TSGE Consulting

Ministry of Environment and Food
The Danish Environmental Protection Agency

GEUS

Comparison of regulatory modelling and data from the Danish Pesticide Leaching Assessment Programme

June 2016

TSGE Consulting Limited
Concordia House
St James Business Park
Grimbald Crag Court
Knaresborough
North Yorkshire
HG5 8QB, UK

This page is left intentionally blank

Foreword

This report requires a basic knowledge of FOCUS (FOrum for Coordination of pesticide fate models and their USe) pesticide fate modelling and the Danish Pesticide Leaching Assessment Programme (PLAP) monitoring fields. For further information visit:

- http://esdac.jrc.ec.europa.eu/projects/focus-dg-sante
- http://pesticidvarsling.dk/om_os_uk/uk-forside.html.

The authors wish to thank the steering committee for their comments.

The members of the steering committee were:

Poul Henning Petersen, SEGES

Preben Olsen, AGRO, Århus University

Annette E. Rosenbom, GEUS

Merete Styczen, University of Copenhagen

Christian Deibjerg, BASF, representing the pesticide industry

Vibeke Møller, The Danish Environmental Protection Agency

Anne Louise Gimsing, The Danish Environmental Protection Agency

This report should referenced as: Pullan, S.P., Gimsing, A.L., Branford, P.R. & Rosenbom, A.E. (2016) *Comparison of regulatory modelling and data from the Danish Pesticide Leaching Assessment Programme*. Knaresborough, TSGE Consulting.

Executive Summary

This report was commissioned by the Danish Environmental Protection Agency (Danish EPA) in collaboration with the Geological Survey of Denmark and Greenland (GEUS) to compare the estimated PECgw (Predicted Environmental Concentration in groundwater) obtained using regulatory models FOCUS-PELMO (Hamburg scenario) and FOCUS MACRO (Karup and Langvad scenarios) with the leaching of pesticides (and/or their degradation products) to groundwater observed in the Danish Pesticide Leaching Assessment Programme (PLAP).

Modelling was performed using unrefined Tier 1 input parameters provided by the Danish EPA, derived utilising the standard European (EU) approach and the Danish (DK) approach, and applied to the three regulatory model scenarios relevant for registration of pesticides in Denmark (Hamburg - PELMO, Karup - MACRO and Langvad - MACRO). Resulting PECgw values were estimated and evaluated with respect to the EU approach (80^{th} percentile PECgw) and the DK approach (1 exceedance of the 0.1 μg/L threshold in 20 modelled years).

PLAP has evaluated the leaching potential of 50 pesticides and 50 of their degradation products (hereafter metabolites) under realistic conditions at five fields in Denmark (Brüsch *et al*., 2015), which are representative of Danish soils and the variation in Denmark's climate (Rosenbom, *et al*., 2015). The 50 pesticides included in PLAP are categorised into (a) high, (b) low and (c) no observed risk to leaching in the PLAP reports, based on whether the pesticide (and/or metabolites) had been detected in water samples from:

- 1 m depth:
  - (i) in average concentrations exceeding 0.1 μg/L within the first season after application,
  - (ii) in three consecutive samples or one single sample exceeding 0.1 μg/L,
  - (iii) in no or few cases or when concentrations are below 0.1 μg/L.
- groundwater monitoring screens (1.5 – 4.5 m depth):
  - (i) at concentrations exceeding 0.1 μg/L,
  - (ii) at concentrations below 0.1 μg/L,
  - (iii) at concentrations below detection limit in the samples collected.

Of the 50 pesticides included in PLAP 27 representative pesticides (and 19 of their associated metabolites), were selected for comparison with regulatory PECgw results. These pesticides comprised thirteen of fourteen high risk pesticides, six of twelve low risk pesticides and eight of 24 no risk pesticides.

With both the regulatory predictions of pesticide leaching to groundwater and the PLAP monitoring data being applied in the Danish regulation of plant protection products it is important to describe the performance of the regulatory model scenarios in relation to predicting the leaching as detected in PLAP seen both from:

- An overall **R**egulatory view-point focusing on the effect of applying the EU or DK approach for parameter selection and output evaluation on the ability of the three regulatory model scenarios to predict the leaching risk of pesticides or metabolites to groundwater as detected via the groundwater monitoring in PLAP.
- A **F**ield specific view-point focusing on the conceptual understanding behind the regulatory model scenarios and its ability to predict the leaching risk detected in PLAP to both 1 m depth (sandy fields: water collected via suction cups; clay till fields: water collected via tile drains) and groundwater (1.5 – 4.5 m) as a result of applications in a specific crop.

In the **R**egulatory-comparison the results demonstrate that the DK approach to parameter selection and output evaluation is more conservative and typically over-estimates the leaching to groundwater, as measured in PLAP, compared to the EU approach. In particular, the DK approach over-estimates the leaching risk to groundwater for compounds that are considered to "pass" based on PLAP groundwater monitoring results (PLAP detections ≤ 0.1 µg/L). The results show that applying the EU approach a maximum of 24/26 compounds (Hamburg – PELMO) and 23/25 compounds (Karup – MACRO and Langvad - MACRO) match the Danish EPA leaching risk conclusion, compared to 17/26 compounds (Hamburg – PELMO), 16/25 compounds (Karup – MACRO) and 15/25 compounds (Langvad – Macro) applying the DK approach.

For those compounds that are considered by the Danish EPA to constitute a serious leaching risk, based on the PLAP groundwater monitoring results, and are therefore considered to have "failed" the leaching assessment, the DK approach is shown to perform better than the EU approach which under-estimates the leaching risk. The results show that applying the DK approach a maximum of 6/8 compounds (Langvad - MACRO) match the Danish EPA leaching risk conclusion, compared to 5/8 compounds (Langvad - MACRO) applying the EU approach.

When the leaching risk conclusion from the Danish EPA is "passed based on expert judgment" the results show that the EU approach performs better than the DK approach. "Passed based on expert judgment" is defined here as those compounds that are considered by the Danish EPA as having a limited risk of leaching, *i.e.* a few detections in the PLAP groundwater monitoring data >0.1 µg/L. The results show that applying the EU approach a maximum of 11/11 compounds (Hamburg – PELMO) match the Danish EPA leaching risk conclusion, compared to 4/11 compounds (Hamburg-PELMO and Karup – MACRO) applying the DK approach. However, the PLAP groundwater monitoring data from which this decision is derived shows that the compounds are found at concentrations >0.1 µg/L in groundwater in a few samples. As a consequence, the EU approach is predicting no risk, with compounds passing the simulated leaching assessment, but the PLAP groundwater monitoring results shows a few detections >0.1 µg/L which could lead to restrictions.

In the **F**ield specific-comparison the results highlight that the regulatory model scenarios Hamburg-PELMO and Karup-MACRO underestimate the leaching to groundwater, as seen in PLAP at the sandy fields. In order to circumvent this lack of ability the application of the DK approach will, compared to the EU approach, provide the best protection of the aquifers below sandy fields against pesticide contamination. In the regulatory model scenario Langvad – MACRO when applying the DK approach the leaching risk to groundwater of more or less all the selected "Pesticide + Crop" combinations at clay till fields was predicted. In the EU approach the PECgw values from Langvad – MACRO underestimated the leaching risk to groundwater. These results show the importance of having a more conservative DK approach in the protection of the quality of the Danish groundwater until more up to date leaching risk assessment models are provided, which incorporate the newest process-understanding for different soil types and climate being update on at least a 10 years basis (Henriksen *et al.,* 2013).

In conclusion, the results demonstrate that when applying the three current regulatory model scenarios and unrefined Tier 1 input parameters the DK approach to parameter selection and output evaluation is more conservative and overestimates the risk of leaching, as measured in groundwater in PLAP, in comparison with the EU approach. This is particularly evident for compounds where there is no risk of leaching according to PLAP. On the other hand, for the pesticides that are shown to be leachers the DK approach is more comparable than the EU approach in determining risk of leaching to groundwater, as seen in PLAP.

Table Of Contents

List of Abbreviations, Acronyms and Model Symbols

C*mean*	Average leachate concentration at 1 m b.g.s in the first year after application
CO_2	Carbon Dioxide
Danish EPA	Danish Environmental Protection Agency
DK	Denmark
DT_{50}	Degradation half-life
EFSA	European Food Safety Authority
EU	European Union
FERA	The Food and Environment Research Agency
FF	Formation Fraction
FOCUS	FOrum for Coordination of pesticide fate models and their Use
GAP	Good Agricultural Practice
GEUS	Geological Survey of Denmark and Greenland
K	First-order degradation coefficient
K_{OC}	Organic carbon normalised adsorption coefficient
K_F	Freundlich adsorption coefficient
K_{FOC}	Organic carbon normalised Freundlich adsorption coefficient
LOD	Limit of Detection
LoEP	List of Endpoints
LOQ	Limit of Quantification
NER	Non-Extractable Residue
Mbgs	meters below ground surface
PECgw	Prediction Environmental Concentration in Groundwater
PELMO	PEsticide Leaching Model
PLAP	Pesticide Leaching Assessment Programme
Q10	Temperature coefficient
1/n	Freundlich exponent

1.0 Introduction

The aim of this project is to compare predicted environmental concentrations in groundwater (PECgw) from the regulatory models FOCUS PELMO (Hamburg scenario) and FOCUS MACRO (with the Danish national Karup and Langvad scenarios) with leaching of pesticides and metabolites to groundwater observed in the Danish Pesticide Leaching Programme (PLAP). Regulatory modelling was performed considering both (i) core EU requirements (based on the EU FOCUS (FOrum for Coordination of pesticide fate models and their USe) methodology) and (ii) the Danish National regulatory approach.

For the approval of pesticide active substances and authorisation of plant protection products in the EU, the risk of a pesticide and/or its metabolites leaching to groundwater is based primarily on the use of mathematical models (*e.g.* PEARL, PELMO, PRZM and MACRO) simulating PECgw at 1 m depth for up to nine realistic worst case scenarios. At the EU active substance level PECgw is calculated utilising EU requirements with respect to the parameter selection, such as: degradation rate, sorption and crop interception, and PECgw output evaluation. For example, in the EU, the 80^{th} percentile of the simulated 20 annual average concentrations represents PECgw.

For national product registrations, Denmark (DK) has a different approach for the derivation of parameters, such as: degradation rate, sorption and crop interception, and output evaluation. In the DK approach only one out of 20 annual average PECgw values is allowed to exceed 0.1 µg/L. In Denmark, PECgw can be determined using the FOCUS Hamburg scenario with FOCUS PELMO (version 5.5.3) representing conditions at 1 m depth or the national scenarios Karup and Langvad using FOCUS MACRO (version 4.4.2) representing conditions at 2.5 m depth (Figure 1.0-1).

In the EU, the groundwater concentration must not exceed the EU-drinking water limit of 0.1 µg/L for an individual pesticide. The same 0.1 µg/L threshold is applied to relevant metabolites, whereas non-relevant metabolites may, in certain circumstances, exceed the threshold[1]. In Denmark, pesticides and metabolites are to be considered in the risk assessment and must not exceed 0.1 µg/L unless they are inherently non-problematic [2] (Danish Evaluation Framework, 2014).

[1] The assessment of the relevance of metabolites in groundwater in the EU is described in the SANCO/221/2000-rev.10-final guidance document.

[2] In Denmark, the Danish Environmental Protection Agency carries out ad hoc appraisals of the extent to which metabolites (defined here as all degradation, reaction and transformation products of pesticides that differ from the ultimate mineralisation products, *i.e.* CO_2, H_2O and mineral salts) are significant with respect to health and the environment. As a rule, a metabolite is included in the assessment (either in the form of considerations based on studies of the active substance or on the basis of independent studies of the metabolite) if it present at more than 10% (typically measured as percentage of added radioactivity). If, based on the available documentation, there are indications that metabolites at less than 10% could prove problematical (e.g. in relation to groundwater pollution), they must also be assessed. The Danish Environmental Protection Agency has decided that metabolites that occur commonly in nature (for example pyrimidine) or which are simple substances such as saccharine are not to be considered relevant.

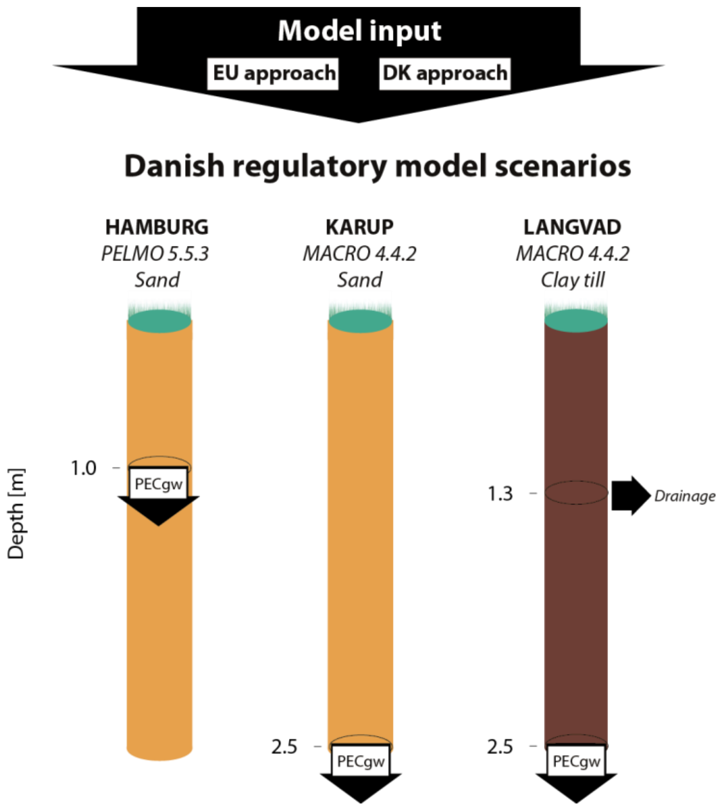


Figure 1.0-1: Conceptual Overview of the three ***regulatory model scenarios*** applied in ***Denmark*** highlighting the ***soil type*** and ***depth of PECgw predictions***.

In 1998, the Danish government started an intensive monitoring programme in order to evaluate the leaching risk of pesticides under field conditions, the Pesticide Leaching Assessment Programme (PLAP). In PLAP pesticides and metabolites used in arable farming are monitored for under actual field conditions at five agricultural fields representing Danish soils and variation in Denmark's climate (Rosenbom *et al*., 2015). The soils can be broadly split into sandy and clay till (Figure 1.0-2). In the latter case tile drain systems are installed and preferential flow and solute transport is the dominant process.

The leaching risk has been evaluated for 50 pesticides and 50 metabolites across the five fields (Brüsch *et al*., 2013). Monitoring results represent analysis results of water sampled at 1 m depth (C*mean* in suction cups at the sandy fields and tile drainage water in the clay till fields) and in groundwater monitoring screens (1.5 – 4.5 m depth) as presented in Figure 1.0-2.

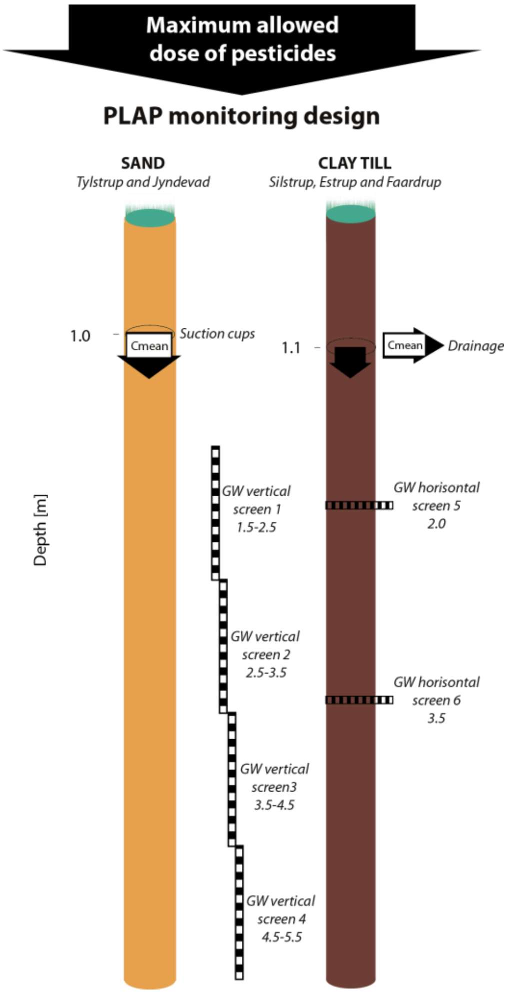


Figure 1.0-2: ***PLAP monitoring design*** with water collected at approx. ***1 m depth*** (Cmean) via suction cups at the sandy fields and drainage at the clay till fields and in the ***groundwater*** via both vertical and horizontal screens at both the sandy and clay till fields.

The monitoring data reported in PLAP provides a unique opportunity to evaluate by comparison the leaching risk related to the use of pesticides on arable fields, when applied at the maximum allowable dose rate and according to good agricultural practice, with the simulated leaching risk assessed with three relevant regulatory model scenarios, Hamburg - PELMO, Karup -MACRO and Langvad - MACRO, when applying the EU and DK approaches to parameter selection and output evaluation.

With both the regulatory predictions of pesticides related leaching to groundwater and the PLAP monitoring concentrations being applied in the Danish regulation of plant protection products, the aim of this report is to describe the performance of the regulatory model scenarios in relation to predicting the leaching risk as detected in PLAP. The objectives are to evaluate whether:

- the more conservative Danish approach (with respect to parameter selection and output evaluation) is required to ensure that the regulatory model scenarios are protective of the leaching risk to groundwater as observed in PLAP for pesticides and their metabolites.
- the present regulatory model scenarios, required by Denmark, adequately assess the leaching risk of active substances and their metabolites through both the sandy and clay till fields of PLAP.

2.0 Materials and Methods

2.1 Regulatory modelling

The assessment of the risk of a pesticide and/or metabolites leaching to groundwater is based primarily on the use of mathematical models (*e.g.* PELMO and MACRO) and modelling input values agreed at the EU level. When calculating the PECgw for national product registrations in Denmark a more conservative approach is taken to parameter selection and output evaluation.

2.1.1 Parameter selection and output evaluation

The input parameter selection for the three regulatory model scenarios and the output evaluation of the PECgw has been undertaken as it would be during the exposure risk assessment following EU and Danish guidance. The Danish EPA are responsible for the selection of all the EU and DK input parameters used in this project. The general principles for the selection of parameters are described here and are summarised in Table 2.1-1.

Table 2.1-1: ***EU*** and ***DK*** approach to ***groundwater modelling*** with regard to ***selection of input values*** and ***evaluation of output PECgw*** results

	EU	DK
Scenarios	Relevant scenarios chosen based on crop.	PELMO (Hamburg). MACRO (Karup and Langvad) can also be presented. If all scenarios are presented all have to pass.
Degradation rate	Geometric mean of the available DT_{50} values.	80th percentile of the available DT_{50} values.
Sorption	Arithmetic mean of the Freundlich parameters 1/n and $K_{FOC.}$	80th percentile for 1/n and 20th percentile for K_{FOC}
Evaluation of output	Modelling is performed for 20 years if the pesticide is used annually. For each year an annual average concentration is calculated. The 80th percentile of the 20 annual averages is calculated, and this concentration has to be below the threshold value of 0.1 µg/L.	Modelling is performed for 20 years if the pesticide is used annually. For each year an annual average concentration is calculated. One of the 20 annual averages is allowed to exceed the threshold value of 0.1 µg/L.
Use every second or third year	If the pesticide is used every second year the model runs for 40 years with application every second year, if the pesticide is used every third year the model runs for 60 years with application every third year. An average is then calculated for the 20 two year intervals (application every second year) or three year intervals (application every third year). The 80th percentile of the 20 averages is then calculated, and this concentration has to be below the threshold value of 0.1 µg/L.	If the pesticide is used every second year the model runs for 40 years with application every second year, if the pesticide is used every third year the model runs for 60 years with application every third year. All 40 or 60 years are evaluated and 2 or 3 of the concentrations respectively are allowed to exceed the threshold of 0.1 µg/L.

The modelling performed in this project is Tier 1 based on laboratory data as listed in the most recent List of Endpoints; no refinement of input parameters has been performed. The DK input parameters have been taken from the most recent Danish evaluations. However, in some cases DK input parameters have been calculated from the values in the List of Endpoints to take new studies into account. The same studies as used to calculate the EU parameters have then been used to calculate the DK parameters, but a thorough evaluation of the underlying degradation and sorption studies has not been performed. An example of input parameters for azoxystrobin and CyPM are presented here for both PELMO (Table 2.1-2) and MACRO (Table 2.1-3). Details of inputs for all pesticide and metabolites are presented in Appendix A.

Common endpoints such as the phys-chem properties, plant uptake factor etc. are also taken from the most recent List of Endpoints. If the endpoints were not available in List of Endpoints or the Danish evaluation the Footprint Pesticide Properties Database[3] has been used.

For each crop, three application dates were considered as required according to the Danish Evaluation Framework. Application rates and application dates were selected based on field use in PLAP and the Danish GAP for the product. Hence the application dates may cover a wide application window if this is specified in the GAP, but at least one of the application dates is close to the actual application date in PLAP. In the EU approach, the interception rates have been selected from the new values presented in Generic Guidance for Tier 1 FOCUS Ground Water Assessments (EFSA, 2014). The Danish interception values have been taken from the Danish Framework for the assessment of pesticides (Danish Evaluation Framework, 2014). An example of the application input parameters for azoxystrobin is presented here (Table 2.1-4).

The PECgw results were evaluated in line with the EU and DK guidance (Table 2.1-1). In the EU approach the PECgw is taken as the 80th percentile of the 20 annual average concentrations. In PELMO this is calculated as the average of the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value. In the DK approach, the number of exceedances of the 0.1 µg/L threshold is reported. For this report the 19th value out the 20 annual average concentrations for applications every year hereafter referred to as 95th percentile PECgw.

For applications every third year, in PELMO the 60 annual average concentrations are calculated by the model and detailed in the year.plm output file. Note that 66 individual years are presented in the output file as this includes the 6 warm-up years which are not included in the analysis. In MACRO in order to calculate the 60 individual years the .bin files were converted to excel files using R and the macroutils package (available from the SLU website[4]). The average hourly water flow (mm/hr) from the micropores and water flow from the macropores was added together and the daily data summed for each year to give the average yearly water flow (mm/year). The average daily solute flow (mg/m^2/hr) from the micropores and macropores was added together and the daily data summed for each year to give the average yearly solute flow (mg/m^2/year). Using the volume and solute mass flow the concentration for each individual year was calculated (µg/L).

