4065	less susceptible	*Spodoptera* spp., *Agrotis* spp., *Diabrotica* spp.	The plots of GM maize were also clearly attacked by other pests like *Spodoptera Frugiperda*, *Agrotis Ipsilon* and *Diabrotica Speciosa* but the GM maize was mostly more resistant to the attack of the different other pests.
Portugal	4066	less susceptible	*Agrotis* spp., *Spodoptera* spp.	The plots of GM maize were also mostly attacked by other pests like , *Agrotis Ipsilon* and *Spodoptera Frugiperda* but the GM maize was mostly more resistant to the attack of those different other pests.
Portugal	4067	less susceptible	*Agrotis* spp., *Diabrotica* spp.	The sanity of GM dry maize made all the difference and was determinant for the GM maize was mostly more resistant to the attack of those different other pests.
Portugal	4068	less susceptible	*Agrotis* spp., *Diabrotica* spp.	The plots of GM maize were also mostly attacked by other pests like *Agrotis Ipsilon* and *Diabrotica Speciosa* but the GM maize was mostly more resistant to the attack of those different other pests.
Portugal	4069	less susceptible	*Agrotis* spp., *Spodoptera* spp.	It is not guaranteed in all campaigns but mostly the GM maize was more resistant to the attack of the different other pests like *Agrotis Ipsilon* and *Spodoptera Frugiperda*.
Portugal	4070	less susceptible	*Agrotis* spp., *Diabrotica* spp., *Spodoptera* spp.	It was quite evident and exhaustive that the GM maize was also attacked by other pests. However was also evident that the GM maize was more resistant to those attack from other pests.
Portugal	4071	less susceptible	*Spodoptera* spp., *Agrotis* spp., *Diabrotica* spp.	Despite that was also clearly visible that the GM maize was more resistant to those attack from other pests, the GM maize was also attacked by other pests.
Portugal	4072	less susceptible	*Agrotis* spp., *Spodoptera* spp.	The sanity of the GM maize provided more resistant from the attack of the different other pests. Despite that the plots of GM maize were also attacked by other pests like *Agrotis Ipsilon* and *Spodoptera Frugiperda*.

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Country	Quest. Nr.	Pest susceptibility	Order of insect pest	Comments
Portugal	4073	less susceptible	*Agrotis* spp.	The health and sanity of GM maize is higher and makes GM plants mostly more resistant to the attack by the different others pests Despite the plots of GM maize were also attacked by other pests like *Agrotis Ipsilon* the GM maize was more resistant from the attack of those other pests compared with the conventional maize.
Portugal	4074	less susceptible	*Agrotis* spp.	The sanity of the GM maize provided more resistant from the attack of the different other pests, was a good advantage.
Portugal	4075	less susceptible	*Agrotis* spp., *Diabrotica* spp.	Despite the plots of GM maize were also attacked by other pests like *Agrotis Ipsilon* and *Diabrotica Speciosa* in reality the GM maize was more resistant from the attack of those other pests compared with the conventional maize.
Portugal	4076	less susceptible	*Agrotis* spp., *Diabrotica* spp., *Spodoptera* spp.	The plots of GM maize were also mostly attacked by other pests but the GM maize was mostly more resistant to the attack of those different other pests.
Portugal	4077	less susceptible	*Agrotis* spp., *Diabrotica* spp.	Although it was not specific in the GM plant, the GM maize was mostly more resistant to the attack of those different other pest.
Portugal	4078	less susceptible	*Agrotis* spp., *Diabrotica* spp.	The plots of GM maize were also mostly attacked by other pests like *Agrotis Ipsilon* and *Diabrotica Speciosa* but the GM maize was really more resistant to the attack of those different other pests.
Portugal	4079	less susceptible	*Agrotis* spp.	The sanity of the GM maize provided more resistant from the attack of the different other pests.
Portugal	4082	less susceptible	*Tetranychus* spp.	Like it happens with the diseases susceptibility the region of production had a lower incidence of pests attack. Despite of that and even the plots of GM maize were also attacked by other pests, the GM maize was a little more resistant to the attack of the different other pests.
Portugal	4083	less susceptible	*Tetranychus* spp., *Agrotis* spp.	Despite the region of production had an evident and real lower incidence of pests attack the GM maize was quite more resistant to the attack of the different other pests.