[3] (http://sitem.herts.ac.uk/aeru/ppdb/en/)
[4] http://www.slu.se/en/collaborative-centres-and-projects/centre-for-chemical-pesticides-ckb1/areas-of-operation-within-ckb/models/macro-52/

Table 2.1-2: FOCUSPELMO 5.5.3 input parameters for ***azoxystrobin*** and ***CyPM***

Parameter	Value	Comment
Common endpoints – from LoEP after evaluation of confirmatory data, 2014		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table 2.1-3	Every year
Molecular weight	403.4 g/mol 389.4 g/mol	Azoxystrobin CyPM
Plant uptake factor	0.5 0	Azoxystrobin CyPM - Worst case
Vapour pressure (20°C)	0 Pa	Loss due to volatilisation was not considered → worst case (azoxystrobin and CyPM)
Aqueous solubility	6.0 mg/L at 20°C 57 mg/L at 25°C	Azoxystrobin CyPM
Formation fraction	0.126 0.874 1	Azoxystrobin to CO_2 bound residues Azoxystrobin to CyPM CyPM to CO_2 bound residues
EU endpoints – Confirmatory data, 2014		
K_{FOC}	423 L/kg 228.4 L/kg	Azoxystrobin CyPM[1]
Freundlich exponent (1/n)	0.86 0.78	Azoxystrobin CyPM[1]
DT_{50} soil (20°C/pF2)	78 d 98.6	Azoxystrobin CyPM[1]
Rate Constants:		
k total (d^{-1})	0.00889	Azoxystrobin: ln(2)/DT_{50}
azoxystrobin to CyPM (d^{-1})	0.00777	Based on FF of 0.874
azoxystrobin to CO_2/NER (d^{-1})	0.00112	Based on a FF of (1-0.874)
k total (d^{-1})	0.00703	CyPM: ln(2)/DT_{50}
CyPM to CO_2/NER (d^{-1})	0.00703	Based on FF of 1
Danish endpoints – Calculated from updated LoEP, 2014		
K_{FOC}	235 L/kg 100.4 L/kg	Azoxystrobin CyPM
Freundlich exponent (1/n)	0.90 0.867	Azoxystrobin CyPM
DT_{50} soil (20°C/pF2)	100.48d 103.6	Azoxystrobin CyPM
Rate Constants		
k total (d^{-1})	0.00690	Azoxystrobin: ln(2)/DT_{50}
azoxystrobin to CyPM (d^{-1})	0.00603	Based on FF of 0.874
azoxystrobin to CO_2/NER (d^{-1})	0.00087	Based on a FF of (1-0.874)
k total (d^{-1})	0.00669	CyPM: ln(2)/ DT_{50}
CyPM to CO_2/NER (d^{-1})	0.00669	Based on FF of 1

[1.] *Values are for acidic soils, considered to be representative of Danish conditions (Northern Zone Guidance, 2015).*

Table 2.1-3: FOCUSMACRO 4.4.2 input parameters for ***azoxystrobin*** and ***CyPM***

Parameter	Value	Comment
Common endpoints – from LoEP after evaluation of confirmatory data, 2014		
Application rate/dates	See Table 2.1-3	Every year
Molecular weight	403.4 g/mol 389.4 g/mol	Azoxystrobin CyPM
Vapour pressure (20°C)	0 Pa	Loss due to volatilisation was not considered → worst case (azoxystrobin and CyPM)
Aqueous solubility	6.0 mg/L at 20°C 57 mg/L at 25°C	Azoxystrobin CyPM
Plant uptake factor	0.5 0	Azoxystrobin CyPM - Worst case
Formation fraction	0.874	Azoxystrobin to CyPM[1]
EU endpoints – Confirmatory data, 2014		
K_{FOC}	423 L/kg 228.4 L/kg	Azoxystrobin CyPM[2]
Freundlich exponent (1/n)	0.86 0.78	Azoxystrobin CyPM[2]
DT_{50} soil (20°C/pF2)	78 d 98.6	Azoxystrobin CyPM[2]
Danish endpoints – Calculated from updated LoEP, 2014		
K_{FOC}	235 L/kg 100.4 L/kg	Azoxystrobin CyPM
Freundlich exponent (1/n)	0.90 0.867	Azoxystrobin CyPM
DT_{50} soil (20°C/pF2)	100.48 d 103.6 d	Azoxystrobin CyPM

1. Equivalent to 0.844 on a mass basis for entry into MACRO.
2. Values are for acidic soils, considered to be representative of Danish conditions (Northern Zone Guidance, 2015).

Table 2.1-4: Application parameters for PECgw for ***azoxystrobin***

Crop	Application rate	Growth stage	Application date	EU endpoints		DK endpoints	
				Interception rate[1]	Effective rate for soil loading	Deposition[2]	Effective rate for soil loading
Spring barley[3]	250 g/ha	30-59	05/06	80%	50 g/ha	43%	107.5 g/ha
	250 g/ha	30-59	20/06	80%	50 g/ha	27%	67.5 g/ha
	250 g/ha	30-59	10/07	90%	25 g/ha	18%	45 g/ha

1. The values are taken from the new guidance, EFSA (2014).
2. The values are taken from the Danish Evaluation Framework (2014).
3. FOCUS surrogate crop spring cereals.

2.1.2 *Regulatory model scenarios*

For the purpose of assessing the leaching potential of pesticides and/or their metabolites, FOCUS (2000, 2009) defined nine realistic worst case groundwater scenarios in representative agricultural regions across the EU.

To estimate PECgw for national product registrations in Denmark, the sandy FOCUS-Hamburg regulatory model scenario (PELMO version 5.5.3) is considered relevant (Figure 2.1-1). In addition, PECgw can also be estimated applying the two national regulatory model scenarios Karup (sandy soil) and Langvad (clay till soil with dominant preferential solute transport), which are executed using the old FOCUS MACRO 4.4.2 (Figure 2.1-1). In product registration in Denmark, if modelling is presented for all three regulatory model scenarios, all three need to pass. A brief description of the characteristics of the three regulatory model scenarios is outlined in (Table 2.1-5). Further details can be found in Barlebo *et al*., (2007).

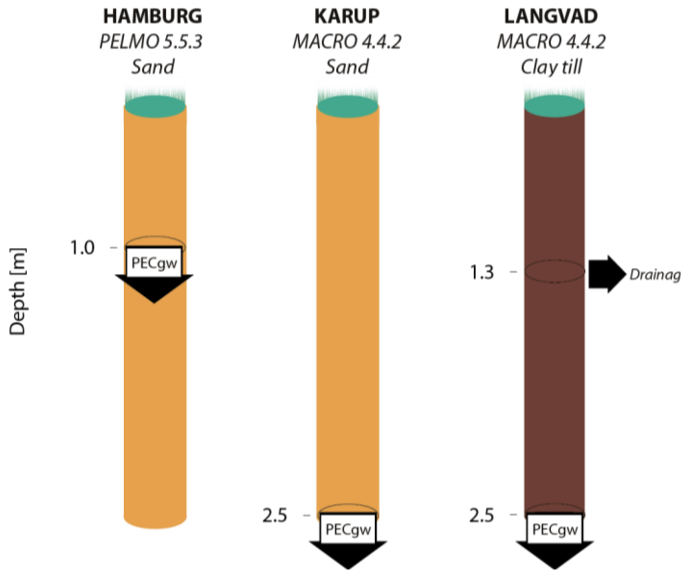


Figure 2.1-1: Conceptual overview of the three ***regulatory model scenarios*** applied in ***Denmark*** highlighting the ***applied model version***, ***soil type*** and ***depth of PECgw predictions***

Table 2.1-5: Regulatory model scenario characteristics

	Hamburg[1]	Karup[4]	Langvad[4]
Model	PELMO	MACRO	MACRO
Yearly average precipitation	786 mm/year	912 mm/year	675 mm/year
Topsoil[2]	Sandy loam[5]	Loamy sand	Sandy loam
Organic carbon content	1.51%[3]	2.2%	2.1%
pH	5.7	n/a	n/a
Surface geology	n/a	Downwash sandy deposits	Till clayey and fine sandy
Tile drain	Not drained	Not drained	1.3 m depth

[1]. *FOCUS groundwater guidance (2000).*
[2]. *USDA classification.*
[3]. *Converted from 2.6% organic matter content.*
[4]. *Barlebo* et al., *(2007).*
[5]. *Sand from 60-200 cm depth..*

As shown in Figure 2.1-1 in PELMO the PECgw results are reported at 1 m depth and in MACRO at the bottom of the soil profile at 2.5 m depth. For a comparison between PECgw results from MACRO at 1 m and at 2.5 m depth see Appendix D. The Langvad – MACRO scenario incorporates a tile drain at 1.3 m depth but the solute transport to drainage is not generated in the FOCUS-MACRO model outputs. The mass balances for this scenario, presented in the study by Barlebo *et al.* (2007), indicate a negligible contribution to drainage.

2.1.3 Conceptualisation of the regulatory model scenarios

A technical description of the models (PELMO and MACRO) is outside the scope of this report, for more details the reader is referred to Klein (2012) for PELMO and Larsbo and Jarvis (2003) for MACRO, note this is the technical description for MACRO 5.0 and not the old MACRO 4.4.2, which the two national regulatory model scenarios Karup and Langvad is based upon. The key characteristics of the model concepts are given in Table 2.1-6.

Table 2.1-6: Model concepts and key characteristics

Subject	FOCUS-PELMO	FOCUS-MACRO
Model version	5.5.3	4.4.2
Release date	May 2013	June 2003
Water flow equation	Capacity type	Richards equation
Solute flow equation	Convection dispersion	Convection dispersion
Preferential flow	No	Yes
Drainage	No	Yes
Sorption	Freundlich	Freundlich
Degradation	First-order	First-order
Plant uptake	Yes	Yes
Volatilisation	Yes	No
Formation of metabolites	In the profile	In the profile

The PEsticide Leaching MOdel (PELMO) is a one-dimensional capacity model simulating the vertical movement of pesticides in soil by an approximation to chromatographic leaching. Water movement is simulated using capacity-based water flow (tipping bucket approach) using a daily time step. Pesticide movement is based on the convection-dispersion equation using a daily time step. Degradation in soil uses a first order degradation rate with correction of rate constant with depth, moisture and temperature. Pesticide sorption to soil is based on K_d, K_{OC}, Freundlich equation for sorption with an option to increase sorption with time and automated pH-dependence. Pesticide volatilization is calculated using Fick's and Henry's law. An extensive metabolism scheme with up to eight metabolites can be simulated simultaneously with the parent. In PELMO water flow in the macropores is not explicitly modelled; see Klein (2012) for more details on assumptions regarding macropore flow.

MACRO simulates pesticide movement through both macropore flow and bulk matrix flow. The movement of water through the soil matrix is described using Richards' equation and solute transport is described with the convection-dispersion equation. Solute movement in the macropores is assumed to be dominated by mass flow. Mass exchange between the flow domains is calculated using approximate first-order expressions based on an effective diffusion path length. Sorption is described with a Freundlich isotherm, with the sorption sites partitioned between the two domains. Degradation is calculated using first-order kinetics.

It should be noted that in latest versions of PELMO and MACRO 5.0 (and above) two-site sorption equations have been introduced in order to describe aged sorption. This can be a key process within the soil as adsorption has been shown to increase over time and can therefore potentially influence the availability of pesticides and metabolites for movement to groundwater (FERA, 2012). Within the regulatory risk assessment processes, at the time of publication, the guidance for the use of aged sorption studies (FERA, 2012) had not been accepted.

2.2 PLAP scenarios

In the PLAP programme (Rosenbom *et al*., 2015), there are five fields and the leaching risk has been evaluated for 50 pesticides and 50 metabolites (Brüsch *et al*., 2013). Monitoring results represent analysis of water sampled at 1 m depth (sandy fields: water collected via suction cups; clay till fields: water collected via tile drains) and in groundwater monitoring screens (1.5 – 4.5 meters below the ground surface; mbgs) as presented in Figure 1.1-2. At each field monthly monitoring is carried out. Added to this is primarily weekly flow-proportional sample of drainage at each of the three clay till fields.

The fields represent a range of soil types and climate variation experienced in DK (Table 2.2-1). All fields are considered to have a shallow groundwater table. Two of the fields are located on coarse and fine sand and three are on clay till deposits (Barlebo, 2007). The clay till fields have a tile drainage system installed at approximately 1 m depth. For further details on field characterisation and monitoring design see Lindhardt *et al*., (2001).

Table 2.2-1: PLAP field characteristics[1]

	Tylstrup	Jyndevad	Silstrup	Estrup	Faardrup
Location	Brønderslev	Tinglev	Thisted	Vejen	Slagelse
Precipitation[2]	941 mm/year	1052 mm/year	949 mm/year	1085 mm/year	682 mm/year
Simulated actual evapotranspiration[2]	515 mm/year	524 mm/year	474 mm/year	481 mm/year	474 mm/year
Simulated groundwater discharge[2]	478 mm/year	608 mm/year	269 mm/year	179 mm/year	106 mm/year
Measured drain discharge[2]			169 mm/year	381 mm/year	102 mm/year
Area	1.1 ha	2.4 ha	1.7 ha	1.3 ha	2.3 ha
Tile drain	No	No	Yes	Yes	Yes
Depth to groundwater	3-4 m	1-2 m			
Topsoil characteristics					
Classification	Loamy sand	Sand	Sandy clay loam/sandy loam	Sandy loam	Sandy loam
Clay content	6%	5%	18-26%	10-20%	14-15%
Silt content	13%	4%	27%	20-27%	25%
Sand content	78%	88%	8%	50-65%	57%
pH	4 – 4.5	5.6 – 6.2	6.7 – 7	6.5 – 7.8	6.4 – 6.6
Total organic carbon	2.0%	1.8%	2.2%	1.7 -7.3%	1.4%
Geological characteristics					
Sediment type	Fine sand	Coarse sand	Clay till	Clay till	Clay till
Deposited by	Saltwater	Meltwater	Glacier	Glacier/meltwater	Glacier
Saturated hydraulic conductivity (C horizon)	$2.0x10^{-5}$ m/s 1.7 m/day	1.3×10^{-4} m/s 11.2 m/day	3.4×10^{-6} m/s 0.3 m/day	8.0×10^{-8} m/s 0.007 m/day	7.2×10^{-6} m/s 0.6 m/day
Fracture intensity	--	--	<1 fractures/m	11 fractures/m	4 fractures/m

[1.] *Reproduced from Lindhardt* et al., *(2001).*
[2.] *Rosenbom et al. (2015).*

2.3 Choice of pesticides, metabolites and crops

The 50 pesticides included in PLAP are categorised in the PLAP reports (Brüsch *et al*., 2013) into (i) high, (ii) low and (iii) no observed risk to leaching, based on whether the pesticide (and/or metabolites) had been detected in water samples from:

- 1 m depth:
  - (i) in average concentrations exceeding 0.1 µg/L within the first season after application,
  - (ii) in three consecutive samples or one single sample exceeding 0.1 µg/L,
  - (iii) in no or few cases or when concentrations are below 0.1 µg/L.
- groundwater monitoring screens (1.5 – 4.5 m depth):
  - (i) at concentrations exceeding 0.1 µg/L,
  - (ii) at concentrations below 0.1 µg/L,
  - (iii) at concentrations below detection limit in the samples collected.

In order to choose pesticides that represented a range of leaching risks in the field, the tiered approach outlined above was used to select a suite of pesticides from the groundwater monitoring results obtained in the period 1999-2012, as presented in Brüsch *et al*., (2013). This final choice was thirteen of the fourteen high risk pesticides (93%), six of the twelve low risk (50%) and eight of the twenty-four (33%) from the no leaching risk category (Table 2.3-1). When choosing pesticides, consideration was also given to uses across multiple fields.

Metabolites of the chosen pesticide were selected if PLAP-concentrations were above the limit of detection in the groundwater between 1999 and 2012 (Brüsch *et al*., 2013). For terbuthylazine only two of the five metabolites included in the monitoring programme were simulated. The tebuconazole metabolite 1,2,4-triazol was also included, although monitoring for this only started after June 2013 and are hence not included in the most recent report.

In the FOCUS PELMO model, the leaching of metabolites is simulated following a degradation scheme of the pesticide, which can, as mentioned earlier, include several metabolites. In the FOCUS-MACRO, only parent to one metabolite can be simulated. Therefore, if there is more than one metabolite only the first metabolite formed from the parent was simulated, except for fluazifop-P-butyl. Due to the short half-life of fluazifop-P-butyl the degradation scheme simulated in MACRO was fluazifop-P to TFMP. The application rate of fluazifop-P-butyl was adjusted to give an application rate for fluazifop-P using a formation fraction of 1and a molecular weight correction.

For each selected pesticide (and/or metabolite) a single crop was selected based on the highest average measured concentration (*Cmean*) at 1 m depth (sandy fields: water collected via suction cups; clay till fields: water collected via tile drains) considering all PLAP monitoring fields from 1999 to 2012. For glyphosate and bentazone, additional crops were also selected as these were pesticides of particular interest. For fluazifop-P-butyl, sugar beet and grass were both selected as for grass, a newer, lower dose rate was more appropriate.

In total, 27 pesticides and 19 metabolites were selected, representing 36 "Pesticide + Crop" scenarios. Two input parameter datasets (EU and DK approach) and three application dates give a total of 216 simulations per regulatory model scenario to be executed. In total 648 simulations were performed for all three regulatory model scenarios.

Table 2.3-1: ***Selection of pesticides, metabolites and crops*** considering all five PLAP fields and Limit of Detection values (LOD) from PLAP

Leaching risk	**Number**	**Pesticide (including metabolites)**	**Crops**	**Limit of Detection** from PLAP [µg/L]
High	1	Azoxystrobin	Spring barley	0.01
		(CyPM)		0.02
	2	Bentazone	Maize, spring barley, peas, spring barley (and red fescue) spring barley (and white clover), white clover	0.01
	3	Bifenox	Spring barley	0.02
		(Bifenox acid)		0.05
	4	Ethofumesate	Sugar beet	0.01
	5	Fluazifop-P-butyl	Sugar beet and grass	0.01
		(Fluazifop-P)		0.01
		(TFMP)		0.02
	6	Glyphosate	Peas, winter wheat, and spring barley	0.01
		(AMPA)		0.01
	7	Metalaxyl-M	Potatoes	0.01
		(CGA62826)		0.01
		(CGA108906)		0.02
	8	Metamitron	Sugar beet	0.01
		(Metamitron-desamino)		0.02
	9	Metribuzin	Potatoes	0.01
		(Metribuzin-diketo)		0.02
		(Metribuzin-desamino-diketo)		0.02
	10	Pirimicarb	Sugar beet	0.01
		(Pirimicarb-desmethyl-formamido)		0.02
	11	Rimsulfuron	Potatoes	0.02
		(PPU)		0.01
	12	Tebuconazole	Winter wheat	0.01
		(1,2,4 triazol)[1]		0.01
	13	Terbuthylazine	Maize	0.01
		(Desethyl-terbuthylazine)		0.01
		(Desisopropyl-atrazine)		0.01
Low	14	Dimethoate	Spring barley	0.01
	15	Epoxiconazole	Winter wheat	0.01
	16	Ioxynil	Winter wheat	0.01
	17	Propiconazole	Spring barley	0.04
	18	Prosulfocarb	Winter wheat	0.01
	19	Pyridate	Maize	0.02
		(PHCP)		0.02
None	20	Aminopyralid	Spring barley	0.02
	21	Bromoxynil	Winter wheat	0.01
	22	Chlormequat	Winter wheat	0.01
	23	Diflufenican	Red fescue	0.01
		(AE-B107137)		0.01
	24	Metrafenone	Winter wheat	0.01
	25	Pendimethalin	Winter wheat	0.01
	26	Picolinafen	Winter wheat	0.01
		(CL153815)		0.01
	27	Triasulfuron	Spring barley	0.02
		(IN-A4098)		0.02

[1.] *For 1,2,4-triazol bi-phasic degradation is being simulated.*

2.4 Design of comparison and associated evaluation between the outcome of the Danish regulatory model scenarios and PLAP

A direct comparison of the concentration output from the regulatory model scenarios with the PLAP monitoring concentration data will not provide any valuable insight, since the data-extraction frames are too different. The model-estimates representative for the yearly average concentration at 1 or 2.5 m depth, PELMO and MACRO respectively, are based on soil parameters, crop data, and minimum 26 years of climate data with one application each year on the same crop, which do not in any way resemble the PLAP field settings (single applications on perhaps different crops, different crop growth stages and rotations, other types of soil-settings, different climatic-conditions etc.). In addition, PLAP monitoring concentration data are obtained by analysing water samples collected at different depths in both the variably-saturated and saturated zone and not only at 1 or 2.5 m depth.

With both regulatory predictions of pesticide related leaching to groundwater and PLAP monitoring results (if available) being applied in the Danish regulation of plant protection products it is important delineate the performance of the regulatory model scenarios in relation to predicting the leaching as detected in PLAP seen both from:

- An overall **R**egulatory view-point focusing on the effect of applying the EU or DK approach (input and output) on the ability of the three regulatory model scenarios to predict the leaching potential of the pesticides or metabolites to groundwater as detected via the groundwater monitoring in PLAP generally and not on the leaching as a result of individual application in a specific crop.
- A **F**ield specific view-point focusing on the conceptual understanding behind the regulatory model scenarios and their ability to predict the leaching risk detected in PLAP to both 1 m depth (analysis of water samples collected from the drainage of the clay till fields and from suction cups in the sandy fields) and groundwater as a result of applications in a specific crop.

For each individual pesticide and metabolite the simulated leaching risk by the regulatory model scenarios will be compared in two ways (**R**) and (**F**):

(**R**) using PLAP data from groundwater (1.5 – 4.5 m depth) presenting the number of detections less than the limit of detection (<LOD), detections ≥LOD and ≤0.1 µg/L and >0.1 µg/L from the full monitoring period, 1999-2013, and using all available data and therefore **not taking into account the specific crops.** The simulated leaching risk conclusion (based on PECgw using the EU and DK approach) will be compared to the leaching risk conclusion based on the PLAP groundwater results for each pesticides and metabolite.

(**F**) using PLAP data from 1 m depth (sandy fields: water collected via suction cups; clay till fields: water collected via tile drains) and groundwater (1.5 – 4.5 m depth) **for applications on the specified crop used in the regulatory model scenarios**. Note, there is no regulatory drinking water threshold value for pesticide concentrations in drainage being transported to surface water, however, for the purpose of the field specific comparison, the 0.1 µg/L will be utilised.

2.4.1 Data extraction from regulatory model scenarios

For the **R**-comparison and the **F**-comparison, when applying the EU-approach for the evaluation of outputs the highest 80th percentile PECgw result from the three individual applications for each of the three regulatory scenarios (Hamburg, Karup and Langvad) was selected for each pesticide and associated metabolites.

The leaching risk conclusions based on the simulated 80th percentile PECgw simulations have been assigned to the following categories:

1.2	Fail: >0.1 µg/L
0.08	Pass: ≤ 0.1 µg/L ≥ LOD
< LOD	Pass: < LOD

When applying the DK approach, in both the **R**-comparison and the **F**-comparison, the results for the highest number of exceedances >0.1 µg/L from the three individual application runs was selected. The number of exceedances in 20 years or 60 years determines the risk of leaching. For applications made every year, only one of the 20 annual averages is allowed to exceed the threshold value of0.1 ug/L. For applications made every third year, three of the 60 annual averages are allowed to exceed 0.1 µg/L. The leaching risk conclusion, based on the number of exceedances, has been assigned to the following categories:

0.125	Fail: 2 or more exceedances in 20 years (application every year) 4 or more exceedances in 60 years (application every 3rd year)
0.08	Pass: 1 or less exceedances in 20 years 3 or less failures in 60 years (application every 3rd year)
≤ LOD	Pass: No exceedances

The highest 95th percentile PECgw value is reproduced in the box. This relates to the second highest annual average PECgw value in all three individual runs when the application is every year, and the fourth highest values when the application is every three years.

2.4.2 Data extraction from PLAP

In the regulation of pesticides the focus is on detections in groundwater and not to the same degree on which crop the pesticide is applied to and whether it and/or its metabolites given this specific application leach to 1 m depth (sandy fields: water collected via suction cups; clay till fields: water collected via tile drains). For this reason the **R**-comparison will include PLAP data for each selected compound presenting information regarding the number of detections <LOD, number of detections ≥LOD ≤0.1 µg/L and number of detection >0.1 µg/L for the full monitoring period 1999-2013. For each pesticide a table displaying all the applications (a.i. mass/ha) at each PLAP field site conducted within this period is presented in Appendix D.

In the **R**-comparison at each PLAP field the number of groundwater samples (1.5 m – 4.5 m depth) from horizontal and vertical screens that are < LOD, ≥ LOD and ≤0.1 µg/L and >0.1µg/L is reported. The risk of leaching for each pesticide and metabolite is determined from the combined data from all fields and is assigned to a colour-coded category (see below). Any detections greater than 0.1 µg/L have been divided into: a serious risk of leaching and a limited risk of leaching, this distinction is based on expert judgment.

(200,25,20)	Serious risk of leaching, many detections >0.1 µg/L
(200,25,2)	Limited risk of leaching, few detections >0.1 µg/L
(200,27,0)	Detections ≤0.1 µg/L and ≥LOD
(227,0,0)	All measured concentrations are <LOD
Not Applied Not Measured	Not applied or not measured

The values reported in the boxes represent, from left to right: the number of detections < LOD, number of detections ≤0.1 µg/L (but above the LOD) and number of detections more than >0.1µg/L.

In order to explore the potential field specific effect of leachability of pesticides a second **F**-comparison was conducted, comparing the PLAP data at 1m depth (sandy fields: water collected via suction cups; clay till fields: water collected via tile drains) with the estimated PECgw average yearly concentration at 1 and /or 2.5 m depth, from PELMO and MACRO, respectively. The PLAP data is reported both as *Cmean*, calculated as average leachate concentration at 1 m depth, and as number of detections in samples from groundwater monitoring wells for each crop considered in the modelling at each relevant field (Tylstrup, Jyndevad, Silstrup, Estrup and Faardrup).

On the sandy fields this is based on analysis of water samples collected from suction cups installed at 1 m depth representing unsaturated conditions. At the clay till fields the samples at 1 m depth are collected from the artificial tile drains located in the variably-saturated zone. The samples from groundwater monitoring wells are typically reported for two years after application, unless otherwise specified.

The *Cmean* is calculated as average leachate concentration at 1 m depth in the first year after application for each "Pesticide + Crop +Field" combination. At each field a "Pesticide + Crop" combination may have been used multiple times, resulting in multiple *Cmean* values being available. The maximum *Cmean* value from the "Pesticide + Crop +Field" combination is used in the **F**-comparison.

The maximum *Cmean* value at 1 m depth (sandy fields: water collected via suction cups; clay till fields: water collected via tile drains) is reported and categorised as outlined below.

0.15	>0.1 µg/L
0.05	≤ 0.1 µg/L ≥ LOD
<LOD	< LOD
Not Applied Not Measured	Not Applied or Not Measured

At each PLAP field the number of groundwater samples (1.5 – 4.5 m depth) from horizontal and vertical screens that are < LOD, ≥LOD and ≤0.1 µg/L and >0.1 µg/L for two years is reported, and categorised as outlined below. The **F**-comparison only has PLAP data for each crop considered in the modelling at each relevant field and therefore the regulatory view (**R**-comparison) of sub-dividing the detections greater than 0.1 µg/L into a serious risk or a limited leaching risk has not been considered.

(200,25,2)	Detections ≥0.1 µg/L
(200,27,0)	Detections ≤0.1 µg/L and ≥LOD
(227,0,0)	All measured concentrations are <LOD
Not Applied Not Measured	Not Applied or Not Measured

The values reported in the brackets represent, from left to right: the number of samples ≤ LOD, number of detections > LOD but ≤0.1 µg/L and number of detections >0.1 µg/L. If more than one set of two year monitoring data may be available for each crop/pesticide combination across the monitoring period; in this case the aggregated values are presented. In the PLAP data any detection >0.1 µg/L is assigned an orange category as a regulatory approach is not being taken. The categories have been kept the same to allow for consistency within the report.

2.4.3 *Regulatory-comparison between simulated leaching risk and PLAP groundwater results*

In the **R**-Comparison the compounds are divided into four categories to highlight the current decision in Denmark by the Danish EPA. These categories are:

(i) Banned (due to leaching to groundwater)
(ii) Banned (due to other issues)
(iii) Authorised (with restrictions (e.g. on dose rate, application timing, growth stage) due to leaching to groundwater)
(iv) Authorised (without restrictions due to leaching to groundwater)

A comparison between the leaching risk based on the PLAP groundwater results for each pesticide and metabolite using the combined field results and simulated leaching assessment for each regulatory scenario is presented applying a:

(i) DK/DK approach - DK parameter selection DK output evaluation (number of exceedances >0.1 µg/L and 95th percentile)
(ii) DK/EU approach - DK parameter selection and EU output evaluation (80th percentile)
(iii) EU/EU approach - EU parameter selection and EU output evaluation (80th percentile)
(iv) EU/DK approach - EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L and 95th percentile)

A comparison of the conclusion of leaching risk from the Danish EPA based on the PLAP groundwater results (1.5 – 4.5 m depth) and simulated leaching assessment from the three regulatory model scenarios applying the DK and EU approaches to parameter selection and output evaluation is also presented. Table 2.4-1 outlines the PLAP groundwater monitoring leaching risk data and the simulated leaching data that will be used in the comparison.

Table 2.4-1: PLAP groundwater monitoring data and simulated leaching risk data

PLAP groundwater monitoring leaching risk	**Simulated leaching risk**	
	DK Approach	**EU – Approach**
Serious risk of leaching, many detections > 0.1 µg/L	2 or more exceedances >0.1 µg/L	80th percentile PECgw >0.1 µg/L
Limited risk of leaching, few detections >0.1 µg/L	1 or less exceedances >0.1 µg/L	80th percentile PECgw ≤0.1 µg/L
All detections ≤0.1 µg/L	1 or less exceedances >0.1 µg/L	80th percentile PECgw ≤0.1 µg/L

2.4.4 *Field-comparison between simulated leaching risk and PLAP results*

The objective of the **F**ield specific comparison is to evaluate whether the present regulatory model scenarios, required by Denmark, adequately assess the leaching risk of pesticides and their metabolites through both the sandy and clay till fields of PLAP. All three regulatory model scenarios can be considered as not up-to-date with respect to the latest knowledge on fate and transport processes(e.g. aged sorption) or climate (applying climate files from 1961-1990; Henriksen *et al*., 2013).

The **F**ield specific comparison focuses on an evaluation of the regulatory model scenarios themselves and their ability to predict the leaching level detected in PLAP as the result of the selected "Pesticide + Crop" combinations. This comparison includes both PLAP-results from 1 m depth as *Cmean* (analysis of water samples collected from suction cups at the sandy fields and from the drainage of the clay till fields within the period May 1999 – June 2013) and the groundwater (water samples collected from both vertical and horizontal monitoring screens with concentrations ≤LOD, >LOD and ≤0.1 µg/L and >0.1 µg/L for the monitoring period May 1999 – June 2013) as a result of application of the selected pesticide to the selected crop.

The F-comparison has been split into two focussing on:

- The sandy fields (Tylstrup and Jyndevad) and respective regulatory model scenarios (Hamburg-PELMO and Karup - MACRO).
- The clay till fields (Silstrup, Estrup and Faardrup) and respective regulatory model scenario (Langvad - MACRO).

3.0 Results and Discussion

For each compound (pesticide and metabolite) detailed results for the three regulatory model scenarios, considering the EU and DK approaches to parameter and output evaluation can be found in Appendix D, Tables D1-1 – D27-4. Appendix D also contains PLAP field application data and groundwater monitoring results collected in the period 1999-2013.

For each individual pesticide and metabolite the simulated leaching risk regulatory model scenarios will be compared in two ways **R**egulatory (**R**) and **F**ield (**F**):

(**R**) using PLAP data from groundwater (1.5 – 4.5 m depth) presenting the number of detections less than the limit of detection (<LOD), detections ≥LOD and ≤0.1 µg/L and >0.1 µg/L from the full monitoring period, 1999-2013, using all available data and therefore **not taking into account the specific crops.** The simulated leaching risk conclusion (based on PECgw using the EU and DK approach) will be compared to the leaching risk conclusion based on the PLAP groundwater results for each pesticides and metabolite.

(**F**) using PLAP data from groundwater from 1 m depth (sandy fields: water collected via suction cups; clay till fields: water collected via tile drains) and groundwater (1.5 – 4.5 m depth) **for applications on the specified crop used in the regulatory model scenarios**.

3.1 Regulatory-Comparison

The results presented here provide an overall **R**egulatory view-point focusing on groundwater detections in general and not on the leaching as a result of individual application in a specific crop. In the **R**-comparison the objective is to evaluate whether:

(i) the more conservative Danish approach (with respect to parameter selection and output evaluation) is required to ensure that the regulatory model scenarios are protective of the leaching risk to groundwater as observed in PLAP for pesticides and their metabolites.

An overview of the PLAP groundwater monitoring results, Table 3.1.1, is presented for each PLAP field showing the number of groundwater samples (1.5 – 4.5 m depth) from horizontal and vertical screens that are <LOD, ≥LOD and ≤0.1 µg/L and >0.1 µg/L across the full monitoring period (May 1999 – June 2013). The total number of samples analysed can be calculated as the sum of each of the three values presented and can show the varying size of dataset available for each substance. The risk of leaching for each pesticide and metabolite is determined from the combined data from all fields and in Table 3.1.1 is assigned a colour code (see below). Any detections greater than 0.1 µg/L have been divided into: a serious risk of leaching and a limited risk of leaching, this is based on expert judgment.

(200,25,20)	Serious risk of leaching, many detections >0.1 µg/L
(200,25,2)	Limited risk of leaching, few detections >0.1 µg/L
(200,27,0)	Detections ≤0.1 µg/L and ≥LOD
(227,0,0)	All measured concentrations are <LOD
Not Applied Not Measured	Not Applied or Not Measured

All the tables in the **R**-Comparison have been divided into four categories to highlight the current decision with respect to each pesticide by the Danish EPA. These categories are:

(i) Banned (due to leaching to groundwater)

(ii) Banned (due to other issues)

(iii) Authorised (with restrictions e.g. on dose rate, application timing, growth stage) due to leaching to groundwater)

(iv) Authorised (without restrictions due to leaching to groundwater)

3.1.1 *Regulatory-comparison results*

Table 3.1-1: Summary of ***groundwater*** monitoring results from ***all five PLAP fields*** considering all crops categorised according to the current ***decision of the Danish EPA*** with respect to use of each ***pesticide including their metabolites in Denmark***

Field **Depth** [m] **Soil type**	**PLAP** **Number of groundwater samples from horizontal and vertical screens in PLAP fields having detections** **<LOD, detections ≥LOD and ≤ 0.1 µg/L and detections >0.1 µg/L**[1] *(May 1999 – June 2013)* **Tylstrup** >3 **Sand**	**Jyndevad** >2 **Sand**	**Silstrup** >2 **Clay till**	**Estrup** >2 **Clay till**	**Faardrup** >2 **Clay till**	**Combined - All fields**[*]	**Notes on the decision of the Danish EPA**
BANNED (due to leaching to groundwater)							
Bifenox	(49,0,0)	(220,2,0)	(178,5,0)	(193,0,0)	(104,0,0)	(744,7,0)	Banned due to leaching of bifenox acid and findings of nitrofen in drainage samples.
- *Bifenox acid*	(49,0,0)	(170,0,0)	(155,7,20)	(196,0,1)	(103,0,0)	(673,7,21)	
Fluazifop-P-butyl (1999 – 2010)	*Not Measured*	*Not Measured*	*Not Measured*	*Not Applied*	(232,0,0)	(232,0,0)	Older, higher application rate – unacceptable risk of leaching of TFMP metabolite)
- *Fluazifop-P*	(243,0,0)	(241,0,0)	(439,1,0)	*Not Applied*	(225,6,1)	(1148,7,1)	
- *TFMP*	(3,0,0)	(3,0,0)	(122,48,9)	*Not Applied*	(3,0,0)	(131,48,9)	
Ethofumesate (1999 – 2010)	*Not Applied*	*Not Applied*	(524,5,0)	(204,0,0)	(298,31,6)	(1026,36,6)	Older, higher application rate – unacceptable risk of leaching
Metalaxyl-M	(199,13,0)	(175,21,22)	*Not Applied*	*Not Applied*	*Not Applied*	(374,34,22)	
- *CGA62826*	(196,16,0)	(137,74,8)	*Not Applied*	*Not Applied*	*Not Applied*	(330,90,8)	
- *CGA108906*	(28,143,41)	(45,108,66)	*Not Applied*	*Not Applied*	*Not Applied*	(73,251,107)	
Metribuzin	(387,1,0)	(26,0,0)	*Not Applied*	*Not Applied*	*Not Applied*	(413,1,0)	Banned due to unacceptable risk of leaching of the metabolites.
- *Metribuzin diketo*	(73,138,315)	(0,7,19)	*Not Applied*	*Not Applied*	*Not Applied*	(78,145,334)	
- *Metribuzin desamino diketo*	(289,231,5)	(6,7,13)	*Not Applied*	*Not Applied*	*Not Applied*	(295,238,18)	
Terbuthylazine	(179,0,0)	(260,0,0)	(280,35,1)	(285,1,0)	(232,30,21)	(1236,66,22)	Banned due to unacceptable risk of leaching of the metabolite (desethyl-terbuthylazine) and the pesticide.
-Desethyl-Terbuthylazine	(191,0,0)	(490,27,0)	(214,159,2)	(230,0,0)	(217,36,30)	(1342,222,32)	
- *Desisopropyl-atrazine*	(191,1,0)	*Not Measured*	(232,4,0)	(259,27,0)	(223,60,0)	(904,92,0)	
Pyridate	*Not Applied*	(116,0,0)	*Not Measured*	*Not Applied*	*Not Applied*	(116,0,0)	Banned due to unacceptable risk of leaching of the metabolite in the modelling
- *PHCP*	*Not Applied*	(184,0,0)	(175,10,4)	*Not Applied*	*Not Applied*	(359,10,4)	
BANNED (due to other issues)							
Rimsulfuron	(178,0,0)	(189,0,0)	*Not Applied*	*Not Applied*	*Not Applied*	(367,0,0)	Banned due to persistence of the metabolite
- *PPU*	(589,58,0)	(489,362,12)	*Not Applied*	*Not Applied*	*Not Applied*	(1078,420,12)	
Dimethoate	(176,0,0)	(190,0,0)	(221,1,0)	(200,0,0)	(207,0,0)	(994,1,0)	Banned due to unacceptable health risks.
AUTHORISED (with restrictions due to leaching to groundwater)							
Bentazone	(330,0,0)	(520,1,0)	(377,26,3)	(572,16,0)	(362,9,4)	(2161,52,7)	
Fluazifop-P-butyl (2011 – 2013)	*Not Applied*	*Not Applied*	*Not Measured*	*Not Applied*	*Not Measured*	*Not Measured*	New, lower application rate
- *Fluazifop-P*	*Not Applied*	*Not Applied*	*Not Measured*	*Not Applied*	(67,0,0)	(67,0,0)	
- *TFMP*	*Not Applied*	*Not Applied*	(103,39,7)	*Not Applied*	(134,0,0)	(237,39,7)	
Ethofumesate (2011 – 2013)	*Not Applied*	*Not Applied*	*Not Applied*	*Not Applied*	(32,0,0)	(32,0,0)	New, lower application rate
Tebuconazole	(195,1,0)	(213,1,0)	(38,0,0)	(157,3,2)	(173,1,0)	(776,6,2)	Restrictions due to risk of leaching of 1,2,4-triazole
- *1,2,-Triazol*	*Not Measured*	*Not Measured*	*Not Measured*	*Not Measured*	*Not Measured*	*Not Measured*	
Epoxiconazole	(199,0,0)	(323,1,0)	(179,0,0)	(88,0,0)	(209,0,0)	(998,1,0)	Restrictions due to risk of leaching of 1,2,4-triazole
Propiconazole	(313,0,0)	(291,0,0)	(222,0,0)	(395,2,0)	(510,1,0)	(1731,3,0)	Restrictions due to risk of leaching of 1,2,4-triazole

Field Depth [m] Soil type	PLAP Number of groundwater samples from horizontal and vertical screens in PLAP fields having detections <LOD, detections ≥LOD and ≤ 0.1 µg/L and detections >0.1 µg/L[1] *(May 1999 – June 2013)* Tylstrup >3 Sand	Jyndevad >2 Sand	Silstrup >2 Clay till	Estrup >2 Clay till	Faardrup >2 Clay till	Combined - All fields[*]	Notes on the decision of the Danish EPA
Triasulfuron	(301,0,0)	*Not Applied*	*Not Measured*	*Not Measured*	*Not Applied*	(301,0,0)	Restrictions due to risk of leaching of the metabolite IN-A4098 in the modelling
- *IN-A4098*	(291,0,0)	*Not Applied*	*Not Measured*	*Not Measured*	*Not Applied*	(291,0,0)	
- *IN-A4098**	*Not Measured*	*Not Applied*	(223,0,0)	(259,1,0)	*Not Applied*	(482,1,0)	
AUTHORISED (without restrictions due to leaching to groundwater)							
Azoxystrobin	(216,0,0)	(233,0,0)	(386,0,0)	(566,2,0)	(286,0,0)	(1687,2,0)	
- *CyPM*	(216,0,0)	(233,0,0)	(470,28,0)	(550,17,1)	(286,0,0)	(1755,45,1)	
Glyphosate	*Not Applied*	(233,0,0)	(400,17,0)	(817,42,5)	(446,5,0)	(1896,64,5)	
- *AMPA*	*Not Applied*	(221,2,0)	(397,20,0)	(858,8,0)	(449,2,0)	(1925,32,0)	
Metamitron**	*Not Applied*	*Not Applied*	(500,27,2)	(204,0,0)	(338,20,4)	(1042,47,6)	
- *Metamitron-desamino*	*Not Applied*	*Not Applied*	(499,26,1)	(203,0,0)	(314,36,12)	(1016,62,13)	
Pirimicarb	(301,0,0)	(251,0,0)	(643,3,0)	(292,1,0)	(435,2,0)	(1922,6,0)	
- *pirimicarb-desmethyl-formamido*	(173,0,0)	(251,0,0)	(468,0,0)	(337,0,0)	(230,2,0)	(1459,2,0)	
Ioxynil	(198,0,0)	(218,0,0)	*Not Applied*	(166,0,0)	(305,1,0)	(887,1,0)	
Prosulfocarb	(40,0,0)	*Not Applied*	(225,1,0)	*Not Applied*	(187,0,0)	(452,1,0)	
Aminopyralid	(84, 0,0)	*Not Applied*	*Not Applied*	(60, 0,0)	*Not Applied*	(144, 0,0)	
Bromoxynil	(192,0,0)	(218,0,0)	*Not Applied*	(166,0,0)	(306,0,0)	(882,0,0)	
Chlormequat	*Not Applied*	(14,0,0)	(102,0,0)	(74,0,0)	*Not Applied*	(190,0,0)	
Diflufenican	*Not Applied*	(152,0,0)	(71,0,1)	*Not Applied*	*Not Applied*	(223,0,1)	
- *AE-B107137*	*Not Measured*	*Not Measured*	*Not Measured*	*Not Measured*	*Not Measured*	*Not Measured*	
Metrafenone	*Not Applied*	*Not Applied*	*Not Applied*	(114,1,0)	(67,0,0)	(181,1,0)	
Pendimethalin	(436,0,0)	(257,0,0)	(344,0,0)	(188,0,0)	(180,0,0)	(1405,0,0)	
Picolinafen	*Not Applied*	(35,0,0)	*Not Applied*	(158,0,0)	*Not Applied*	(193,0,0)	
- *CL 153815*	*Not Applied*	(35,0,0)	*Not Applied*	(158,0,0)	*Not Applied*	(193,0,0)	

[1.] Presented as (800, 200, 20), which is the number of groundwater samples from horizontal and vertical screens that have a concentration: <LOD, ≥LOD and ≤0.1 µg/L and > 0.1ug/L.
**These IN-A4098 groundwater results are from degradation of tribenuron-methyl.*
***A restriction on the dose has been applied to metamitron prior to the tests in PLAP.*
n/a: Not applicable.
Not Measured: Application of pesticide takes place at the site, but there are no measurements of the pesticide or its metabolites.
Not Applied: Pesticide is not applied at the field.

Legend for Risk of Leaching to Groundwater
Serious risk of leaching, many detections >0.1 µg/ (red)
Limited risk of leaching , few detections >0.1 µg/L (yellow)
Detections ≤0.1 µg/L and ≥LOD (blue)
All measured concentrations <LOD (grey)

A comparison between the leaching risk assessment based on the PLAP groundwater results for each pesticide and metabolite using the combined field results (not taking specific crops into account) and simulated PECgw from each regulatory scenario: Hamburg - PELMO (Table 3.1-2), Karup - MACRO (Table 3.1-3) and Langvad - MACRO (Table 3.1-4) is presented applying a:

(i) DK/DK approach - DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L and 95th percentile)

(ii) DK/EU approach - DK parameter selection and EU output evaluation (80th percentile)

(iii) EU/EU approach - EU parameter selection and EU output evaluation (80th percentile)

(iv) EU/DK approach - EU parameter selection and DK output evaluation (number of exceedances

>0.1 µg/L and 95th percentile)

For the EU evaluation of outputs the 80th percentile PECgw simulations have been assigned to the following categories:

1.20	>0.1 µg/L
0.08	≤ 0.1 µg/L ≥LOD
<LOD	<LOD

For the DK approach the number of exceedances in 20 years or 60 years determines the risk of leaching. For applications made every year, only one of the 20 annual averages is allowed to exceed the threshold value of 0.1 µg/L. For applications made every third year, three of the 60 annual averages are allowed to exceed 0.1 µg/L. The following categories have been assigned based on the simulated PECgw results:

0.13	2 or more failures in 20 years (application every year) 4 or more failures in 60 years (application every 3rd year)
0.08	1 or less failures in 20 years 3 or less failures in 60 years (application every 3rd year)
<LOD	No failures

The 95th percentile PECgw value is reproduced in the box. This relates to the second highest annual average PECgw value in all three individual runs when the application is every year, and the fourth highest values when the application is every three years.