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Country	Quest. Nr.	Pest susceptibility	Order of insect pest	Comments
Portugal	4084	less susceptible	*Agrotis* spp., *Diabrotica* spp.	The fact that the GM plants had less entry points (fewer gateways - input port) and also the large sanity of the GM plants made the GM plants more resistant to the attack of the different other pests.
Portugal	4085	less susceptible	*Diabrotica* spp., *Agrotis* spp.	It was clearly evident that the GM maize was more resistant to those attacks from other pests. Despite that fact the GM maize was also attacked by other pests but quite less.
Portugal	4086	less susceptible	*Agrotis* spp.	Despite the region of production had also an evident lower incidence of others pests attack, practically insignificant, the GM maize was quite more resistant to the attack of the different other pests.
Portugal	4087	less susceptible	*Tetranychus* spp., *Agrotis* spp.	High production safety of the GM maize. Despite the region of production had a lower incidence of pests attacks however the GM plants were naturally more protected against the attack of other pests.
Portugal	4088	less susceptible	*Tetranychus* spp., *Agrotis* spp.	The plots of GM maize were also mostly attacked by other pests like *Tetranychus Urticae* and *Agrotis Ipsilon* but the GM maize was quite more resistant to the attack of those different others pests.
Portugal	4089	less susceptible	*Agrotis* spp.	The sanity of the GM maize was the great advantage and attractive for production.
Portugal	4090	less susceptible	*Agrotis* spp.	Susceptibility was justified by the good strength and vigor of the GM maize that made GM plants more protected against the attack of other pests.
Portugal	4091	less susceptible	*Agrotis* spp.	It was justified by the quality and sanity of the GM maize that made GM plants more protected against the attack of other pests.
Portugal	4093	less susceptible	*Agrotis* spp., *Diabrotica* spp.	It was almost impossible for the farmer to record and analyse differences also in others pests susceptibility because the region of production had a very low incidence of others pests. However the farmer knows that the GM maize was naturally more protected against the attack of other pests.
Portugal	4096	less susceptible	*Agrotis* spp.	Despite the region of production had an evident lower incidence of others pests attack, mostly insignificant, the GM maize was more resistant to the attack of the different other pests. The sanity of the GM maize and their safety production were huge advantages for the farmer.

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Country	Quest. Nr.	Pest susceptibility	Order of insect pest	Comments
Portugal	4097	less susceptible	*Agrotis* spp., *Spodoptera* spp.	Although the GM event was specific for the maize borer and not for other pests, mostly the GM plants were less susceptible (more resistant) from the attacks of other pests.
Portugal	4098	less susceptible	*Agrotis* spp., *Agriotes* spp.	The plots of GM maize were also mostly attacked by other pests like *Agrotis Ipsilon* and *Agriotes* spp. but the GM maize was mostly more resistant to the attack of those different other pests.
Portugal	4099	less susceptible	*Agrotis* spp., *Tetranychus* spp.	It is not guaranteed in all campaigns but mostly the GM maize was more resistant to the attack of the different other pests like *Agrotis Ipsilon* and *Tetranychus Urticae*. In this last campaign the difference was not very significant.
Portugal	4100	less susceptible	*Agrotis* spp., *Tetranychus*spp.	The plots of GM maize were also mostly attacked by other pests like *Tetranychus Urticae* and *Agrotis Ipsilon* but the GM maize was quite more resistant to the attack of those different others pests.
Portugal	4101	less susceptible	*Agrotis* spp., *Agriotes* spp.	The GM maize was not specific for the control of the attacks of the others pests except the maize borer. However was indirectly more resistant to the attack of the different other pests (less susceptible to other pests).
Portugal	4104	less susceptible	*Agrotis* spp., *Tetranychus* spp., *Diabrotica* spp.	The key for that fantastic susceptibility to others pests was justified by the amazing sanity of the GM maize that made GM plants more protected against the attack of other pests.
Portugal	4105	less susceptible	*Agrotis* spp., *Tetranychus* spp., *Diabrotica* spp.	It was quite evident for the farmer that the GM maize was also attacked by other pests. However was evident that the GM maize was more resistant to those attack from other pests justified by the amazing sanity and the control of the maize borer of the GM
Czech Republic	4044	less susceptible		We didn't observe any pest species, but generally maize was healthier and better.

Table A.14: Additional comments on weed pressure (Section 3.4.6)

Country	Quest. Nr.	Weed pressure	Comments
Spain	3988	more weeds	YieldGard maize fields have more weeds than conventional maize fields.The reason could be that the YieldGard maize plants have shorter size and let the entry of sunlight, shade less and there are more weeds.

Table A.15: Weeds that occurred in MON 810 (Section 3.4.6)

Name of weed	**Frequency**
Sorghum halapense	114
Abutilon theophrasti	98
Echinocloa spp.	95
Xanthium spp	61
Amaranthus spp.	60
Chenopodium ssp.	55
Setaria spp.	50
Datura stramonium	45
Cyperus spp.	40
Solanum nigrum	38
Digitaria sanguinalis	15
Cynodon dactylon	12
Cirsium ssp.	11
Phragmites australis	11
Portulaca oleracea	11
Raphanus raphanistrum	8
Agropyron repens	7
Polygnonum spp.	7
Galium spp.	3
Sedum spp.	3
Diplotaxis erucoides	2
Avena fatua	1
cereal volunteers	1
Convolvulus arvense	1
Lolium ssp.	1
Matricaria ssp	1
Medicago sativa	1
Salsola kali	1
Sinapis spp.	1
Thlaspi arvense	1
Thypha spp.	1
Veronica	1

Table A.16: Specifications for the performance of animals fed MON 810 (section 3.4.8)

Country	**Quest. Nr.**	**Performance of animals**	**Specification**
Czech Republic	4054	different	the animals are healthy because silage does not contain mycotoxins produced by corn borer. Much better pregnancy, milk quality and better overall condition of dairy cows.
Romania	3850	different	Grains are more healthy and without diseases

Table A.17: Motivations for not complying with the label recommendations (section 3.5.2)

Country	Quest. Nr.	Compliance	Reasons
Spain	3911	no	I did not plant a refuge
Spain	3972	no	I did not plant a refuge because it complicates the sowing.
Spain	4003	no	It is complicated to plant a refuge.
Spain	4005	no	I did not plant a refuge
Spain	4008	no	I did not plant a refuge
Spain	4013	no	I did not plant a refuge
Spain	4016	no	I did not plant a refuge because it is very inconvenient.
Spain	4018	no	I did not plant a refuge because nobody do it.
Spain	4019	no	I did not read the label recommendations.
Spain	4020	no	I did not plant a refuge because nobody do it.
Spain	4021	no	I did not have enough time to plant a refuge.
Spain	4022	no	I did not plant a refuge
Spain	4023	no	I did not plant a refuge
Spain	4024	no	I did not plant a refuge
Spain	4026	no	I did not plant a refuge
Spain	4027	no	I did not plant a refuge
Spain	4028	no	I did not read the label recommendations.
Spain	4029	no	I did not plant a refuge because it complicates the sowing.
Spain	4034	no	I did not plant a refuge
Spain	4035	no	I did not read the label recommendations.
Spain	4037	no	I did not read the label recommendations.
Spain	4040	no	I did not plant a refuge

Table A.18: Motivations for not planting a refuge (section 3.5.3)

Country	Quest. Nr.	Plant refuge?	Reasons
Spain	3911	no	It complicates the sowing
Spain	3972	no	It complicates the sowing
Spain	4003	no	It is very complicated, it is difficult to follow the technical guidelines.
Spain	4005	no	It complicates the sowing
Spain	4008	no	I sow small surface and it complicates the sowing.
Spain	4013	no	I have a small field, I sow a small surface.
Spain	4016	no	It is very inconvenient when I have to sow.
Spain	4018	no	None of my neighbors sowing YieldGard maize plant a refuge.
Spain	4019	no	I'm not informed about refuges because I did not read the label recommendations.
Spain	4020	no	Because nobody sow refuges and all ECB insects will come to my refuge.
Spain	4021	no	I have very short time to sow and to plant a refuge is a complication.
Spain	4022	no	I have short time to sow and it complicates the sowing.
Spain	4023	no	It complicates the sowing, I sow a small surface and nobody plant a refuge.
Spain	4024	no	I don't see necessary to plant a refuge, it is inconvenient.
Spain	4026	no	I sow a small surface of YieldGard maize and it complicates the sowing.
Spain	4027	no	I sow a small surface and if I would plant refuge I could have big yield losses by ECB attack.
Spain	4028	no	I'm not informed about refuges because I did not read the label recommendations.
Spain	4029	no	I have short time to sow maize and to plant a refuge is a complication.
Spain	4034	no	I sow a small surface and it complicates the sowing.
Spain	4035	no	I don't know the technical guidelines, I'm not informed.
Spain	4037	no	I'm not informed, I don't know the technical guidelines.
Spain	4040	no	It complicates the sowing

Appendix B

Questionnaire

2	0	1	3	-	0	1	-	M	A	R	-	E	S	-	0	1	-	0	1	-	0	1

Year - Event - Partner - Country -Interviewer- Farmer - Area

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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2	0	1	3	-	0	1	-	M	A	R	-	E	S	-	0	1	-	0	1	-	0	1

Year - Event - Partner - Country -Interviewer- Farmer - Area

Code:

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

Farmer ☐☐ Area ☐☐

Coding explanations:

2	0	1	3	-	0	1	-	M	A	R	-	E	S	-	0	1	-	0	1	-	0	1

Year | Event Code | Partner[1] Code | Country Code | Interviewer[2] Code | Farmer Code | Area Code

Codes:

Event: 01 MON 810
02 ...

Partner[1]: MON Monsanto
MAR Markin
AGR Agro.Ges
... ...

Country: ES Spain
PT Portugal
RO Romania
…

Interviewer[2]: 01 A
02 B
03 …

Farmer: incremental counter within the interviewer

Area: incremental counter within the farmer

---

[1] Partner is the organization that implements the survey
[2] Interviewer is the employee from the Partner that is contacting the farmers

The European Association for Bioindustries

2	0	1	3	-	0	1	-	M	A	R	-	E	S	-	0	1	-	0	1	-	0	1

Year - Event - Partner - Country -Interviewer- Farmer - Area

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?[3]

O Yes O No

[3] 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)

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: ________________________

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 vigorous	O Less vigorous
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[4] 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: ____
____
____

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

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

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]

____

____

____

____

____

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2	0	1	3	-	0	1	-	M	A	R	-	E	S	-	0	1	-	0	1	-	0	1

Year - Event - Partner - Country -Interviewer- Farmer - Area

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 ____

____
____
____