Table 3.1-2: ***PLAP groundwater*** monitoring results and ***Hamburg - PELMO PECgw*** at ***1 m*** depth for the ***four different EU and DK approaches***

	Groundwater monitoring results[1] (May 1999 – June 2013) **Combined - All fields**	**PECgw at 1 m depth Hamburg - PELMO** **DK/DK approach**[2]	**DK/EU approach**[2]	**EU/EU approach**[4]	**EU/DK approach**[5]
BANNED (due to leaching to groundwater)					
Bifenox	(744,7,0)	<LOD	<LOD	<LOD	<LOD
- *Bifenox acid*	(673,7,21)	0.892	0.740	0.189	0.286
Fluazifop-P-butyl (1999 – 2010) old higher app. rate	(232,0,0)	<LOD	<LOD	<LOD	<LOD
- *Fluazifop-P*	(1148,7,1)	0.066	0.023	<LOD	<LOD
- *TFMP*	(131,48,9)	2.105	1.263	0.396	0.613
Ethofumesate (1999 – 2010) old higher app. rate	(1026,36,6)	2.237	0.891	<LOD	0.015
Metalaxyl-M	(374,34,22)	0.019	<LOD	<LOD	<LOD
- *CGA62826*	(330,90,8)	0.763	0.351	0.186	0.454
- *CGA108906*	(73,251,107)	0.282	0.139	0.371	0.812
Metribuzin	(413,1,0)	0.343	0.142	<LOD	<LOD
- *Metribuzin diketo*	(78,145,334)	0.025	<LOD	<LOD	<LOD
- *Metribuzin desamino-diketo*	(295,238,18)	0.309	0.110	<LOD	0.087
Terbuthylazine	(1236,66,22)	0.019	0.012	<LOD	<LOD
-Desethyl-terbuthylazine	(1342,222,32)	3.100	2.591	0.122	0.231
- *Desisopropyl-atrazine*	(904,92,0)	5.790	5.524	2.960	3.226
Pyridate	(116,0,0)	<LOD	<LOD	<LOD	<LOD
- *PHCP*	(359,10,4)	1.712	1.623	<LOD	<LOD
BANNED (due to other issues)					
Rimsulfuron	(367,0,0)	0.188	0.080	<LOD	0.021
- *PPU*	(1078,420,12)	0.181	0.122	0.075	0.098
Dimethoate	(994,1,0)	<LOD	<LOD	<LOD	<LOD
AUTHORISED (with restrictions due to leaching to groundwater)					
Bentazone	(2161,52,7)	2.085	0.751	0.030	0.081
Fluazifop-P-butyl (2011 – 2013) new lower app. rate	*Not Measured*	<LOD	<LOD	<LOD	<LOD
- *Fluazifop-P*	(67,0,0)	<LOD	<LOD	<LOD	<LOD
- *TFMP*	(237,39,7)	0.491	0.482	0.096	0.126
Ethofumesate (2011 – 2013) new lower app. rate	(32,0,0)	0.247	0.082	<LOD	<LOD
Tebuconazole	(776,6,2)	<LOD	<LOD	<LOD	<LOD
- *1,2,4-triazol*	*Not Measured*	0.378	0.360	0.056	0.059
Epoxiconazole	(998,1,0)	0.012	0.011	<LOD	<LOD
Propiconazole	(1731,3,0)	<LOD	<LOD	<LOD	<LOD
Triasulfuron	(301,0,0)	0.562	0.533	0.320	0.340
- *IN-A4098*	(291,0,0)	0.057	0.050	0.035	0.036
- *IN-A4098**	(482,1,0)	n/a	n/a	n/a	n/a
AUTHORISED (without restrictions due to leaching to groundwater)					
Azoxystrobin	(1687,2,0)	0.135	0.115	<LOD	<LOD
- *CyPM*	(1755,45,1)	2.747	2.501	<LOD	<LOD
Glyphosate	(1896,64,5)	<LOD	<LOD	<LOD	<LOD
- *AMPA*	(1925,32,0)	<LOD	<LOD	<LOD	<LOD
Metamitron	(1042,47,6)	0.560	0.060	<LOD	<LOD
- *Metamitron-desamino*	(1016,62,13)	1.388	0.306	<LOD	<LOD

	Groundwater monitoring results[1] (May 1999 – June 2013)	**PECgw at 1 m depth Hamburg - PELMO**			
	Combined - All fields	**DK/DK approach**[2]	**DK/EU approach**[2]	**EU/EU approach**[4]	**EU/DK approach**[5]
Pirimicarb	(1922,6,0)	7.624	3.941	0.039	0.042
- pirimicarb-desmethyl-formamido	(1459,2,0)	0.148	0.143	<LOD	<LOD
Ioxynil	(887,1,0)	<LOD	<LOD	<LOD	<LOD
Prosulfocarb	(452,1,0)	<LOD	<LOD	<LOD	<LOD
Aminopyralid	(144, 0,0)	0.067	0.058	0.032	0.048
Bromoxynil	(882,0,0)	<LOD	<LOD	<LOD	<LOD
Chlormequat	(190,0,0)	1.609	0.958	<LOD	<LOD
Diflufenican	(223,0,1)	<LOD	<LOD	<LOD	<LOD
- AE-B107137	*Not Measured*	<LOD	<LOD	<LOD	<LOD
Metrafenone	(181,1,0)	<LOD	<LOD	<LOD	<LOD
Pendimethalin	(1405,0,0)	<LOD	<LOD	<LOD	<LOD
Picolinafen	(193,0,0)	<LOD	<LOD	<LOD	<LOD
- CL 153815	(193,0,0)	0.023	0.020	<LOD	<LOD

1. Presented as (800, 200, 20), which is the number of groundwater samples from horizontal and vertical screens that have a concentration: <LOD, ≥LOD and ≤0.1 µg/L and > 0.1ug/L.
2. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).
4. EU parameter selection and EU output evaluation (80th percentile PECgw).
5. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
**These IN-A4098 groundwater results are from degradation of tribenuron-methyl.*
n/a: Not applicable.
Not Measured: Application of pesticide takes place at the site, but there are no measurements of the pesticide or its metabolites.
Not Applied: The pesticide is not applied at the field.

Legend for Risk of Leaching to Groundwater:
- *Serious risk of leaching, many detections >0.1 µg/L* (red)
- *Limited risk of leaching, few detections >0.1 µg/L* (yellow)
- *Detections ≤0.1 µg/L and ≥LOD* (blue)
- *All measured concentrations <LOD* (grey)

DK output evaluation:
- *2 or more exceedances in 20 years (application every year), 4 or more exceedances in 60 years (application every 3rd year)* (red)
- *1 or less exceedances in 20 years (application every) year), 3 or less exceedances in 60 years (application 3rd year)* (blue)
- *No failures* (grey)

EU output evaluation:
- *>0.1 µg/L* (red)
- *≤ 0.1 µg/L ≥LOD* (blue)
- *<LOD* (grey)

Table 3.1-3: ***PLAP groundwater*** monitoring results and ***Karup - MACRO PECgw*** at ***2.5 m*** depth for the ***four different EU and DK approaches***

	Groundwater monitoring results[1] (May 1999 – June 2013) Combined - All fields	PECgw at 2.5 m depth Karup - MACRO DK/DK approach[2]	DK/EU approach[3]	EU/EU approach[4]	EU/DK approach[5]
BANNED (due to leaching to groundwater)					
Bifenox	(744,7,0)	<LOD	<LOD	<LOD	<LOD
- *Bifenox acid*	(673,7,21)	0.645	0.615	0.189	0.194
Fluazifop-P-butyl (1999 – 2010) old higher app. rate	(232,0,0)	n/a	n/a	n/a	n/a
- *Fluazifop-P*	(1148,7,1)	0.051	0.035	<LOD	<LOD
- *TFMP*	(131,48,9)	1.514	1.011	0.319	0.439
Ethofumesate (1999 – 2010) old higher app. rate	(1026,36,6)	2.177	1.618	<LOD	0.013
Metalaxyl-M	(374,34,22)	0.016	<LOD	<LOD	<LOD
- *CGA62826*	(330,90,8)	0.504	0.238	0.147	0.266
- *CGA108906*	(73,251,107)	n/a	n/a	n/a	n/a
Metribuzin	(413,1,0)	0.770	0.363	<LOD	<LOD
- *Metribuzin diketo*	(78,145,334)	0.081	0.039	<LOD	<LOD
- *Metribuzin desamino diketo*	(295,238,18)	n/a	n/a	n/a	n/a
Terbuthylazine	(1236,66,22)	0.016	0.014	<LOD	<LOD
- *Desethyl-terbuthylazine*	(1342,222,32)	3.292	3.179	0.156	0.181
- *Desisopropyl-atrazine*	(904,92,0)	6.460	6.245	3.398	3.504
Pyridate	(116,0,0)	<LOD	<LOD	<LOD	<LOD
- *PHCP*	(359,10,4)	3.374	2.880	<LOD	<LOD
BANNED (due to other issues)					
Rimsulfuron	(367,0,0)	0.181	0.080	<LOD	0.021
- PPU	(1078,420,12)	0.182	0.125	0.078	0.108
Dimethoate	(994,1,0)	<LOD	<LOD	<LOD	<LOD
AUTHORISED (with restrictions due to leaching to groundwater)					
Bentazone	(2161,52,7)	1.696	1.271	0.036	0.068
Fluazifop-P-butyl (2011 – 2013) new lower app. rate	*Not Measured*	n/a	n/a	n/a	n/a
- *Fluazifop-P*	(67,0,0)	<LOD	<LOD	<LOD	<LOD
- *TFMP*	(237,39,7)	0.475	0.461	0.115	0.119
Ethofumesate (2011 – 2013) new lower app. rate	(32,0,0)	0.185	0.153	<LOD	<LOD
Tebuconazole	(776,6,2)	<LOD	<LOD	<LOD	<LOD
- *1,2,4-triazol*	*Not Measured*	0.296	0.286	0.042	0.044
Epoxiconazole	(998,1,0)	<LOD	<LOD	<LOD	<LOD
Propiconazole	(1731,3,0)	<LOD	<LOD	<LOD	<LOD
Triasulfuron	(301,0,0)	0.352	0.328	0.228	0.231
- *IN-A4098*	(291,0,0)	0.025	0.024	<LOD	0.021
- *IN-A4098**	(482,1,0)	n/a	n/a	n/a	n/a
AUTHORISED (without restrictions due to leaching to groundwater)					
Azoxystrobin	(1687,2,0)	0.136	0.134	<LOD	<LOD
- *CyPM*	(1755,45,1)	1.952	1.875	<LOD	<LOD
Glyphosate	(1896,64,5)	<LOD	<LOD	<LOD	<LOD
- *AMPA*	(1925,32,0)	<LOD	<LOD	<LOD	<LOD
Metamitron	(1042,47,6)	0.298	0.180	<LOD	<LOD
- *Metamitron-desamino*	(1016,62,13)	0.755	0.416	<LOD	<LOD
Pirimicarb	(1922,6,0)	6.606	6.219	0.011	0.020
- *Pirimicarb-desmethyl-formamido*	(1459,2,0)	0.128	0.118	<LOD	<LOD

	Groundwater monitoring results[1] (May 1999 – June 2013)	PECgw at 2.5 m depth Karup - MACRO			
	Combined - All fields	DK/DK approach[2]	DK/EU approach[3]	EU/EU approach[4]	EU/DK approach[5]
Ioxynil	(887,1,0)	<LOD	<LOD	<LOD	<LOD
Prosulfocarb	(452,1,0)	<LOD	<LOD	<LOD	<LOD
Aminopyralid	(144, 0,0)	0.081	0.049	0.043	0.059
Bromoxynil	(882,0,0)	<LOD	<LOD	<LOD	<LOD
Chlormequat	(190,0,0)	1.016	0.868	<LOD	<LOD
Diflufenican	(223,0,1)	<LOD	<LOD	<LOD	<LOD
- AE-B107137	*Not Measured*	<LOD	<LOD	<LOD	<LOD
Metrafenone	(181,1,0)	<LOD	<LOD	<LOD	<LOD
Pendimethalin	(1405,0,0)	<LOD	<LOD	<LOD	<LOD
Picolinafen	(193,0,0)	<LOD	<LOD	<LOD	<LOD
- CL 153815	(193,0,0)	0.022	0.022	<LOD	<LOD

1. Presented as (800, 200, 20), which is the number of groundwater samples from horizontal and vertical screens that have a concentration: <LOD, ≥LOD and ≤0.1 µg/L and > 0.1ug/L.
2. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).
4. EU parameter selection and EU output evaluation (80th percentile PECgw).
5. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
**These IN-A4098 groundwater results are from degradation of tribenuron-methyl.*
n/a: Not applicable.
Not Measured: Application of pesticide takes place at the site, but there are no measurements of the pesticide or its metabolites.
Not Applied: The pesticide is not applied at the field.

Legend for Risk of Leaching to Groundwater:
Serious risk of leaching, many detections >0.1 µg/L (red)
Limited risk of leaching, few detections >0.1 µg/L (yellow)
Detections ≤0.1 µg/L and ≥LOD (blue)
All measured concentrations <LOD (grey)

DK output evaluation:
2 or more exceedances in 20 years (application every year), 4 or more exceedances in 60 years (application every 3rd year) (red)
1 or less exceedances in 20 years (application every) year), 3 or less exceedances in 60 years (application 3rd year) (blue)
No failures (grey)

EU output evaluation:
>0.1 µg/L (red)
≤ 0.1 µg/L ≥LOD (blue)
<LOD (grey)

Table 3.1-4: ***PLAP groundwater*** monitoring results and ***Langvad - MACRO PECgw*** at ***2.5 m*** depth for the ***four different EU and DK approaches***

	Groundwater monitoring results[1] (May 1999 – June 2013) **Combined - All fields**	**PECgw at 2.5 m depth Langvad - MACRO** **DK/DK approach**[2]	**DK/EU approach**[3]	**EU/EU approach**[4]	**EU/DK approach**[5]
BANNED (due to leaching to groundwater)					
Bifenox	(744,7,0)	<LOD	<LOD	<LOD	<LOD
- *Bifenox acid*	(673,7,21)	1.766	1.556	1.347	1.624
Fluazifop-P-butyl (1999 – 2010) old higher app. rate	(232,0,0)	n/a	n/a	n/a	n/a
- *Fluazifop-P*	(1148,7,1)	3.41	0.163	0.158	0.351
- *TFMP*	(131,48,9)	1.084	1.024	0.224	0.259
Ethofumesate (1999 – 2010) old higher app. rate	(1026,36,6)	5.309	2.247	1.207	1.692
Metalaxyl-M	(374,34,22)	0.030	0.016	<LOD	0.030
- *CGA62826*	(330,90,8)	0.274	0.251	0.076	0.113
- *CGA108906*	(73,251,107)	n/a	n/a	n/a	n/a
Metribuzin	(413,1,0)	0.535	0.310	0.036	0.203
- *Metribuzin diketo*	(78,145,334)	0.065	0.031	<LOD	0.064
- *Metribuzin desamino-diketo*	(295,238,18)	n/a	n/a	n/a	n/a
Terbuthylazine	(1236,66,22)	1.269	1.128	0.204	0.367
-*Desethyl-terbuthylazine*	(1342,222,32)	2.899	2.803	0.923	0.953
- *Desisopropyl-atrazine*	(904,92,0)	4.348	3.745	1.730	2.036
Pyridate	(116,0,0)	<LOD	<LOD	<LOD	<LOD
- *PHCP*	(359,10,4)	2.906	2.631	0.349	0.371
BANNED (due to other issues)					
Rimsulfuron	(367,0,0)	0.095	0.066	<LOD	0.035
- PPU	(1078,420,12)	0.169	0.166	0.073	0.079
Dimethoate	(994,1,0)	0.109	0.080	0.029	0.046
AUTHORISED (with restrictions due to leaching to groundwater)					
Bentazone	(2161,52,7)	6.071	3.760	3.000	3.917
Fluazifop-P-butyl (2011 – 2013) new lower app. rate	*Not Measured*	n/a	n/a	n/a	n/a
- *Fluazifop-P*	(67,0,0)	<LOD	<LOD	<LOD	<LOD
- *TFMP*	(237,39,7)	0.711	0.656	0.072	0.077
Ethofumesate (2011 – 2013) new lower app. rate	(32,0,0)	0.538	0.256	0.098	0.144
Tebuconazole	(776,6,2)	0.023	0.021	<LOD	<LOD
- *1,2,4-triazol*	*Not Measured*	0.263	0.263	0.052	0.053
Epoxiconazole	(998,1,0)	0.012	0.011	<LOD	<LOD
Propiconazole	(1731,3,0)	<LOD	<LOD	<LOD	<LOD
Triasulfuron	(301,0,0)	0.352	0.341	0.169	0.176
- *IN-A4098*	(291,0,0)	0.049	0.046	0.022	0.023
- *IN-A4098**	(482,1,0)	n/a	n/a	n/a	n/a
AUTHORISED (without restrictions due to leaching to groundwater)					
Azoxystrobin	(1687,2,0)	0.327	0.279	<LOD	<LOD
- *CyPM*	(1755,45,1)	1.458	1.364	<LOD	<LOD
Glyphosate	(1896,64,5)	<LOD	<LOD	<LOD	<LOD
- *AMPA*	(1925,32,0)	<LOD	<LOD	<LOD	<LOD
Metamitron	(1042,47,6)	8.253	2.697	2.322	3.714
- *Metamitron-desamino*	(1016,62,13)	1.991	1.413	0.690	0.782

	Groundwater monitoring results[1] (May 1999 – June 2013)	PECgw at 2.5 m depth Langvad - MACRO			
	Combined - All fields	**DK/DK approach[2]**	**DK/EU approach[3]**	**EU/EU approach[4]**	**EU/DK approach[5]**
Pirimicarb	(1922,6,0)	6.285	6.177	0.043	0.054
- pirimicarb-desmethyl-formamido	(1459,2,0)	0.102	0.097	<LOD	<LOD
Ioxynil	(887,1,0)	<LOD	<LOD	<LOD	<LOD
Prosulfocarb	(452,1,0)	<LOD	<LOD	<LOD	<LOD
Aminopyralid	(144, 0,0)	0.037	0.033	0.025	0.027
Bromoxynil	(882,0,0)	<LOD	<LOD	<LOD	<LOD
Chlormequat	(190,0,0)	0.811	0.793	0.020	0.022
Diflufenican	(223,0,1)	<LOD	<LOD	<LOD	<LOD
- AE-B107137	*Not Measured*	<LOD	<LOD	<LOD	<LOD
Metrafenone	(181,1,0)	<LOD	<LOD	<LOD	<LOD
Pendimethalin	(1405,0,0)	<LOD	<LOD	<LOD	<LOD
Picolinafen	(193,0,0)	<LOD	<LOD	<LOD	<LOD
- CL 153815	(193,0,0)	0.110	0.103	<LOD	<LOD

1. Presented as (800, 200, 20), which is the number of groundwater samples from horizontal and vertical screens that have a concentration: < LOD, ≥LOD and ≤0.1 µg/L and > 0.1ug/L.
2. DK parameter selection of inputs and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).
4. EU parameter selection and EU output evaluation (80th percentile PECgw).
5. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
**These IN-A4098 groundwater results are from degradation of tribenuron-methyl.*
n/a: Not applicable.
Not Measured: Application of pesticide takes place at the site, but there are no measurements of the pesticide or its metabolites.
Not Applied: The pesticide is not applied at the field.

Legend for Risk of Leaching to Groundwater:
Serious risk of leaching, many detections >0.1 µg/L (red)
Limited risk of leaching, few detections >0.1 µg/L (yellow)
Detections ≤0.1 µg/L and ≥LOD (blue)
All measured concentrations <LOD (grey)

DK output evaluation:
2 or more exceedances in 20 years (application every year), 4 or more exceedances in 60 years (application every 3rd year) (red)
1 or less exceedances in 20 years (application every) year), 3 or less exceedances in 60 years (application 3rd year) (blue)
No failures (grey)

EU output evaluation:
>0.1 µg/L (red)
≤ 0.1 µg/L ≥LOD (blue)
<LOD (grey)

The results demonstrate that higher PECgw values are simulated by the Danish approach for parameter selection in comparison to the EU approach (Table 3.1-2, 3.1-3 and 3.1-4). This was also found by Stenemo and Alvin (2013) when modelling hypothetical substances using the DK and EU approach. The conservatism of four combinations of approaches can for these selected compounds be ranked: DK/DK, DK/EU, EU/DK and EU/EU.

When comparing the DK approach to output evaluation (number of exceedances >0.1 µg/L) and the EU approach to output evaluation (80th percentile PECgw), but keeping the same parameter selection (*i.e.* comparing DK/DK to DK/EU and EU/EU to EU/DK) the difference in leaching risk conclusion is marginal (Table 3.1-2 and Table 3.1-4). As a consequence, from this point forward of the results section will focus on the difference between the DK and EU approaches with respect to parameter selection.

A comparison of the conclusion of leaching risk from the Danish EPA based on the PLAP groundwater results and simulated leaching assessment from the three regulatory model scenarios applying the DK and EU approaches to parameter selection and output evaluation is presented in Table 3.1-5.

Table 3.1-5: Comparison of the ***Danish EPA conclusion*** on leaching assessment based on the ***PLAP groundwater*** results to the ***simulated*** leaching assessment of the three ***regulatory model scenarios*** applying the ***DK*** and ***EU*** approach to parameter selection and output evaluation

Danish EPA conclusion of leaching risk based on PLAP groundwater monitoring results	Regulatory model scenarios	Percentage of compounds where the simulated leaching assessment matches the Danish EPA leaching conclusion[1]	
		DK Approach	**EU Approach**
		2 or more exceedances[2] >0.1 µg/L	80th percentile PECgw >0.1 µg/L
Failed Serious risk of leaching, many detections > 0.1 µg/L	Hamburg – PELMO	70% (7/10)	50% (5/10)
	Karup – MACRO	63% (5/8)	50% (4/8)
	Langvad – MACRO	75% (6/8)	63% (5/8)
		1 or less exceedances[2] >0.1 µg/L	80th percentile PECgw ≤0.1 µg/L
Passed based on expert judgment Limited risk of leaching, few detections >0.1 µg/L	Hamburg – PELMO	36% (4/11)	100% (11/11)
	Karup – MACRO	36% (4/11)	91% (10/11)
	Langvad – MACRO	27% (3/11)	55% (6/11)
		1 or less exceedances[2] >0.1 µg/L	80th percentile PECgw ≤0.1 µg/L
Passed All detections ≤0.1 µg/L	Hamburg – PELMO	65% (17/26)	92% (24/26)
	Karup – MACRO	64% (16/25)	92% (23/25)
	Langvad – MACRO	60% (15/25)	92% (23/25)

1. The brackets show the number of compounds where the simulated leaching assessment matches the Danish EPA leaching conclusion and the total number of compounds that are in that category.

2 Number of exceedances per 20 year period appropriate for annual applications. For those substances applied once every three years, the DK approach is considered to fail if there are 4 or more exceedances >0.1 >0.1µg/L in a 60 year period.

The results show a mixed picture when it comes to determining if the EU approach or the DK approach is more appropriate for establishing the conclusion on the leaching risk to groundwater, as observed in PLAP (Table 3.1-5). For example, for compounds where the leaching risk conclusion from the Danish EPA is “failed”, the DK approach is better able to predict this (maximum 6/8 compounds in Langvad-MACRO match) in comparison to the EU approach (5/8 compounds in Langvad - MACRO). The difference is larger for Hamburg – PELMO where 7/10 compounds match the leaching risk conclusion with the DK approach compared to 5/10 compounds with the EU approach.

The Langvad – MACRO regulatory scenario has the highest percentage of compounds where the simulated leaching assessment corresponds to Danish EPA leaching conclusion, for both the DK and EU approach, than when compared to Hamburg-PELMO and Karup – MACRO.

It is worth noting that for the MACRO regulatory scenarios, the total number of compounds that appear in the “failed” category is lower than for PELMO, eight as opposed to ten, respectively. This is because in FOCUS-MACRO only parent to one metabolite can be simulated. The leaching risk for two metabolites (CGA108906 and metribuzin desamino diketo) was, therefore, only calculated with Hamburg - PELMO.

For compounds where the leaching risk conclusion by the Danish EPA is a “pass” (PLAP groundwater monitoring results are ≤ 0.1 µg/L) the EU approach performs better than the DK approach (Table 3.1-5). The results show that applying the EU approach a maximum of 24/26 compounds (Hamburg – PELMO) and 23/25 compounds (Karup – MACRO and Langvad - MACRO) match the Danish EPA leaching risk conclusion, compared to 17/26 compounds (Hamburg – PELMO), 16/25 compounds (Karup – MACRO) and 15/25 compounds (Langvad – MACRO) applying the DK approach. The regulatory scenario with the highest percentage of compounds where the simulated leaching assessment corresponds to Danish EPA leaching conclusion is Hamburg – PELMO in both the DK approach and EU approach.

When the leaching risk conclusion from the Danish EPA is “passed based on expert judgment” the percentage of compounds where the simulated leaching assessment corresponds to Danish EPA leaching conclusion is higher for the EU approach than the DK approach (Table 3.1-5). The results show that applying the EU approach a maximum of 11/11 compounds (Hamburg – PELMO) match the Danish EPA leaching risk conclusion, compared to 4/11 compounds (Hamburg – PELMO and Karup – MACRO) applying the DK approach. However, the PLAP groundwater monitoring data from which this decision is derived shows that the compounds are found at concentrations >0.1 µg/L in groundwater in a few samples (Table 3.1-1). For example, metamitron has six detections in PLAP >0.1 µg/L, the DK approach PECgw is 0.298 µg/L and the EU approach is <LOD. Therefore, the DK approach is more able to predict the leaching risk as seen in PLAP, whereas the EU approach is under-estimating the risk.

Another picture appears when evaluating how well the outcome (failed/passed) of the three regulatory model scenarios, applying both the DK and EU approach, match with the final associated registration decision (banned/authorised) made by the Danish EPA (Table 3.1-6). When the outcome of the model scenarios with the selected “Pesticide + Crop” applying the DK approach is “failed” then only 48% of the compounds were associated with a banned decision from the Danish EPA The other outcomes (“DK-Passed”; “EU-Failed”; “EU-Passed”) match the Danish EPA decision for 70-75% of the compounds included. The Langvad-MACRO scenarios match best when the outcome is “passed” (76 % when applying the DK approach and 74% when applying the EU approach), whereas Hamburg-PELMO has the best match when the outcome is “Failed” (86% when applying the EU approach and 50% when applying the DK approach).

Table 3.1-6: Comparison of the ***outcome (failed/passed)*** of the three ***regulatory model scenarios*** applying both the ***DK*** and ***EU*** approach to the ***final associated registration decision of the Danish EPA(banned/authorised)***.

Approach	Outcome	Regulatory model scenario	Number of model scenarios “Pesticide + Crop”	Model scenarios with outcome matching the final associated registration decision of the Danish EPA based on a sum of often multiple “Pesticide + Crop” combinations		
				Number	Percentage	Av. percentage
DK	Failed	Hamburg - PELMO	24	12	50%	48%
		Karup - MACRO	22	10	45%	
		Langvad - MACRO	25	12	48%	
	Passed	Hamburg - PELMO	26	18	69%	72%
		Karup - MACRO	24	17	71%	
		Langvad - MACRO	21	16	76%	
EU	Failed	Hamburg - PELMO	7	6	86%	75%
		Karup - MACRO	7	5	71%	
		Langvad - MACRO	12	8	67%	
	Passed	Hamburg - PELMO	43	29	67%	70%
		Karup - MACRO	39	27	69%	
		Langvad - MACRO	34	25	74%	

3.1.2 Regulatory-comparison discussion

The leaching assessment of a pesticide and its metabolite(s) to groundwater is an important consideration for the registration of plant protection products in Denmark as nearly all drinking water is from groundwater with little or no treatment after abstraction. Therefore, if a pesticide or metabolite is detected above 0.1 µg/L in the raw water supply then it is likely to be greater than 0.1 μg/L at the tap, where the threshold concentration for drinking water is applied. In addition, under the EU Water Framework Directive (Annex I of the Groundwater Daughter Directive) good chemical status for groundwater cannot be met when the EU standard (0.1 μg/L for an individual pesticide) is exceeded.

In the regulatory, **R**-comparison, the objective was to evaluate whether:

- the more conservative Danish approach (with respect to parameter selection and output evaluation) is required to ensure that the regulatory model scenarios are protective of the leaching risk to groundwater as observed in PLAP for pesticides and their metabolites.

The results demonstrate that the DK approach to parameter selection and output evaluation is more conservative and typically over-estimates the leaching to groundwater, as measured in PLAP, compared to the EU approach. In particular, the DK approach over-estimates the leaching risk to groundwater for some of the compounds that are considered to "pass" based on PLAP groundwater monitoring results (detections ≤ 0.1 μg/L). However, for those compounds that are considered to pose a serious leaching risk, based on the PLAP groundwater monitoring results, and are therefore considered to have "failed" the leaching assessment, the DK approach is shown to predict leaching better that the EU approach which typically under-estimates the leaching risk.

When the leaching risk conclusion from the Danish EPA is "passed based on expert judgment" the results show that the EU approach performs better than the DK approach. However, the PLAP groundwater monitoring data from which this decision is derived shows that the compounds are found at concentrations >0.1 μg/L in groundwater in a few samples. As a consequence, the EU approach is predicting no risk, with compounds passing the simulated leaching assessment, but the PLAP groundwater monitoring results shows several detections >0.1 μg/L which would lead to restrictions.

With respect to the regulatory model scenarios the results highlight that Hamburg – PELMO and Karup – MACRO are only marginally different in terms of simulated leaching assessment. Although, for the compounds that are considered to have be a serious leaching risk, Hamburg-PELMO, with the DK approach, performs better than Karup-MACRO, but not as well as Langvad – MACRO. It is worth noting that PECgw from Hamburg - PELMO is estimated at 1 m depth and in Karup - MACRO at 2.5 m depth. When Karup - MACRO was re-run for selected pesticides changing the reporting depth from 2.5 m to 1 m there was no change in the leaching category assigned (see Appendix D for more information).

For most pesticides and metabolites the observations above 0.1 g/L in the PLAP groundwater are at the clay till fields (Table 3.1-1). The exception is for metalaxyl-M (metabolites: CGA62826 and CGA108906), metribuzin (metabolites: metribuzin-diketo and metribuzin desamino-diketo) and rimsulfuron (metabolite: PPU), which are potato herbicides only used at the sandy fields – note these pesticides are all currently banned in Denmark. The same observations can be made of bentazone in the leaching data. At the sandy PLAP fields the number of detections <LOD, ≥LOD and ≤ 0.1 μg/L, >0.1 μg/L is (850, 1, 0), respectively and at the clay till PLAP fields it is (1311, 51, 7), respectively. In the PLAP groundwater monitoring data the leaching risk conclusion five of these compounds for (metalaxyl-M, CGA62826, CGA108906, metribuzin-diketo and metribuzin desamino-diketo) is "failed". The DK approach predicts this whereas in EU approach the PECgw is <LOD for three of the compounds.

It is worth noting that this report has produced PECgw results based on unrefined Tier 1 input estimates of compound degradation and sorption characteristics and therefore refinements to the input data are possible.

Potential refinements could include, for example, consideration of more realistic field dissipation behaviour or aged sorption processes, if applicable. Additional consideration could be given to the representativeness of the sorption and degradation datasets to Danish soil conditions or to refinements to the application window or crop growth stage in order to better reflect actual conditions in the field at the time of application.

The K_{FOC} and 1/n in particular can have a large effect on the leaching assessment. For example, for CyPM (metabolite of azoxystrobin) the K_{FOC} and 1/n in the EU approach is 228.4 L/kg and 0.78, respectively; in the DK approach 100.4 L/kg and 0.867, respectively (Table 2.1-2). The 80th percentile PECgw in Hamburg-PELMO for the EU approach is < LOD and in DK approach is 2.501 µg/L (Table 3.1-2). Note, the difference in DT_{50} between the EU and the DK values used in the modelling is small, 98.6 days and 103.6 days, respectively (Table 2.1-2). The DT_{50}, K_{FOC} and 1/n for all the selected compounds applying the DK and EU approach are given in Appendix A.

The PECgw values shown in the summary tables (Tables 3.1-2 – 3.1-4) are the worst-case (highest) PECgw results from the three individual applications simulated. For some compounds, if the best-case (lowest) PECgw had been chosen the conclusions regarding leaching risk would also change. See Appendix D for the full results tables, including the PECgw results for the three individual applications.

Assumptions in the input parameters regarding the application rate could also influence the PECgw. In this report the maximum application rate, as observed in PLAP, was used. It is possible that these uses are “old” higher use rates than those currently being supported. The use of older/higher use rates will potentially affect both the simulated leaching assessment but also the conclusion on leaching risk from the PLAP groundwater monitoring if newer/lower use rates have been introduced. The effect of rate reduction (via regulation) can be seen in the PLAP groundwater results for fluazifop-P-butyl (and metabolites fluazifop-P and TFMP), and ethofumesate (Table 3.1-1). The rate reduction has reduced the concentrations observed in PLAP groundwater for fluazifop-P and ethofumesate (Table 3.1-1). As a result the conclusion of leaching risk in PLAP has also changed from “failed” to “passing”. The new/lower use rate is also reflected in lower PECgw results (3.1-2, 3.1-3 and 3.1-4). The application date and the BBCH at application could also influence the PECgw. For example if the modelling was conducted at an earlier application date (and earlier BBCH) this could result in a higher soil loading and potentially a higher PECgw.

The difference between the leaching risk from the PLAP groundwater results and the model results could be as a result of the models (PELMO and MACRO) not accounting for a key fate and transport process in the environment. For example, glyphosate is under estimated by all three regulatory model scenarios and all four approaches for parameter selection and output evaluation (Tables 3.1-2, 3.1-3 and 3.1-4). However, the leaching of glyphosate could be as a result of particle facilitated transport through discontinuities such as biopores and fractures to shallow groundwater (Kjær *et al*., 2011), which is not considered in either model.

The conclusion on leaching risk to groundwater from the PLAP groundwater monitoring results is based on the aggregation of data for a compound across all relevant PLAP field not taking a specific crop into account. The weather conditions during and after application or during sampling has not been considered either. The timing and intensity of rainfall events after application is a critical factor in the transport of pesticides to groundwater (Mermoud and Meiwirth, 2004) as well as the antecedent moisture conditions of the soil. Extreme weather conditions, such as prolonged high intensity and high volume rainfall events, soon after application, could therefore, result in large leaching events with concentrations >0.1 µg/L that in typical field conditions may not occur. Conversely, lower rainfall volumes, such as prolonged period of dry weather, could also lead to lower concentrations than might be expected in typical field conditions. Extreme weather conditions not only affect the leaching of a compound, but potentially the decision behind application, e.g. a sustained period of wet weather could delay an application in the field. When a decision is taken by the Danish EPA to ban a pesticide the climate data associated with the PLAP monitoring data is also considered.

In the PLAP fields the potential for compounds to be detected at elevated concentrations in groundwater as a result of applications upstream has been noted in PLAP monitoring results by Brüsch *et al*. (2015). For example at Tylstrup the metabolite of metalaxyl-M, CGA108906, was present before metalaxyl-M was applied. It was noted that as there were findings of CGA108906 in the suction cups and a horizontal well situated just below the fluctuating groundwater table indicating that the origin was from the PLAP field.

For metabolites detected in the PLAP groundwater monitoring there is a possibility that the peak concentrations may be as a result of leaching from the previous application of another pesticide. This would not be captured in the modelling. For example IN-A4098 is a transformation product of: triasulfuron, iodosulfuron, prosulfuron, tribenuron-methyl, chlorsulfuron, thifensulfuron, metsulfuron and 1,2,4-triazol is a transformation product of tebuconazole, penconazole, epoxiconazole, propiconazole, difenoconazole and paclobutrazol. Note, these are not exhaustive lists.

The potential for selection bias in the PLAP groundwater monitoring data also needs to be considered, particularly as the decision for unacceptable leaching in the PLAP groundwater results is based on expert judgment. Selection bias could occur if, for example, when a compound is detected at concentrations > 0.1 µg/L more samples are taken and it then stays in the monitoring programme longer. Or conversely, if a compound is not suspected to leach so is not monitored for, or potentially not monitored for long enough.

To obtain an optimal reflection of a future conclusion by the Danish EPA regarding a compound *via* the choice of regulatory model scenario and approach has proven to be outside the remit of this study. The fact that only 48% of the model scenarios applying the DK-approach with the outcome “failed” match the conclusion of the Danish EPA conclusion based on PLAP results could be, in part, due to the fact that this study addresses worst case scenarios without the refinements which may typically be expected in a regulatory submission. It has to be noted that the conclusion of the Danish EPA is often based on an evaluation on multiple “Pesticide + Crop” combinations and seldom on a specific crop as included the simulations executed in this study. An analysis of the conclusion of the comparison of the Danish EPA based on PLAP with the results of regulatory modelling against key substance parameters (K_{FOC}, DT_{50}, 1/n) showed no clear trends.

*3.1.3 Conclusion of **R**egulatory-comparison*

Overall, based on the results shown in this report, the DK approach is more conservative and overestimates the risk of leaching for compounds where there is no risk. The EU approach on the other hand results in an under-estimation of the leaching risk, particularly for those compounds ranked as having a high leaching risk based on the PLAP groundwater monitoring results. When the outcome of modelling using the DK approach is “failed” this matches the decision of the Danish EPA for just under half the substances simulated. However this could be, in part, due to the fact that this study addresses worst case scenarios without the refinements which may typically be expected in a regulatory submission.

3.2 Field – Comparison

The objective of the **F**ield specific comparison is to evaluate whether the present regulatory model scenarios, required by Denmark, adequately assess the leaching risk of pesticides and their metabolites through both the sandy and clay till fields of PLAP. All three regulatory model scenarios can be considered as not up-to-date with respect to the latest knowledge on transport processes(e.g. aged sorption) or climate (applying climate files from 1961-1990; Henriksen *et al*.,. 2013).

The **F**ield specific comparison focuses on an evaluation of the regulatory model scenarios themselves and their ability to predict the leaching level detected in PLAP as the result of the selected "Pesticide + Crop" combinations. This comparison is split into two, considering first:

- the PLAP-results from 1 m depth as *Cmean* (analysis of water samples collected from suction cups at the sandy fields and from the drainage of the clay till fields within the period May 1999 – June 2013) as a result of application of the selected pesticide to the selected crop

and then:

- groundwater (water samples collected from between 1.5 m – 4.5 m depth and from both vertical and horizontal monitoring screens with concentrations ≤LOD, >LOD and ≤0.1 µg/L and >0.1 µg/L for the monitoring period May 1999 – June 2013) as a result of application of the selected pesticide to the selected crop.

Multiple studies on the PLAP fields (e.g. Rosenbom *et al*., 2015) have identified and reported on the transport pathways being piston like in sandy soil and preferential in clay till soils it is important to differ between these two soil types when doing a direct **F**-comparison as indicated by the R-comparison with the sandy Hamburg-PELMO model scenario not being able to assess the preferential leaching at the clay till fields as well as the clay till Langvad – MACRO model scenario.

The **F**-comparison has, hence, been split into two focussing on:

- The **sandy PLAP-fields** (Tylstrup and Jyndevad) and respective regulatory model scenarios (Hamburg -PELMO) and Karup - MACRO) (Figure 3.2-1; Table 3.2-1). Both model scenarios simulate piston like transport, however both contain different weaknesses in their hydraulic description.
- The **clay till PLAP-fields** (Silstrup, Estrup and Faardrup) and respective regulatory model scenario (Langvad - MACRO) (Figure 3.2-2; Table 3.2-2). This model scenario does incorporate preferential transport but uses an old out-dated version of MACRO (MACRO 4.4.2) with a sub-optimal estimation of the water saturation.

Before presenting the comparison the following knowledge is required. The only direct **F**-comparison possible between *Cmean* at 1 m depth (sandy fields: water collected via suction cups; clay till fields: water collected via tile drains) in PLAP and the estimated PECgw by the regulatory model scenarios is between the two sandy PLAP-fields and Hamburg - PELMO as illustrated by Figure 3.2-1 and 3.2-2. The estimated PECgw of the Karup - MACRO presents the leaching from a 2.5 m thick unsaturated sandy soil.

For the clay till PLAP-fields the *Cmean* at 1 m depth is represented by the detections in the drainage, which do not account for the additional mass leaching below depth of the drain system (indicated by arrows in Figure 3.2-2). Consequently, this *Cmean* could be less than the actual transport passing 1 m depth, since there is nearly only drainage when the groundwater table is above depth of the drain system.

Additionally, MACRO – Langvad estimates PECgw at 2.5 m depth, and does not provide an indication of the transport of pesticide mass flux or water flux to the drains installed at 1.3 m depth. Langvad - MACRO does not account for any other horizontal groundwater transport in the zone between the depth of drain system and 2.5 m depth. The latter makes PECgw not comparable with the conditions in the upper groundwater as monitored in PLAP.

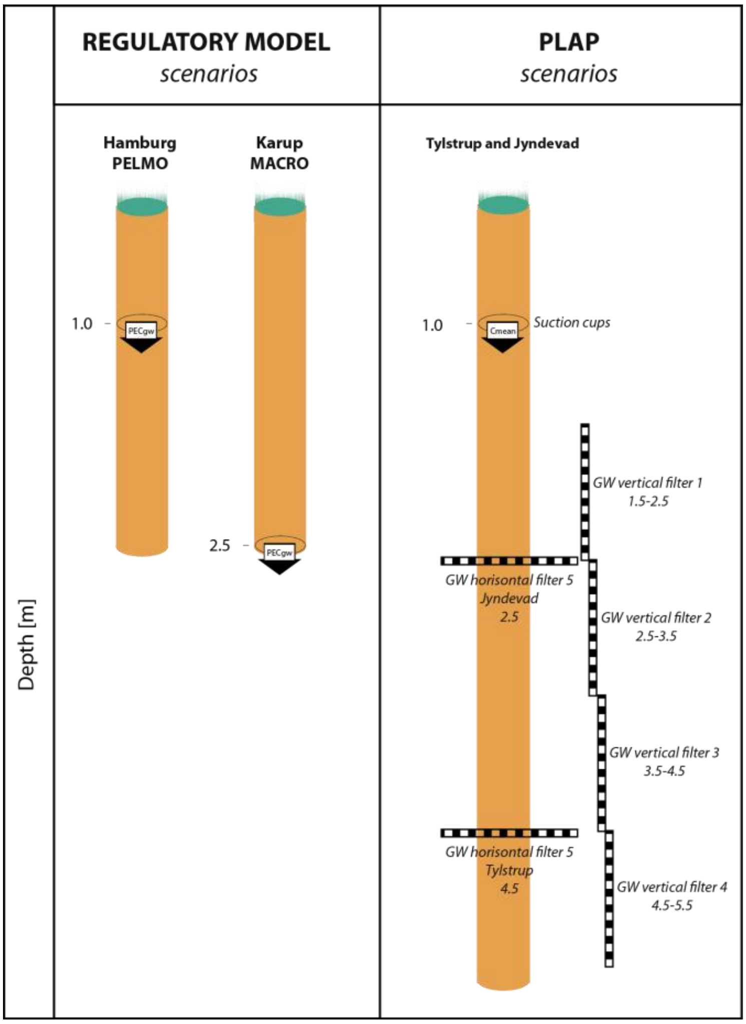


Figure 3.2-1: ***Comparison*** of the regulatory model scenarios ***Hamburg - PELMO*** and ***Karup - MACRO*** estimated ***PECgw*** with the monitoring results obtained at the ***sandy PLAP-*** fields from ***1 m depth (Cmean)*** and ***groundwater (detections)***.

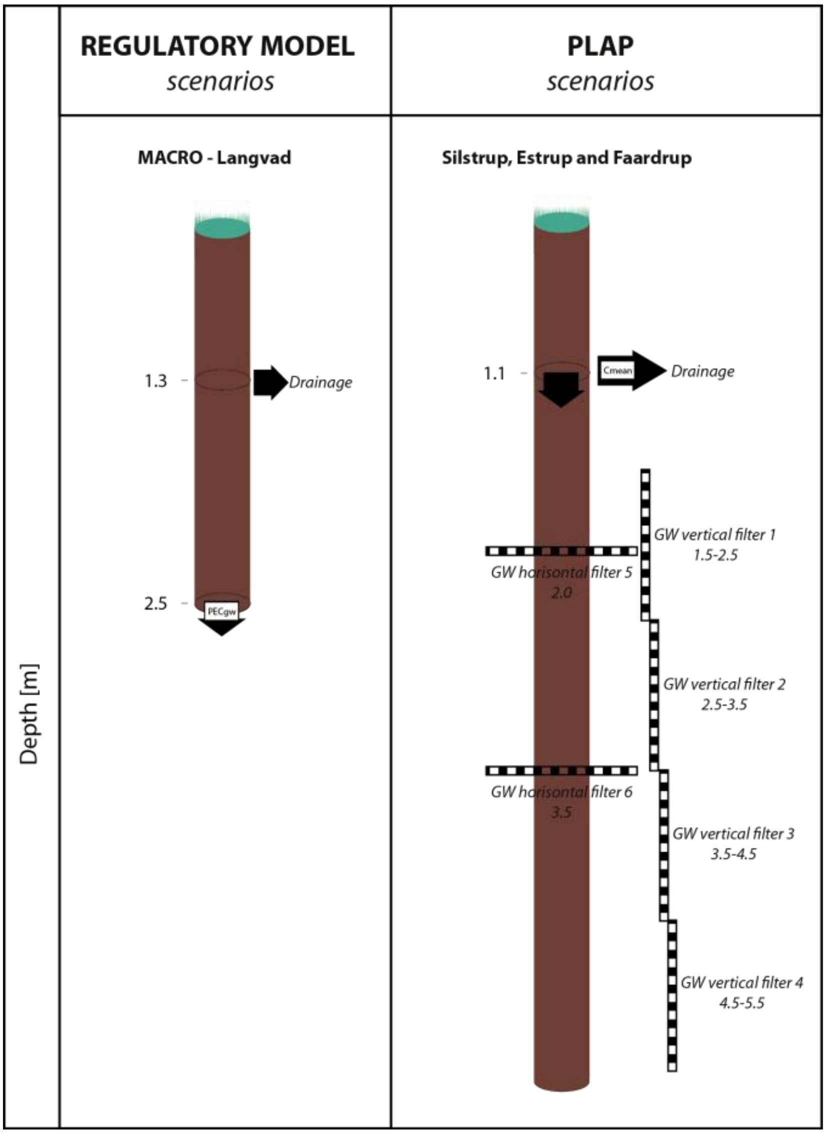


Figure 3.2-2: ***Comparison*** of the regulatory model scenario ***Langvad-MACRO*** estimated ***PECgw*** with the monitoring results obtained at the ***clay till PLAP***-fields from ***1 m depth (Cmean)*** and ***groundwater (detections)***.

The leaching of each selected compound (pesticide and metabolite) at 1 m depth (sandy fields: water collected via suction cups; clay till fields: water collected via tile drains) and to groundwater (1.5 – 4.5 m depth) is estimated for the selected crop considered in the modelling if similar "Pesticide + Crop" leaching scenarios exist for the PLAP-fields. The *Cmean* value for all the "Pesticide + Crop" at a specific PLAP-field is categorised as outlined below:

0.15	>0.1 µg/L
0.05	≤ 0.1 µg/L ≥ LOD
<LOD	< LOD
Not Applied Not Measured	Not Applied or Not Measured

At each PLAP field the number of exceedances for two years of groundwater monitoring has been reported, and categorised as outlined below. The regulatory view (**R**-comparison) of sub-dividing detections greater than 0.1 µg/L into a serious risk or a limited leaching risk has not been considered.

(200,25,2)	Detections >0.1 µg/L
(200,27,0)	Detections ≤0.1 µg/L and ≥LOD
(227,0,0)	All measured concentrations are <LOD
Not Applied Not Measured	Not Applied or Not Measured

The values reported in the brackets represent, from left to right: the number of samples < LOD, number of detections ≥ LOD but ≤0.1 µg/L and number of detections >0.1 µg/L. In the PLAP data any detection >0.1 µg/L is assigned an orange category as a regulatory approach is not being taken. The categories have been kept the same to allow for consistency within the report.

PECgw results from the DK approach and the EU approach to the parameter selection and output evaluation are also presented in Tables 3.2-1 and 3.2-2. For the EU evaluation of outputs the 80th percentile PECgw simulations have been assigned to the following categories:

1.20	>0.1 µg/L
0.08	≤ 0.1 µg/L ≥ LOD
≤ LOD	≤ LOD

For the DK approach the number of exceedances in 20 years or 60 years determines the risk of leaching. For applications made every year, only one of the 20 annual averages is allowed to exceed the threshold value of 0.1 µg/L. For applications made every third year three of the 60 annual averages are allowed to exceed 0.1 µg/L. The leaching risk conclusion, based on the number of exceedances, has been assigned to the following categories:

0.13	2 or more failures in 20 years (application every year) 4 or more failures in 60 years (application every 3rd year)
0.08	1 or less failures in 20 years 3 or less failures in 60 years (application every 3rd year)
≤ LOD	No failures

The 95th percentile PECgw value is reproduced in the box. This relates to the second highest annual average PECgw value in all three individual runs when the application is every year, and the fourth highest values when the application is every three years.

3.2.1 Field – comparison for sandy fields

For the selected "pesticide and crop" combinations the results presented (Table 3.2-1; Figure 3.2-1) provide an overview of the PLAP monitoring results at:

- **1 m depth** – *Cmean*, which is based on detections in water collected from suction cups
- **groundwater** – Number of groundwater samples collected from both vertical and horizontal screens with:
    - no detections,
    - detections ≥LOD and ≤0.1 µg/L,
    - detections >0.1 µg/L.

Table 3.2-1: Overview of the ***leaching results for selected "pesticide and crop"*** combinations for ***sandy fields*** presenting the ***PLAP*** monitoring results (represented by ***Cmean at 1 m depth*** and ***detections in groundwater***) and the ***estimated PECgw*** applying both the ***EU*** and ***DK*** approach

FRAME	**PLAP scenarios**				**REGULATORY scenarios**			
	Groundwater monitoring results[1] *(May 1999 – June 2013)*		***Cmean* at 1m depth** *in 1st year after application* [µg/L]		**PECgw EU approach** *80th percentile* [µg/L]		**PECgw DK approach** *Number of exceedances >0.1µg/L and 95th percentile* [µg/L]	
Field	**Tylstrup**	**Jyndevad**	**Tylstrup**	**Jyndevad**	**Hamburg**	**Karup**	**Hamburg**	**Karup**
Azoxystrobin	(120,0,0)	Not Applied	<LOD	Not Applied	<LOD	<LOD	0.135	0.136
- CYPM	(120,0,0)	Not Applied	<LOD	Not Applied	<LOD	<LOD	2.747	1.952
Bentazone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Maize	(179,0,0)	(64,1,0)	<LOD	0.24	0.030	0.021	2.085	1.658
Spring barley	(126,0,0)	(146,0,0)	<LOD	0.04	0.027	0.036	1.443	1.696
Peas	Not Applied	(284,0,0)	Not Applied	0.13	0.017	0.021	0.734	1.651
Bifenox	(38,0,0)	(214,2,0)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
- Bifenox acid	(38,0,0)	(170,0,0)	<LOD	<LOD	0.189	0.189	0.892	0.645
Metalaxyl-M	(187,12,0)	(163,20,22)	<LOD	0.02	<LOD	<LOD	0.019	0.016
- CGA62826	(184,15,0)	(129,69,8)	0.02	0.19	0.186	0.147	0.763	0.504
- CGA108906	(27,131,41)	(41,99,66)	0.12	0.6	0.371	n/a	0.282	n/a
Metribuzin	(336,1,0)	Not Applied	<LOD	Not Applied	<LOD	<LOD	0.343	0.770
- Metribuzin diketo	(73,141,315)	Not Applied	0.36	Not Applied	<LOD	<LOD	0.025	0.081
- Metribuzin desamino diketo	(289,234,5)	Not Applied	0.97	Not Applied	0.018	n/a	0.309	n/a
Rimsulfuron	(172,0,0)	(233,0,0)	<LOD	<LOD	<LOD	0.011	0.188	0.181
- PPU	(592,58,0)	(483,362,12)	0.02	0.13	0.075	0.078	0.181	0.182
Tebuconazole	(189,1,0)	(207,1,0)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
- 1,2,4-triazol	Not Measured	Not Measured	Not Measured	Not Measured	0.056	0.042	0.378	0.296
Terbuthylazine	(167,0,0)	Not Applied	<LOD	Not Applied	<LOD	<LOD	0.019	0.016
-Desethyl-terbuthylazine	(179,0,0)	Not Applied	<LOD	Not Applied	0.122	0.156	3.100	3.292
- Desisopropyl-atrazine	(179,1,0)	Not Applied	<LOD	Not Applied	2.960	3.398	5.790	6.460
Dimethoate	Not Applied	<LOD	Not Applied	<LOD	<LOD	<LOD	<LOD	<LOD
Ioxynil	(124,0,0)	(212,0,0)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Propiconazole	(286,0,0)	Not Measured	<LOD	Not Measured	<LOD	<LOD	<LOD	<LOD
Pyridate	Not Applied	(101,0,0)	Not Applied	<LOD	<LOD	<LOD	<LOD	<LOD
- PHCP	Not Applied	(169,0,0)	Not Applied	<LOD	<LOD	<LOD	1.712	3.374
Aminopyralid	(73,0,0)	Not Applied	<LOD	Not Applied	0.032	0.043	0.067	0.081
Bromoxynil	(184,0,0)	(212,0,0)	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Pendimethalin	(431,0,0)	Not Applied	<LOD	Not Applied	<LOD	<LOD	<LOD	<LOD
Picolinafen	Not Applied	(35,0,0)	Not Applied	<LOD	<LOD	<LOD	<LOD	<LOD
- CL 153815	Not Applied	(70,0,0)	Not Applied	<LOD	<LOD	<LOD	0.023	0.022

FRAME	PLAP scenarios				REGULATORY scenarios			
	Groundwater monitoring results[1] *(May 1999 – June 2013)*		***Cmean* at 1m depth** *in 1st year after application* [µg/L]		**PECgw EU approach** *80th percentile* [µg/L]		**PECgw DK approach** *Number of exceedances >0.1µg/L and 95th percentile* [µg/L]	
Field	**Tylstrup**	**Jyndevad**	**Tylstrup**	**Jyndevad**	**Hamburg**	**Karup**	**Hamburg**	**Karup**
Triasulfuron	(358,0,0)	Not Applied	<LOD	Not Applied	0.320	0.228	0.562	0.352
- IN-A4098	(344,0,0)	Not Applied	<LOD	Not Applied	0.035	0.019	0.057	0.025

1. The number of exceedances given in the brackets, for example (800, 200, 20), are the number of analyses not detected, number of analyses >LOD and ≤0.1 µg/L and number of analyses > 0.1ug/L.
n/a: Not applicable.
Not Measured: Application of pesticide takes place at the field, but there are no measurements of the pesticide or its metabolites..
Not Applied: Pesticide is not applied at the field.

Legend for Groundwater Results:
Detections >0.1 µg/L (orange)
Detections ≤0.1 µg/L and >LOD (blue)
Measured concentrations ≤LOD (grey)

DK output evaluation:
2 or more failures in 20 years (application every year)
4 or more failures in 60 years (application every 3rd year) (red)
1 or less failures in 20 years (application every year)
3 or less failures in 60 years (application 3rd year) (blue)
No failures (grey)

EU output evaluation:
>0.1 µg/L (red)
≤ 0.1 µg/L > LOD (blue)
≤ LOD (grey)

The difference between Hamburg and Karup regulatory model scenarios PECgw is marginal when both applying the DK and EU approach. Interestingly, the Hamburg-PELMO scenario contains less precipitation than the Karup-MACRO scenario (Table 2.1-5).

When comparing the regulatory model scenarios when the PECgw >0.1 µg/L (red cells) to the "Pesticide + Crop" PLAP-scenarios at >0.1 µg/L (orange cells), considering both detections in water from suction cups and groundwater, the regulatory model scenarios over-predict for following compounds:

- EU approach:
  - one pesticide (triasulfuron)
  - three metabolites (bifenox acid, desethyl-terbuthylazine and desisopropyl-atrazine)
- DK approach:
  - five pesticides (azoxystrobin, bentazone – spring barley, metribuzin, rimsulfuron and triasulfuron)
  - five metabolites (CYPM, bifenox acid, metribuzin desamino diketo, desethyl-terbuthylazine, desisopropyl-atrazine and PHCP)

and under predict for the following compounds:

- EU approach:
  - three pesticides (bentazone - maize, bentazone – peas and metalaxyl-M)
  - three metabolites (metribuzin diketo, metribuzin desamino diketo and PPU)
- DK approach:
  - one pesticide (metalaxyl-M)
  - one metabolites (metribuzin diketo)

From the above it is clear that predicting the leaching related to the pesticides applied to potatoes like metribuzin, rimsulfuron and lately metalaxyl-M poses a challenge for these two regulatory model scenarios. The often negligible leaching of the pesticide and the long-term leaching of their metabolites do not seems to be accounted for with the processes incorporated in the model scenarios. Rosenbom *et al.* (2009) determined in a numerical modelling study of the metribuzin related leaching at Jyndevad that it is not possible to describe this type of leaching by the simple degradation and sorption processes included in tier 1 of the EU risk assessment procedure. In addition, the preferential transport generated by the ridge and furrow topography on a potato-field is not accounted for by these model scenarios (Jacobsen and Jorge, 2013).

To circumvent this lack of ability of the model scenarios Hamburg-PELMO and Karup-MACRO to predict the leaching to the groundwater the results clearly indicate that application of the DK approach will, compared to the EU approach, provide the best protection of the aquifers below sandy fields against pesticide related contamination.

3.2.2 Field –comparison clay till fields

For the selected "pesticide and crop" combinations the results presented (Table 3.2-2; Figure 3.2-2) provide an overview of the PLAP monitoring results at:

- **1 m depth** – *Cmean*, which is based on detections in water collected primarily flow-proportional from drainage (Lindhardt *et al.*, 2000).
- **groundwater** – Number of groundwater samples collected from both vertical and horizontal screens with:
    - no detections,
    - detections above LOD and below or equal to 0.1 µg/L,
    - detections exceeding 0.1 µg/L.

The average precipitation of Langvad (675 mm/year) is comparable with Faardrup (682 mm/year) and lower than the two other PLAP-fields Silstrup (949 mm/year) and Estrup (1085 mm/year). This difference in precipitation is not reflected in a lower PECgw in the regulatory model scenario. The PECgw at 2.5 m depth from Langvad suggests a high level of leaching, particularly when compared to *Cmean* in drainage at 1 m depth in the PLAP fields.

This could indicate that the mass being transported via the tile drains at the Langvad regulatory model scenario is low, as in the Faardrup field. This high leaching level predicted by Langvad - MACRO is visualised by the high number of exceedances (red cells in Table 3.2-2), particularly when applying the DK approach compared to the EU approach. This was also reported at the sandy fields.

The regulatory model scenario Langvad - MACRO seems to over predict the leaching to the groundwater as detected in the similar "Pesticide + Crop" PLAP-scenarios (exceedances >0.1 µg/L as signified by the orange cells) when looking at both detections in water from drainage and groundwater (Table 3.2-2), for the:

- EU approach:
    - no pesticides
    - one metabolites (desisopropyl atrazine)
- DK approach:
    - four pesticides (bentazone – grass, pirimicarb, dimethoate, chlormequat)
    - three metabolites (pirimicarb desmethyl-formamido, desisopropyl atrazine, CL 153815)

and under predict for the:

- EU approach:
    - three pesticides (azoxystrobin, ethofumesate lower app. rate, tebuconazole)

    - four metabolites (CYPM, TFMP, pirimicarb desmethyl-formamido, CL 153815)
- DK approach:
    - one pesticide (tebuconazole)
    - no metabolites

This outcome shows that when applying the DK approach in Langvad - MACRO the regulatory model scenario seems to be able to predict the leaching risk to groundwater of more or less all the selected "Pesticide + Crop" combinations at clay till fields. How representative the conceptual model behind Langvad - MACRO is for clay till is unclear given the lack of knowledge regarding the horizontal removal of mass from the 2.5 m soil profile including a fluctuating groundwater table. The choice of the DK approach seems to improve the leaching risk assessment for the clay till fields compared to applying the EU approach.

Table 3.2-7: Overview of ***the leaching results for selected "pesticide and crop"*** combinations for ***clay till fields*** presenting the ***PLAP*** monitoring results (represented ***by Cmean at 1 m depth*** and ***detections in groundwater***) and the estimated ***PECgw*** applying both the ***DK*** and ***EU approach***

Frame	PLAP scenarios						REGULATORY scenarios	
	Groundwater monitoring results[1] *(May 1999 – June 2013)*			***Cmean* at 1 m depth in drainage** *in 1st year after application*[2] [µg/L]			**PECgw EU approach** *80th percentile* [µg/L]	**PECgw DK approach** *Number of exceedances >0.1µg/L and 95th percentile* [µg/L]
Field	**Silstrup**	**Estrup**	**Faardrup**	**Silstrup**	**Estrup**	**Faardrup**	**Langvad**	**Langvad**
Azoxystrobin	(244,0,0)	(563,2,0)	Not Applied	0.01	0.12	Not Applied	<LOD	0.327
- *CYPM*	(329,27,0)	(547,17,1)	Not Applied	0.02	0.41	Not Applied	<LOD	1.458
Bentazone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Maize	Not Applied	(209,12,0)	(173,6,4)	Not Applied	0.18	2.82	3.000	6.071
Spring barley	Not Applied	(113,4,0)	(171,3,0)	Not Applied	0.05	<LOD	0.963	1.461
Peas	(254,18,3)	(208,0,0)	Not Applied	0.26	0.03	Not Applied	0.797	1.454
Grass	Not Applied	Not Applied	Applied in June 2013*	Not Applied	Not Applied	Applied in June 2013*	0.053	0.160
Bifenox	Not Applied	(189,0,0)	Not Applied	Not Applied	<LOD	Not Applied	<LOD	<LOD
- *Bifenox Acid*	Not Applied	(190,0,1)	Not Applied	Not Applied	0.16	Not Applied	1.347	1.766
Ethofumesate – higher app. rate	Not Applied	Not Applied	(331,31,6)	Not Applied	Not Applied	0.06	1.207	5.309
Ethofumesate – lower app. rate	Not Applied	Not Applied	(331,31,6)	Not Applied	Not Applied	0.06	0.098	0.538
Fluazifop-P-butyl – higher app. rate (sugar beet)	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	n/a	n/a
- *Fluazifop-P*	(169,0,0)	Not Applied	(201,5,1)	<LOD	Not Applied	0.02	0.158	0.341
- *TFMP*	(225,71,16)	Not Applied	Not Measured	0.24	Not Applied	Not Measured	0.224	1.084
Fluazifop-P-butyl – lower app. rate (grass)	Not Measured	Not Applied	Not Measured	Not Measured	Not Applied	Not Measured	n/a	n/a
- *Fluazifop-P*	Not Measured	Not Applied	(55,0,0)	Not Measured	Not Applied	<LOD	<LOD	<LOD
- *TFMP*	(171,39,7)	Not Applied	(191,0,0)	0.074	Not Applied	<LOD	0.072	0.711
Metamitron	(296,24,2)	(201,0,0)	(307,20,4)	0.05	1.1	0.02	2.322	8.253
Metamitron-desamino	(306,12,4)	(201,0,0)	(283,36,12)	0.06	0.21	0.06	0.690	1.991
Pirimicarb	(588,3,0)	(140,0,0)	(189,2,0)	<LOD	<LOD	<LOD	0.043	6.285
- *Pirimicarb desmethyl-formamido*	(468,0,0)	(327,0,0)	(189,2,0)	<LOD	0.12	<LOD	<LOD	0.102
Tebuconazole	Not Applied	(153,3,2)	(167,1,0)	Not Applied	0.44	<LOD	<LOD	0.023
- *1,2,4-triazol*	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	0.052	0.263

Frame	PLAP scenarios						REGULATORY scenarios	
	Groundwater monitoring results[1] *(May 1999 – June 2013)*			***Cmean* at 1 m depth in drainage** *in 1st year after application[2]* [µg/L]			**PECgw EU approach** *80th percentile* [µg/L]	**PECgw DK approach** *Number of exceedances >0.1µg/L and 95th percentile* [µg/L]
Field	**Silstrup**	**Estrup**	**Faardrup**	**Silstrup**	**Estrup**	**Faardrup**	**Langvad**	**Langvad**
Terbuthylazine	Not Applied	(277,1,0)	(222,30,21)	Not Applied	0.48	0.67	0.204	1.269
-Desethyl-terbuthylazine	Not Applied	(283,7,0)	(207,36,30)	Not Applied	0.31	0.59	0.923	2.899
- Desisopropyl-atrazine	Not Applied	(253,25,0)	(214,59,0)	Not Applied	0.02	0.03	1.730	4.348
Dimethoate	(163,1,0)	Not Applied	(189,0,0)	0.02	Not Applied	<LOD	0.029	0.109
Epoxiconazole	(168,0,0)	(80,0,0)	Not Applied	<LOD	0.02	Not Applied	<LOD	0.012
Ioxynil	(30,0,0)	(147,0,0)	(273,1,0)	<LOD	0.04	<LOD	<LOD	<LOD
Propiconazole	(185,0,0)	Not Applied	(188,1,0)	<LOD	Not Applied	<LOD	<LOD	<LOD
Prosulfocarb	(220,1,0)	Not Applied	(183,0,0)	0.01	Not Applied	<LOD	<LOD	<LOD
Pyridate	Not Measured	Not Applied	Not Applied	Not Measured	Not Applied	Not Applied	<LOD	<LOD
- PHCP	(170,10,4)	Not Applied	Not Applied	0.06	Not Applied	Not Applied	0.349	2.906
Aminopyralid	Not Applied	(56,0,0)	Not Applied	Not Applied	<LOD	Not Applied	0.025	0.037
Bromoxynil	Not Applied	(147,0,0)	Not Applied	Not Applied	0.01	Not Applied	<LOD	<LOD
Chlormequat	(97,0,0)	(67,0,0)	Not Applied	<LOD	<LOD	Not Applied	0.020	0.811
Diflufenican	(67,0,1)	Not Applied	Not Applied	<LOD	Not Applied	Not Applied	<LOD	<LOD
- AE-B107317	(68,0,0)	Not Applied	Not Applied	<LOD	Not Applied	Not Applied	<LOD	<LOD
Metrafenone	Not Applied	(100,1,0)	Not Applied	Not Applied	0.02	Not Applied	<LOD	<LOD
Pendimethalin	(139,0,0)	Not Applied	(174,0,0)	0.04	Not Applied	<LOD	<LOD	<LOD
Picolinafen	Not Applied	(154,0,0)	Not Applied	Not Applied	0.03	Not Applied	<LOD	<LOD
- CL 153815	Not Applied	(154,0,0)	Not Applied	Not Applied	0.24	Not Applied	<LOD	0.110

[1] The number of exceedances given in the brackets, for example (800, 200, 20), are the number of analyses not detected, number of analyses >LOD and ≤0.1 µg/L and number of analyses > 0.1ug/L.
n/a: Not applicable.
Not Measured: Application of pesticide takes place at the field, but there are no measurements of the pesticide or its metabolites..
Not Applied: Pesticide is not applied at the field.
**Applications in June 2013 – therefore not covered by the monitoring period from May 1999 – June 2013.*

Legend for Groundwater Results:
Detections >0.1 µg/L (orange)
Detections ≤0.1 µg/L and >LOD (blue)
Measured concentrations ≤LOD (grey)

DK output evaluation:
2 or more failures in 20 years (application every year) / *4 or more failures in 60 years (application every 3rd year)* (red)
1 or less failures in 20 years (application every year) / *3 or less failures in 60 years (application 3rd year)* (blue)
No failures (grey)

EU output evaluation:
>0.1 µg/L (red)
≤ 0.1 µg/L > LOD (blue)
≤ LOD (grey)

4.0 General Discussion and Conclusions

The monitoring data reported in PLAP provides a unique opportunity to evaluate by comparison the leaching risk related to the use of pesticides on arable fields, when applied at the maximum allowable dose rate and according to good agricultural practice, with the simulated leaching risk assessed with three relevant regulatory model scenarios, Hamburg - PELMO, Karup - MACRO and Langvad - MACRO, when applying the EU and DK approaches to parameter selection and output evaluation.

With both the regulatory predictions of pesticides and metabolites in groundwater and the PLAP monitoring concentrations being applied in the Danish regulation of plant protection products it is important to describe the performance of the regulatory model scenarios in relation to predicting the leaching as detected in PLAP seen both from:

- An overall **R**egulatory view-point focusing on the effect of applying the EU or DK approach for parameter selection and output evaluation on the ability of the three regulatory model scenarios including a selected "Pesticide + Crop" combination to predict the leaching risk of the pesticide or its metabolites to groundwater as delineated by the conclusion of the Danish EPA based on groundwater detections in PLAP and not taking into account the specific crops.
- A **F**ield specific view-point focusing on the conceptual understanding behind the regulatory model scenarios and its ability to predict the leaching risk detected in PLAP to both 1 m depth (sandy fields: water collected via suction cups; clay till fields: water collected via tile drains) and groundwater (1.5 – 4.5 m) of a compound as a result of a specific "Pesticide + Crop" scenarios.

The objectives of this report were to evaluate whether:

- the more conservative Danish approach (with respect to parameter selection and output evaluation) is required to ensure that the regulatory model scenarios are protective of the leaching risk to groundwater as observed in PLAP for pesticides and their metabolites.
- the present regulatory model scenarios, required by Denmark, adequately assess the leaching risk of pesticides and their metabolites through both the sandy and clay till fields of PLAP.

27 pesticides and 19 of their associated metabolites included in PLAP were selected for this study (Table 2.3-1) representing 36 "Pesticide + Crop" scenarios being applied in both the **R**-comparison and **F**-comparison. The input parameters regarding the fate of the compound, crop and application for both the DK and EU approach were selected by the Danish EPA (Appendix A). Input parameters selected are based on unrefined Tier 1 assumptions and this study does not include a detailed evaluation on the effect of these input parameters on the leaching risk assessment by the three regulatory model scenarios.

In the **R-**comparison the results demonstrate that the DK approach to parameter selection and output evaluation is more conservative and for at least 9 compounds over-estimates the leaching to groundwater, as measured in PLAP, compared to the EU approach. In particular, the DK approach over-estimates the leaching risk to groundwater for compounds that are considered to "pass" based on PLAP groundwater monitoring results (detections ≤ 0.1 µg/L). The results show that applying the EU approach a maximum of 24/26 compounds (Hamburg – PELMO) and 23/25 compounds (Karup – MACRO and Langvad - MACRO) match the Danish EPA leaching risk conclusion "passed", compared to 17/26 compounds (Hamburg – PELMO), 16/25 compounds (Karup – MACRO) and 15/25 compounds (Langvad – MACRO) applying the DK approach.

However, for those compounds that are considered to be a serious leaching risk, based on the PLAP groundwater monitoring results, and are therefore considered to have “failed” the leaching assessment, the DK approach is shown to perform better than the EU approach, which under-estimates the leaching risk. The results show that applying the DK approach a maximum of 6/8 compounds (Langvad - MACRO) match the Danish EPA leaching risk conclusion “failed”, compared to 5/8 compounds (Langvad - MACRO) applying the EU approach.

When the leaching risk conclusion from the Danish EPA is “passed based on expert judgment” the results show that the EU approach performs better than the DK approach. The results show that applying the EU approach a maximum of 11/11 compounds (Hamburg – PELMO) match the Danish EPA leaching risk conclusion “passed based on expert judgment”, compared to 4/11 compounds (Hamburg – PELMO) applying the DK approach. However, the PLAP groundwater monitoring data from which this decision is derived shows that the compounds are found at concentrations >0.1 μg/L in groundwater in a few samples. As a consequence, the EU approach is predicting no risk, with compounds passing the simulated leaching assessment, but the PLAP groundwater monitoring results shows several detections >0.1 μg/L, which would lead to regulatory restrictions.

In the **F**-comparison the results highlight that the regulatory model scenarios Hamburg-PELMO and Karup-MACRO underestimate the leaching to groundwater, as seen in PLAP at the sandy fields. In order to circumvent this lack of ability, the application of the DK approach will, compared to the EU approach, provide the best protection of the aquifers below sandy fields against pesticide contamination. In the regulatory model scenario Langvad – MACRO when applying the DK approach the leaching risk to groundwater of more or less all the selected “Pesticide + Crop” combinations at clay till fields was predicted. In the EU approach the PECgw values from Langvad – MACRO underestimated the leaching risk to groundwater. These results show the importance of having a more conservative DK approach in the protection of the quality of the groundwater until more up to date leaching risk assessment models are provided, which incorporate the newest process-understanding for different soil types and climate being update on at least a 10 years basis (Henriksen *et al*., 2013).

The overall conclusion of both the **R**-comparison (not accounting for specific crops) and the **F**-comparison (accounting for specific crops) is that the DK-approach compared to the EU-approach will for both the sandy and clay till fields included in PLAP provide:

- a better protection of the quality of the Danish groundwater against the compounds with a high leaching potential.
- an over-conservative assessment of the compounds having a low leaching risk.

4.1 Recommendations for Future Work

The report has produced PECgw results based on unrefined Tier 1 input estimates of compound degradation and sorption characteristics. It is suggested that further work could be performed utilising refined higher tier approaches, such as field dissipation and aged sorption. Further work could also be considered to investigate the effect of recent changes in the regulation for the EU approach in terms of calculating K_{FOC} based on a geometric mean as opposed to an arithmetic mean.

The model-estimates from the regulatory model scenarios are based on soil parameters, crop data, and climate data, which do not resemble the PLAP field settings. It is clear that process-understanding to account for the long-term preferential leaching of metabolites from the sandy fields and preferential transport of both pesticides and metabolites from the clay till fields need to be incorporated in future regulatory model scenarios. At all five PLAP field the dynamic water balance for the variably-saturated zone has already been estimated using MACRO version 5.2 as presented in the PLAP reports (Brüsch *et al.*, 2015). These five model setups have been calibrated for the period 1999-2004 and "validate" for the period 2004-2013. Further work could consider using the "calibrated and validated" PLAP models to estimate the leaching related to application of pesticides at the PLAP fields using field-specific weather data, soil settings, crop growth stages and fate data.

4.2 Conclusions

In conclusion, the results demonstrate that when applying the three current regulatory model scenarios the DK approach to parameter selection and output evaluation is more conservative and overestimates the risk of leaching, as measured in groundwater in PLAP, in comparison with the EU approach. This is particularly evident for compounds where there is no risk of leaching according to PLAP. On the other hand, for the pesticides that are shown to be leachers the DK approach is more comparable than the EU approach in determining risk of leaching to groundwater, as seen in PLAP.

5.0 References

Barlebo, H.C., Rosenbom, A.E. & Kjær, J. (2007) *Evaluation of pesticide scenarios for the registration procedure*. Environmental Project No 1178, 142p.

Brüsch, W., Rosenbom, A.E., Juhler, R.K., Gudmundsson, L., Nielsen, C.B., Plauborg, F. & Olsem, P. (2013) *The Danish Pesticide Leaching Assessment Programme: monitoring results 1999 – June 2013.* Geological Survey of Denmark and Greenland Report, 146p.

Brüsch, W., Rosenbom, A.E., Badawi, N., Gudmundsson, L., von Platten-Hallermund, F., Nielsen, C.B., Plauborg, F., Laier, .T. & Olsem, P. (2013) *The Danish Pesticide Leaching Assessment Programme: monitoring results 1999 – June 2012.* Geological Survey of Denmark and Greenland Report, 157p.

Danish Evaluation Framework (2014) *Framework for the Assessment of Plant Protection Products*. Department of Pesticides and Gene Technology and Danish Environmental Protection Agency, version 1.3, 73p.

European Food Safety Authority, 2014. EFSA Guidance Document for evaluating laboratory and field dissipation studies to obtain DegT50 values of active substances of plant protection products and transformation products of these active substances in soil. *EFSA Journal* 2014, 12 (5), 3662p.

FERA (2012) *Guidance on how aged sorption studies for pesticides should be conducted, analysed and used in regulatory assessments*. The Food and Environment Research Agency, Sand Hutton, York, UK.

FOCUS (2000). *FOCUS groundwater scenarios in the EU plant protection product review process*. Report of the FOCUS Groundwater Scenarios Workgroup, EC Document Reference Sanco/321/2000 rev.2.

FOCUS (2009). *Assessing the potential for movement of active substances and their metabolites to ground water in the EU.* Report of the FOCUS Ground Water Work Group, EC Document Reference Sanco/13144/2010 version 1, 604pp.

Guidance document on the assessment of the relevance of metabolites in groundwater of substances regulated under council directive 91/414/EEC (SANCO/221/2000 rev.10 (final) dated 25 February 2003).

Henriksen, H.J., Rosenbom, A.E., Keur, P. van der, Olesen, J.E., Jørgensen, L.J., Kjær, J., Sonnenborg, T, Christensen, O.B. (2013). Prediction of climatic impacts on pesticide leaching to the aquatic environments. Evaluation of direct and indirect (crop rotations, crop management, and pesticide use) climate change effects of pesticide leaching in a regulatory perspective for two Danish cases. Danish EPA, Pesticide research no. 143. ISBN no. 978-87-92903-23-5.

Jacobsen, O.S. & Jonge, H.D. (2013) *Potato Cropping and Pesticide Leaching Risk.* In: Brown, C. (Ed.), Pesticide Behaviour in Soils (Water and Air, York).

Kjær, J., Ernsten, V., Jacobsen, O.H., Hansen, N., Wollesen de Jonge, L. & Olsen, P. (2011) Transport modes and pathways of the strongly sorbing pesticides glyphosate and pendimethalin through structured drained soils. *Chemosphere*, **84**, 471-479.

Klein, M. (2012) *User Manual PELMO (Pesticide Leaching Model) version 4.01.* Fraunhofer Institute for Molecular Biology and applied Ecology, Schmallenberg, Germany, pp.139.

Larsbo, M. & Jarvis, N. (2003) *MACRO 5.0 A model of water flow and solute transport in macroporus soils. Technical description.* Emergo 2003:6 Swedish University of Agricultural Science, Department of Soil Science, Uppsala, Sweden.

Lindhardt, B., Abildtrup, C., Vosgerau, H., Olsen, P., Trop, S., Iversen, B.V., Jørgensen, J.O., Plauborg, F., Rasmussen, P. & Gravesen, P. (2001). *The Danish Pesticide Leaching Programme: site characterization and monitoring design*. Geological Survey of Denmark and Greenland, Danish Institute of Agricultural Sciences and National Environmental Research Institute Report, 298p.

Mermoud, D. N & Meiwirth, K. (2004) Herbicide transport and vulnerability of a shallow groundwater: localy and regional scale study. In *2nd International Workshop on Integrated Soil and Water Protection: Risks from Diffuse Pollution (SOWA)*, 73-78.

Northern Zone Guidance (2015) *Guidance document on work sharing in the Northern Zone in the authorization of plant protection products.* Available from: https://www.kemi.se/Documents/Bekampningsmedel/Vaxtskyddsmedel/Northern-Zone-work-sharing-guidance-02-04-2014-Final-rev-3.pdf. Accessed May 2015.

Rosenbom, A.E., Olsen, P., Plauborg, F., Grant, R., Juhler, R.K., Brüsch, W., Kjær, J. (2015). Pesticide leaching through sandy and loamy fields – Long-term lessons learnt from the Danish Pesticide Leaching Assessment Programme. *Environmental Pollution* 201, 75-90.

Stenemo, F. & Alvin, A.L. (2015) *Comparison of Northern Zone Groundwater Models*. Uppsala, Geosigma, 44p.

University of Hertfordshire (2013) The Pesticide Properties DataBase (PPDB) developed by the Agriculture & Environment Research Unit (AERU), University of Hertfordshire, 2006-2013. Available from: http://sitem.herts.ac.uk/aeru/ppdb/en/

http://www.slu.se/en/collaborative-centres-and-projects/centre-for-chemical-pesticides-ckb1/areas-of-operation-within-ckb/models/macro-52/. Accessed 01 August 2015.

Appendix A
Pesticide and metabolite input tables

The PELMO model default values are given in Table A1-1, and the MACRO model default parameters in Table A1-2. These values are used in the modelling, unless otherwise specified.

A1 Default Parameters

Table A1-1: FOCUS PELMO 5.5.3 default parameters

Parameter	Value	Comment
Application depth	0 cm	Model default
Diffusion co-efficient air	0.05 cm^2/s	Model default
Thickness of boundary layer	0.1 cm	Model default
Soil photolysis rate	0 d^{-1}	Model default
Reference radiation	500 W/m^2	Model default
Limit for Freundlich equation	$1*E^{-20}$ µg/L	Model default
Sorption annual increase	0%	Model default
Equilibrium constant for DOC	0 L/kg	Model default
Increase of sorption when soil is air-dried	1	Model default
pKa	20	No pH dependent sorption
Kinetic sorption	Not applied	--
Depth dependent sorption/transformation data	Std. deg. values (Tier I)	Model default
Individual rate correction in soil:		
temperature	20ºC	-
Q_{10}	2.58	EFSA recommended value
relative moisture	100%	-
moisture exponent	0.7	Model default

Table A1-2: FOCUS MACRO 4.4.2 default parameters

Parameter	Value	Comment
Molar enthalpy of vaporisation	95000 J/mol	Model default
Molar enthalpy of dissolution	27000 J/mol	Model default
Diffusion co-efficient water	4.3E-5 m^2/d	Model default
Diffusion co-efficient air	0.43 m^2/d	Model default
Ref.concentration in the liquid phase (g/m^3)	1	Model default
Wash-off factor from crop in MACRO (1/mm)	0.05	Model default
Effect of temperature MACRO Exponent (1/K)	0.0948	Model default
MACRO exponent for the effect of water content	0.70	Model default
Half-life measured at PF	2	Model default

A2 Aminopyralid

Table A2-1: FOCUSPELMO 5.5.3 input parameters for ***aminopyralid***

Parameter	Value	Comment
Common endpoints – LoEP 2013		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A20-3	Every year
Molecular weight	207 g/mol	Aminopyralid
Plant uptake factor	0	Aminopyralid
Vapour pressure (25°C)	2.59×10^{-8} Pa	Aminopyralid
Aqueous solubility (20°C)	205000 mg/L (pH 7)	Aminopyralid[1]
EU endpoints – LoEP 2013		
K_{FOC}	5.15 L/kg	Aminopyralid
Freundlich exponent (1/n)	0.888	Aminopyralid
DT_{50} soil (20°C/pF2)	14.1 d	Aminopyralid (field)
Danish endpoints – Calculated from LoEP 2013		
K_{FOC}	3.91 L/kg	Aminopyralid
Freundlich exponent (1/n)	0.920	Aminopyralid
DT_{50} soil (20°C/pF2)	16.8 d	Aminopyralid

[1.] The aqueous solubility was measured at 20°C, however, in PELMO vapour pressure and aqueous solubility are required to be put in the same temperature, therefore the aqueous solubility at 20°C is assumed to be the aqueous solubility at 25°C.

Table A2-2: FOCUSMACRO 4.4.2 input parameters for ***aminopyralid***

Parameter	Value	Comment
Common endpoints – LoEP 2013		
Application rate/dates	See Table A20-3	Every year
Molecular weight	207 g/mol	Aminopyralid
Vapour pressure (25°C)	2.59×10^{-8} Pa	Aminopyralid
Aqueous solubility (20°C)	205000 mg/L (pH 7)	Aminopyralid
Plant uptake factor	0	Aminopyralid
EU endpoints – LoEP 2013		
K_{FOC}	5.15 L/kg	Aminopyralid
Freundlich exponent (1/n)	0.888	Aminopyralid
DT_{50} soil (20°C/pF2)	14.1 d	Aminopyralid (field)
Danish endpoints – Calculated from LoEP 2013		
K_{FOC}	3.91 L/kg	Aminopyralid
Freundlich exponent (1/n)	0.920	Aminopyralid
DT_{50} soil (20°C/pF2)	16.8 d	Aminopyralid

Table A2-3: Application parameters for PECgw for ***aminopyralid***

Crop	Application rate	Growth stage[2]	Application date	EU endpoints		Danish endpoints	
				Interception rate[3]	Effective rate for soil loading	Deposition[4]	Effective rate for soil loading
Spring barley[1]	7.5 g/ha	21	01/05	20%	6 g/ha	55%	4.125 g/ha
	7.5 g/ha	26	10/05	20%	6 g/ha	49%[5]	3.675 g/ha
	7.5 g/ha	32	20/05	80%	1.5 g/ha	43%	3.225 g/ha

1. Surrogate crop spring cereals.
2. GAP: BBCH 21 – 32. Beginning of May to middle of May.
3. The values are taken from the new guidance, EFSA (2014).
4. The values are taken from the Danish Evaluation Framework (2014).
5. Average of deposition for BBCH 20 – 24 and 28 – 32.

A3 Azoxystrobin and CyPM

Table A3-1: FOCUSPELMO 5.5.3 input parameters for ***azoxystrobin*** and ***CyPM***

Parameter	Value	Comment
Common endpoints – LoEP after evaluation of confirmatory data, 2014		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A1-5	Every year
Molecular weight	403.4 g/mol 389.4 g/mol	Azoxystrobin CyPM
Plant uptake factor	0.5 0	Azoxystrobin CyPM - Worst case
Vapour pressure (20°C)	0 Pa	Loss due to volatilisation was not considered → worst case (azoxystrobin and CyPM)
Aqueous solubility	6.0 mg/L at 20°C 57 mg/L at 25°C	Azoxystrobin CyPM
Formation fraction	0.126 0.874 1	Azoxystrobin to CO_2 bound residues Azoxystrobin to CyPM CyPM to CO_2 bound residues
EU endpoints – LoEP after evaluation of confirmatory data, 2014		
K_{FOC}	423 L/kg 228.4 L/kg	Azoxystrobin CyPM[1]
Freundlich exponent (1/n)	0.86 0.78	Azoxystrobin CyPM[1]
DT_{50} soil (20°C/pF2)	78 d 98.6	Azoxystrobin CyPM[1]
Rate Constants:		
k total (d^{-1})	0.00889	Azoxystrobin: $\ln(2)/DT_{50}$
azoxystrobin to CyPM (d^{-1})	0.00777	Based on FF of 0.874
azoxystrobin to CO_2/NER (d^{-1})	0.00112	Based on a FF of (1-0.874)
k total (d^{-1})	0.00703	CyPM: $\ln(2)/DT_{50}$
CyPM to CO_2/NER (d^{-1})	0.00703	Based on FF of 1
Danish endpoints – Calculated from updated LoEP after evaluation of confirmatory data, 2014		
K_{FOC}	235 L/kg 100.4 L/kg	Azoxystrobin CyPM
Freundlich exponent (1/n)	0.90 0.867	Azoxystrobin CyPM
DT_{50} soil (20°C/pF2)	100.48d 103.6	Azoxystrobin CyPM
Rate Constants		
k total (d^{-1})	0.00690	Azoxystrobin: $\ln(2)/DT_{50}$
azoxystrobin to CyPM (d^{-1})	0.00603	Based on FF of 0.874
azoxystrobin to CO_2/NER (d^{-1})	0.00087	Based on a FF of (1-0.874)
k total (d^{-1})	0.00669	CyPM: $\ln(2)/DT_{50}$
CyPM to CO_2/NER (d^{-1})	0.00669	Based on FF of 1

[1.] *Values are for acidic soils, considered to be representative of Danish conditions, Danish Evaluation Framework (2014).*

Table A3-2: FOCUSMACRO 4.4.2 input parameters for ***azoxystrobin*** and ***CyPM***

Parameter	Value	Comment
Common endpoints – LoEP after evaluation of confirmatory data, 2014		
Application rate/dates	See Table A1-5	Every year
Molecular weight	403.4 g/mol 389.4 g/mol	Azoxystrobin CyPM
Vapour pressure (20°C)	0 Pa	Loss due to volatilisation was not considered → worst case (azoxystrobin and CyPM)
Aqueous solubility	6.0 mg/L at 20°C 57 mg/L at 25°C	Azoxystrobin CyPM
Plant uptake factor	0.5 0	Azoxystrobin CyPM - Worst case
Formation fraction	0.874	Azoxystrobin to CyPM[1]
EU endpoints – LoEP after evaluation of confirmatory data, 2014		
K_{FOC}	423 L/kg 228.4 L/kg	Azoxystrobin CyPM[2]
Freundlich exponent (1/n)	0.86 0.78	Azoxystrobin CyPM[2]
DT_{50} soil (20°C/pF2)	78 d 98.6	Azoxystrobin CyPM[2]
Danish endpoints – Calculated from updated LoEP after evaluation of confirmatory data, 2014		
K_{FOC}	235 L/kg 100.4 L/kg	Azoxystrobin CyPM
Freundlich exponent (1/n)	0.90 0.867	Azoxystrobin CyPM
DT_{50} soil (20°C/pF2)	100.48 d 103.6 d	Azoxystrobin CyPM

1. Equivalent to 0.844 on a mass basis for entry into MACRO.

Table A3-3: Application parameters for PECgw – ***azoxystrobin***

Crop	Application rate	Growth stage	Application date	EU endpoints		Danish endpoints	
				Interception rate[1]	Effective rate for soil loading	Deposition[2]	Effective rate for soil loading
Spring barley[3]	250 g/ha 250 g/ha 250 g/ha	30-59 30-59 30-59	05/06 20/06 10/07	80 % 80% 90%	50 g/ha 50 g/ha 25 g/ha	43% 27 % 18 %	107.5 g/ha 67.5 g/ha 45 g/ha

1. The values are taken from the new guidance, EFSA (2014).
2. The values are taken from the Danish Evaluation Framework (2014).
3. FOCUS surrogate crop spring cereals.

A4 Bentazone

Table A4-1: FOCUSPELMO 5.5.3 input parameters for ***bentazone***

Parameter	Value	Comment
Common endpoints – EFSA Conclusions, 2015		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A2-3	Every year
Molecular weight	240.3 g/mol	Bentazone
Plant uptake factor	0.5	Bentazone
Vapour pressure (20°C)	$5x10^{-6}$ Pa	Bentazone
Aqueous solubility (20°C)	570 mg/L	Bentazone
EU endpoints – LoEP, 2015		
K_{FOC}	30.2 L/kg	Bentazone
Freundlich exponent (1/n)	0.97	Bentazone
DT_{50} soil (20°C/pF2)	7.5 d	Bentazone
Danish endpoints – Calculated from the data in the LoEP, 2015		
K_{FOC}	13.58 L/kg	Bentazone
Freundlich exponent (1/n)	1.00	Bentazone
DT_{50} soil (20°C/pF2)	12.2 d	Bentazone

Table A4-2-: FOCUSMACRO 4.4.2 input parameters for ***bentazone***

Parameter	Value	Comment
Common endpoints – EFSA Conclusions, 2015		
Application rate/dates	See Table A2-3	Every year
Molecular weight	240.3 g/mol	Bentazone
Vapour pressure (20°C)	$5x10^{-6}$ Pa	Bentazone
Aqueous solubility (20°C)	570 mg/L	Bentazone
Plant uptake factor	0.5	Bentazone
EU endpoints – LoEP, 2015		
K_{FOC}	30.2 L/kg	Bentazone
Freundlich exponent (1/n)	0.97	Bentazone
DT_{50} soil (20°C/pF2)	7.5 d	Bentazone
Danish endpoints– Calculated from the data in the LoEP, 2015		
K_{FOC}	13.58 L/kg	Bentazone
Freundlich exponent (1/n)	1.00	Bentazone
DT_{50} soil (20°C/pF2)	12.2 d	Bentazone

Table A4-3: Application parameters for PECgw – ***bentazone***

Crop	Application rate	Growth stage	Application date	EU endpoints		Danish endpoints	
				Interception rate[1]	Effective rate for soil loading	Deposition[2]	Effective rate for soil loading
Maize[3]	480 g/ha	14	20/05	25%	360 g/ha	75 %	360 g/ha
	480 g/ha	14	30/05	25%	360 g/ha	75 %	360 g/ha
	480 g/ha	14	05/06	25%	360 g/ha	75 %	360 g/ha
Spring barley[4]	600 g/ha	12-25	01/05	0 %	600 g/ha	75%	450 g/ha
	600 g/ha	12-25	15/05	20 %	480 g/ha	55%	330 g/ha
	600 g/ha	12-25	30/05	20 %	480 g/ha	55%	330 g/ha
Peas[5]	480 g/ha	10-19	01/05	35%	312 g/ha	95%	456 g/ha
	480 g/ha	10-19	15/05	35%	312 g/ha	50%	240 g/ha
	480 g/ha	10-19	30/05	35%	312 g/ha	24%	115.2 g/ha
White clover[6,7]	1440 g/ha	-	01/05	90%	144 g/ha	10%	144 g/ha
	1440 g/ha	-	15/05	90%	144 g/ha	10%	144 g/ha
	1440 g/ha	-	30/05	90%	144 g/ha	10%	144 g/ha

1. The values are taken from the new guidance, EFSA (2014).
2. The values are taken from the Danish EPA Guidance (2014).
3. Deposition of product on the soil beneath the crops is from FOCUS Groundwater 2002; this is the same as the new EFSA groundwater crop interception values.
4. FOCUS surrogate crop spring cereals.
5. FOCUS surrogate crop in MACRO legumes.
6. FOCUS surrogate crop grass.
7. Established grass, therefore an interception of 90% and deposition of 10% assumed.

A5 Bifenox and bifenox acid

Table A5-1: FOCUSPELMO 5.5.3 input parameters for ***bifenox*** and ***bifenox acid***

Parameter	Value	Comment
Common endpoints – LoEP, 2007 and assessment of Fox 480 SC by DEPA, 2012		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A3-3	Every year
Molecular weight	342.14 g/mol 328.1 g/mol	Bifenox Bifenox acid
Plant uptake factor	0	Bifenox and bifenox acid
Vapour pressure (20°C)	4.74×10^{-8} Pa 4.74×10^{-8} Pa	Bifenox Bifenox acid[1]
Aqueous solubility (20°C)	0.1mg/L 1000 mg/L	Bifenox Bifenox acid
EU endpoints – LoEP, 2007		
K_{FOC}	7143 L/kg 143.3 L/kg	Bifenox Bifenox acid
Freundlich exponent (1/n)	0.96 0.84	Bifenox Bifenox acid
DT_{50} soil (20°C/pF2)	8.3 d 56.3 d	Bifenox Bifenox acid
Formation fraction	1 1	Bifenox to Bifenox acid Bifenox acid to CO_2 bound residues
Rate Constants:		
k total (d^{-1})	0.0835	Bifenox: ln(2)/DT_{50}
Bifenox to Bifenox acid (d^{-1})	0.0835	Based on FF of 1
k total (d^{-1})	0.0123	Bifenox acid: ln(2)/ DT_{50}
Bifenox acid to CO_2/NER (d^{-1})	0.0123	Based on FF of 1
Danish endpoints – from the assessment of Fox 480 SC by DEPA, 2012		
K_{FOC}	4415 L/kg 136 L/kg	Bifenox[2] Bifenox acid
Freundlich exponent (1/n)	1.1 0.87	Bifenox Bifenox acid
DT_{50} soil (20°C/pF2)	12.8 d 66.8 d	Bifenox Bifenox acid
Formation fraction	0.8 1	Bifenox to Bifenox acid[3] Bifenox acid to CO_2 bound residues
Rate Constants		
k total (d^{-1})	0.0542	Bifenox: ln(2)/ DT_{50}
Bifenox to Bifenox acid (d^{-1})	0.04336	Based on FF of 0.8
Bifenox to CO_2/NER (d^{-1})	0.01084	Based on a FF of (1- 0.8)
k total (d^{-1})	0.0104	Bifenox acid: ln(2)/ DT_{50}
Bifenox acid to CO_2/NER (d^{-1})	0.0104	Based on FF of 1

1. No vapour pressure value available, therefore assumed to be as parent.
2. Note, in the LoE (2007) the units are incorrectly stated as mL/mg.
3. Formation based on maximum percent formed.

Table A5- 2: FOCUSMACRO 4.4.2 input parameters for ***bifenox*** and ***bifenox acid***

Parameter	Value	Comment
Common endpoints - LoEP, 2007 and assessment of Fox 480 SC by DEPA, 2012		
Application rate/dates	See Table A3-3	Every year
Molecular weight	342.14 g/mol 328.1 g/mol	Bifenox Bifenox acid
Vapour pressure (20°C)	4.74×10^{-8} Pa 4.74×10^{-8} Pa	Bifenox Bifenox acid[1]
Aqueous solubility (20°C)	0.1 mg/L 1000 mg/L	Bifenox Bifenox acid
Plant uptake factor	0	Bifenox and bifenox acid
EU endpoints – LoEP, 2007		
K_{FOC}	7143 L/kg 143.3 L/kg	Bifenox[2] Bifenox acid
Freundlich exponent (1/n)	0.96 0.84	Bifenox Bifenox acid
DT_{50} soil (20°C/pF2)	8.3 d 56.3 d	Bifenox Bifenox acid
Formation fraction	1	Bifenox to Bifenox acid[3]
Danish endpoints – from the assessment of Fox 480 SC by DEPA, 2012		
K_{FOC}	4415 L/kg 136 L/kg	Bifenox Bifenox acid
Freundlich exponent (1/n)	1.1 0.87	Bifenox Bifenox acid
DT_{50} soil (20°C/pF2)	12.8 d 66.8 d	Bifenox Bifenox acid
Formation fraction	0.8	Bifenox to Bifenox acid[4,5]

1. No vapour pressure value available, therefore assumed to be as parent.
2. Note, in the LoE (2007) the units are incorrectly stated as mL/mg.
3. Equivalent to 0.959 on a mass basis for entry into MACRO.
4. Formation based on maximum percent formed.
5. Equivalent to 0.767 on a mass basis for entry into MACRO.

Table A5-3: Application parameters for PECgw – ***bifenox***

Crop	Application rate	Growth stage	Application date	EU endpoints		Danish endpoints	
				Interception rate[1]	Effective rate for soil loading	Deposition[2]	Effective rate for soil loading
Spring barley[3]	576 g/ha 576 g/ha 576 g/ha	21-22 21-22 21-22	01/05 15/05 30/05	0 % 20 % 20 %	576 g/ha 460.8 g/ha 460.8 g/ha	75% 55% 55%	432 g/ha 316.8 g/ha 316.8 g/ha

1. The values are taken from the new guidance, EFSA (2014).
2. The values are taken from the Danish EPA Guidance (2014).
3. FOCUS surrogate crop spring cereal.

A6 Bromoxynil

Table A6-1: FOCUSPELMO 5.5.3 input parameters for ***bromoxynil***

Parameter	Value	Comment
Common endpoints – Review report 2004		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A21-3	Every year
Molecular weight	276.9 g/mol	Bromoxynil
Plant uptake factor	0	Bromoxynil
Vapour pressure (25°C)	1.7×10^{-4} Pa	Bromoxynil
Aqueous solubility (25°C)	90 mg/L	Bromoxynil
EU endpoints – Review report 2004 and Danish evaluation of bromoxynil 2009		
K_{FOC}	192 L/kg	Bromoxynil
Freundlich exponent (1/n)	0.805	Bromoxynil
DT_{50} soil (20°C/pF2)	0.7 d	Bromoxynil[1]
Danish endpoints – Danish evaluation of bromoxynil 2009		
K_{FOC}	159 L/kg	Bromoxynil
Freundlich exponent (1/n)	0.856	Bromoxynil
DT_{50} soil (20°C/pF2)	0.8 d	Bromoxynil

[1.] *Calculated from the four available DT_{50} values from the Danish evaluation of bromoxynil 2009.*

Table A6-2: FOCUSMACRO 4.4.2 input parameters for ***bromoxynil***

Parameter	Value	Comment
Common endpoints – Review report 2004		
Application rate/dates	See Table A21-3	Every year
Molecular weight	276.9 g/mol	Bromoxynil
Vapour pressure (25°C)	1.7×10^{-4} Pa	Bromoxynil
Aqueous solubility (25°C)	90 mg/L	Bromoxynil
Plant uptake factor	0	Bromoxynil
EU endpoints – Review report 2004 and Danish evaluation of bromoxynil 2009		
K_{FOC}	192 L/kg	Bromoxynil
Freundlich exponent (1/n)	0.805	Bromoxynil
DT_{50} soil (20°C/pF2)	0.7 d	Bromoxynil[1]
Danish endpoints – Danish evaluation of bromoxynil 2009		
K_{FOC}	159 L/kg	Bromoxynil
Freundlich exponent (1/n)	0.856	Bromoxynil
DT_{50} soil (20°C/pF2)	0.8 d	Bromoxynil

[1.] *Calculated from the four available DT_{50} values from the Danish evaluation of bromoxynil 2009.*

Table A6-3: Application parameters for PECgw for ***bromoxynil***

Crop	Application rate	Growth stage[2]	Application date	EU endpoints		Danish endpoints	
				Interception rate[3]	Effective rate for soil loading	Deposition[4,5]	Effective rate for soil loading
Winter wheat[1]	200 g/ha	12	20/09	0%	200 g/ha	77%	154 g/ha
	200 g/ha	15	15/10	0%	200 g/ha	77%	154 g/ha
	200 g/ha	19	30/10	0%	200 g/ha	77%	154 g/ha

1. Surrogate crop winter cereals.
2. GAP: BBCH 12 – 31, but in PLAP only the autumn use has been tested, so only BBCH 12 – 19 included.
3. The values are taken from the new guidance, EFSA (2014).
4. The values are taken from the Danish Evaluation Framework (2014).
5. Assumed same deposition as there is no deposition given for BBCH 13 – 23.

A7 Chlormequat

Table A7-1: FOCUSPELMO 5.5.3 input parameters for ***chlormequat***

Parameter	Value	Comment
Common endpoints – Northern Zone evaluation 2015		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A22-3	Every year
Molecular weight	158.1 g/mol	Chlormequat
Plant uptake factor	0	Chlormequat
Vapour pressure (20°C)	1×10^{-7} Pa	Chlormequat
Aqueous solubility (20°C)	500×10^{3} mg/L	Chlormequat
EU endpoints – Northern Zone evaluation 2015		
K_{FOC}	152 L/kg	Chlormequat
Freundlich exponent (1/n)	0.83	Chlormequat
DT_{50} soil (20°C/pF2)	19.5 d	Chlormequat
Danish endpoints – Northern Zone evaluation 2015		
K_{FOC}	75.3 L/kg	Chlormequat
Freundlich exponent (1/n)	0.94	Chlormequat
DT_{50} soil (20°C/pF2)	28.9 d	Chlormequat

Table A7-2: FOCUSMACRO 4.4.2 input parameters for ***chlormequat***

Parameter	Value	Comment
Common endpoints – Northern Zone evaluation 2015		
Application rate/dates	See Table A22-3	Every year
Molecular weight	158.1 g/mol	Chlormequat
Vapour pressure (20 °C)	1×10^{-7} Pa	Chlormequat
Aqueous solubility (20 °C)	500×10^{3} mg/L	Chlormequat
Plant uptake factor	0	Chlormequat
EU endpoints – Northern Zone evaluation 2015		
K_{FOC}	152 L/kg	Chlormequat
Freundlich exponent (1/n)	0.83	Chlormequat
DT_{50} soil (20°C/pF2)	19.5 d	Chlormequat
Danish endpoints – Northern Zone evaluation 2015		
K_{FOC}	75.3 L/kg	Chlormequat
Freundlich exponent (1/n)	0.94	Chlormequat
DT_{50} soil (20°C/pF2)	28.9 d	Chlormequat

Table A7-3: Application parameters for PECgw for ***chlormequat***

Crop	Application rate[2]	Growth stage[3]	Application date	EU endpoints: Interception rate[4]	EU endpoints: Effective rate for soil loading	Danish endpoints: Deposition[5]	Danish endpoints: Effective rate for soil loading
Winter wheat[1]	698.4 g/ha	25	20/04	20%	558.72 g/ha	60%	419.04 g/ha
	698.4 g/ha	28	15/05	20%	558.72 g/ha	60%	419.04 g/ha
	698.4 g/ha	32	30/05	80%	139.68 g/ha	42%	293.328 g/ha

1. Surrogate crop winter cereals.
2. Current GAP: 0.75-1.125 kg a.s./ha.
3. GAP: BBCH 25 -32, May – June but use in PLAP is in April.
4. The values are taken from the new guidance, EFSA (2014).
5. The values are taken from the Danish Evaluation Framework (2014).

A8 Diflufenican and AE-B107137

Table A8-1: FOCUSPELMO 5.5.3 input parameters for ***diflufenican*** **and** ***AE-B107137***

Parameter	Value	Comment
Common endpoints –LoEP, 2007		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A23-3	Every year
Molecular weight	394.29 g/mol 283.20 g/mol	Diflufenican AE-B107137
Plant uptake factor	0	Diflufenican and AE – B107137
Vapour pressure (25°C)	4.25×10^{-6} Pa 4.25×10^{-6} Pa	Diflufenican AE-B107137[1]
Aqueous solubility (20°C)	0.05 mg/L 410 mg/L	Diflufenican[2] AE-B107137
Formation fraction	0.67 0.33 1	Diflufenican to CO_2 bound residues Diflufenican to AE-B107137 AE-B107137 to CO_2 bound residues
Individual rate correction in soil:		
temperature	20ºC	-
Q_{10}	2.2	LoE, 2007
relative moisture	100%	-
moisture exponent	0.7	Model default
EU endpoints – LoEP, 2007		
K_{FOC}	3417 L/kg 13 L/kg	Diflufenican - New DAR AE-B107137 – LoEP, 2007
Freundlich exponent (1/n)	0.917 0.73	Diflufenican - New DAR AE-B107137 - LoEP, 2007
DT_{50} soil (20°C/pF2)	141.8 d 10.6 d	Diflufenican - LoEP, 2007 (Q10 2.2) AE-B107137 - LoEP, 2007
Rate Constants:		
k total (d^{-1})	0.00489	Diflufenican: ln(2)/ DT_{50}
Diflufenican to AE-B107137 (d^{-1})	0.00161	Based on FF of 0.33
Diflufenican to CO_2/NER (d^{-1})	0.00328	Based on a FF of (1- 0.33)
k total (d^{-1})	0.06549	AE-B107137: ln(2)/ DT_{50}
AE-B107137 to CO_2/NER (d^{-1})	0.06549	Based on FF of 1
Danish endpoints – calculated from LoEP 2007		
K_{FOC}	2091.2L/kg 7.6 L/kg	Diflufenican AE-B107137
Freundlich exponent (1/n)	0.935 0.828	Diflufenican AE-B10713
DT_{50} soil (20°C/pF2)	184.94 d 13.9 d	Diflufenican AE-B107137
Rate Constants		
k total (d^{-1})	0.00375	Diflufenican: ln(2)/ DT_{50}
Diflufenican to AE-B107137 (d^{-1})	0.00124	Based on FF of 0.33
Diflufenican to CO_2/NER (d^{-1})	0.00251	Based on a FF of (1- 0.33)
k total (d^{-1})	0.04987	AE-B107137: ln(2)/ DT_{50}
AE-B107137 to CO_2/NER (d^{-1})	0.04987	Based on FF of 1

1. No vapour pressure value available, therefore assumed to be as parent.
2. The aqueous solubility was measured at 20°C, however, in PELMO vapour pressure and aqueous solubility are required to be put in the same temperature, therefore the aqueous solubility at 20°C is assumed to be the aqueous solubility at 25°C.

Table A8-2: FOCUSMACRO 4.4.2 input parameters for ***diflufenican*** and ***AE-B107137***

Parameter	Value	Comment
Common endpoints – LoEP, 2007		
Application rate/dates	See Table A23-3	Every year
Molecular weight	394.29 g/mol 283.20 g/mol	Diflufenican – Danish EPA AE-B107137 – Danish EPA
Vapour pressure (25°C)	4.25×10^{-6} Pa 4.25×10^{-6} Pa	Diflufenican – Danish EPA AE-B107137 – Danish EPA[1]
Aqueous solubility (20°C)	0.05 mg/L 410 mg/L	Diflufenican – Danish EPA AE-B107137 – Danish EPA
Plant uptake factor	0	Diflufenican and AE – B107137 - Danish EPA
Effect of temperature MACRO Exponent (1/K)	0.0790	Model default
Formation fraction	0.33	Diflufenican to AE-B107137[2] Danish EPA
EU endpoints – LoEP, 2007		
K_{FOC}	3417 L/kg 13 L/kg	Diflufenican - New DAR AE-B107137 – LoE, 2007
Freundlich exponent (1/n)	0.917 0.73	Diflufenican - New DAR AE-B107137 - LoE, 2007
DT_{50} soil (20°C/pF2)	141.8 d 10.6 d	Diflufenican - LoE, 2007 (Q10 2.2) AE-B107137 - LoE, 2007
Danish endpoints – calculated from LoEP 2007		
K_{FOC}	2091.2 L/kg 7.6 L/kg	Diflufenican AE-B107137
Freundlich exponent (1/n)	0.935 0.828	Diflufenican AE-B10713
DT_{50} soil (20°C/pF2)	184.94 d 13.9 d	Diflufenican AE-B107137

1. No vapour pressure value available, therefore assumed to be as parent.
2. Equivalent to 0.237on a mass basis for entry into MACRO.

Table A8-3: Application parameters for PECgw – ***diflufenican***

Crop	Application rate	Growth stage	Application date	EU endpoints		Danish endpoints	
				Interception rate[1]	Effective rate for soil loading	Deposition[2]	Effective rate for soil loading
Red Fescue[3,4]	75 g/ha 75 g/ha 75 g/ha	- - -	01/04 15/04 30/04	90% 90% 90%	7.5 g/ha 7.5 g/ha 7.5 g/ha	10% 10% 10%	7.5 g/ha 7.5 g/ha 7.5 g/ha

1. The values are taken from the new guidance, EFSA (2014).
2. The values are taken from the Danish EPA Guidance (2014).
3. FOCUS surrogate crop Grass.
4. Assumption that the red fescue is established.

A9 Dimethoate

Table A9-1: FOCUSPELMO 5.5.3 input parameters for ***dimethoate***

Parameter	Value	Comment
Common endpoints – LoEP and DAR 2006		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A14-3	Every year
Molecular weight	229.3 g/mol	Dimethoate
Plant uptake factor	0.5	Dimethoate
Vapour pressure (25°C)	2.46 x 10^{-4} Pa	Dimethoate
Aqueous solubility (25°C)	39800 mg/L (pH 7)	Dimethoate
Individual rate correction in soil: temperature Q_{10} relative moisture moisture exponent	 20ºC 2.2 100% 0.7	 - EFSA recommended value - Model default
EU endpoints - LoEP and DAR 2006		
K_{FOC}	30.1 L/kg	Dimethoate
Freundlich exponent (1/n)	1.02	Dimethoate
DT_{50} soil (20°C/pF2)	2.6 d	Dimethoate
Danish endpoints – Calculated from LoEP and DAR 2006		
K_{FOC}	21.25 L/kg	Dimethoate
Freundlich exponent (1/n)	1.05	Dimethoate
DT_{50} soil (20°C/pF2)	3.08 d	Dimethoate

Table A9-2: FOCUSMACRO 4.4.2 input parameters for ***dimethoate***

Parameter	Value	Comment
Common endpoints - LoEP and DAR 2006		
Application rate/dates	See Table A14-3	Every year
Molecular weight	229.3 g/mol	Dimethoate
Vapour pressure (25°C)	2.46×10^{-4} Pa	Dimethoate
Aqueous solubility (25°C)	39800 mg/L (pH 7)	Dimethoate
Plant uptake factor	0.5	Dimethoate
Effect of temperature MACRO Exponent (1/K)	0.0790	Model default
EU endpoints - LoEP and DAR 2006		
K_{FOC}	30.1 L/kg	Dimethoate
Freundlich exponent (1/n)	1.02	Dimethoate
DT_{50} soil (20°C/pF2)	2.6 d	Dimethoate
Danish endpoints – Calculated from LoEP and DAR 2006		
K_{FOC}	21.25 L/kg	Dimethoate
Freundlich exponent (1/n)	1.05	Dimethoate
DT_{50} soil (20°C/pF2)	3.08 d	Dimethoate

Table A9-3: Application parameters for PECgw for ***dimethoate***

Crop	Application rate	Growth stage[2]	Application date	EU endpoints		Danish endpoints	
				Interception rate[3]	Effective rate for soil loading	Deposition[4]	Effective rate for soil loading
Spring barley[1]	250 g/ha 250 g/ha 250 g/ha	33 – 35 49 – 59 49 – 59	01/06 20/06 15/07	80% 90% 90%	50 g/ha 25 g/ha 25 g/ha	27% 18% 18%	67.5 g/ha 45 g/ha 45 g/ha

1. Surrogate crop spring cereals
2. GAP just says before BBCH 59
3. The values are taken from the new guidance, EFSA (2014).
4. The values are taken from the Danish Evaluation Framework (2014).

A10 Epoxiconazole

Table A10-1: FOCUSPELMO 5.5.3 input parameters for ***epoxiconazole***

Parameter	**Value**	**Comment**
Common endpoints – Danish assessment 2015		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A15-3	Every year
Molecular weight	329.76 g/mol	Epoxiconazole
Plant uptake factor	0.5	Epoxiconazole
Vapour pressure (20°C)	$8.7 * 10^{-7}$ Pa	Epoxiconazole
Aqueous solubility (20°C)	7.1 mg/L	Epoxiconazole
EU endpoints – Danish assessment 2015		
K_{FOC}	1073.1 L/kg	Epoxiconazole
Freundlich exponent (1/n)	0.836	Epoxiconazole
DT_{50} soil (20°C/pF2)	103.7 d	Epoxiconazole
Danish endpoints – Danish assessment 2015		
K_{FOC}	360 L/kg	Epoxiconazole
Freundlich exponent (1/n)	0.888	Epoxiconazole
DT_{50} soil (20°C/pF2)	136.7 d	Epoxiconazole

Table A10-2: FOCUSMACRO 4.4.2 input parameters for ***epoxiconazole***

Parameter	**Value**	**Comment**
Common endpoints – Danish assessment 2015		
Application rate/dates	See Table A15-3	Every year
Molecular weight	329.76 g/mol	Epoxiconazole
Vapour pressure (20°C)	$8.7 * 10^{-7}$ Pa	Epoxiconazole
Aqueous solubility (20°C)	7.1 mg/L	Epoxiconazole
Plant uptake factor	0.5	Epoxiconazole
EU endpoints – Danish assessment 2015		
K_{FOC}	1073.1 L/kg	Epoxiconazole
Freundlich exponent (1/n)	0.836	Epoxiconazole
DT_{50} soil (20°C/pF2)	103.7 d	Epoxiconazole
Danish endpoints – Danish assessment 2015		
K_{FOC}	360 L/kg	Epoxiconazole
Freundlich exponent (1/n)	0.888	Epoxiconazole
DT_{50} soil (20°C/pF2)	136.7 d	Epoxiconazole

Table A10-3: Application parameters for PECgw for ***epoxiconazole***

Crop	Application rate	Growth stage[2]	Application date	EU endpoints		Danish endpoints	
				Interception rate[3]	Effective rate for soil loading	Deposition[4]	Effective rate for soil loading
Winter wheat[1]	125 g/ha	31 – 32	15/05	80%	25 g/ha	42%	52.5 g/ha
	125 g/ha	38 – 45	10/06	90%	12.5 g/ha	10%	12.5 g/ha
	125 g/ha	61 – 69	05/07	90%	12.5 g/ha	4%	5 g/ha

1. *Surrogate crop winter cereals.*
2. *GAP says BBCH 31 – 69.*
3. *The values are taken from the new guidance, EFSA (2014).*
4. *The values are taken from the Danish Evaluation Framework (2014).*

A11 Ethofumesate

Table A11- 1: FOCUSPELMO 5.5.3 input parameters for ***ethofumesate***

Parameter	Value	Comment
Common endpoints – from the new evaluation of ethofumesate in EU (final LoEP not yet published)		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A4-3 and A4-4	Every third year
Molecular weight	286.3 g/mol	Ethofumesate
Plant uptake factor	0.5	Ethofumesate
Vapour pressure (20°C)	$6.5x10^{-4}$ Pa	Ethofumesate
Aqueous solubility (20°C)	50 mg/L	Ethofumesate
EU endpoints - from the new evaluation of ethofumesate in EU (final LoEP not yet published)		
K_{FOC}	118 L/kg	Ethofumesate
Freundlich exponent (1/n)	0.905	Ethofumesate
DT_{50} soil (20°C/pF2)	26.2 d	Ethofumesate
Danish endpoints – calculated from the data in the new evaluation of ethofumesate in EU (final LoEP not yet published)		
K_{FOC}	69.8 L/kg	Ethofumesate
Freundlich exponent (1/n)	0.93	Ethofumesate
DT_{50} soil (20°C/pF2)	49.92 d	Ethofumesate

Table A11-2: FOCUSMACRO 4.4.2 input parameters for ***ethofumesate***

Parameter	Value	Comment
Common endpoints - from the new evaluation of ethofumesate in EU (final LoEP not yet published)		
Application rate/dates	See Table A4-3 and A4-4	Every third year
Molecular weight	286.3 g/mol	Ethofumesate
Vapour pressure (20°C)	$6.5x10^{-4}$ Pa	Ethofumesate
Aqueous solubility (20°C)	50 mg/L	Ethofumesate
Plant uptake factor	0.5	Ethofumesate
EU endpoints - from the new evaluation of ethofumesate in EU (final LoEP not yet published)		
K_{FOC}	118 L/kg	Ethofumesate
Freundlich exponent (1/n)	0.905	Ethofumesate
DT_{50} soil (20°C/pF2)	26.2 d	Ethofumesate
Danish endpoints – calculated from the data in the new evaluation of ethofumesate in EU (final LoEP not yet published)		
K_{FOC}	69.8 L/kg	Ethofumesate
Freundlich exponent (1/n)	0.93	Ethofumesate
DT_{50} soil (20°C/pF2)	49.92 d	Ethofumesate

Table A11-3: Application parameters for PECgw – ***ethofumesate - higher dose rate***

Crop	Application rate	Number of applications per year	Number of days between applications[1]	Growth stage	Application date for the first application	EU endpoints		Danish endpoints	
						Interception rate[6,7]	Effective rate for soil loading	Deposition[7,8]	Effective rate for soil loading
Sugar beet[5]	173 g/ha 173 g/ha 173 g/ha	3	9 days	10[2] 11[3] 15[4]	01/05 15/05 30/05	20% 20% 20%	138.4 g/ha 138.4 g/ha 138.4 g/ha	100% 98% 81%	173 g/ha 169.5 g/ha 140.1 g/ha

[1.] The minimal interval between applications from the PLAP data.
[2.] Minimum growth stage from PLAP data for the first application.
[3.] Minimum growth stage from PLAP data for the second application.
[4.] Minimum growth stage from the PLAP data for the third application.
[5.] Note, application is every third year.
[6]. The values are taken from the new guidance, EFSA (2014).
[7]. Same interception/deposition for all three applications.
[8.] The values are taken from the Danish Evaluation Framework (2014).

Table A11-4: Application parameters for PECgw – ***ethofumesate - lower dose rate***

Crop	Application rate	Number of applications per year	Number of days between applications[1]	Growth stage	Application date for the first application	EU endpoints		Danish endpoints	
						Interception rate[6,7]	Effective rate for soil loading	Deposition[7,8]	Effective rate for soil loading
Sugar beet[5]	35 g/ha 35 g/ha 35 g/ha	2	9 days	10[2] 11[3] 15[4]	01/05 15/05 30/05	20% 20% 20%	28 g/ha 28 g/ha 28 g/ha	100% 98% 81%	35 g/ha 33.3 g/ha 28.4 g/ha

[1.] The minimal interval between applications from the PLAP data.
[2.] Minimum growth stage from PLAP data for the first application.
[3.] Minimum growth stage from PLAP data for the second application.
[4.] Minimum growth stage from the PLAP data for the third application.
[5.] Note, application is every third year.
[6]. The values are taken from the new guidance, EFSA (2014).
[7]. Same interception/deposition for all three applications.
[8.] The values are taken from the Danish Evaluation Framework (2014).

A12 Fluazifop-P-butyl, fluazifop-P and TFMP

Table A12-1: FOCUSPELMO 5.5.3 input parameters for ***fluazifop-P-butyl***, ***fluazifop-P*** and ***TFMP*** ("Compound 10", 5-(trifluoromethyl)-2(1H)-pyridinone)

Parameter	Value	Comment
Common endpoints – LoEP after evaluation of confirmatory data, June 2014		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A5-3 See Table A5-5	Every third year (sugar beet) Every year (grass)
Molecular weight	383.4 g/mol 327.4 g/mol 163 g/mol	Fluazifop-P-butyl Fluazifop-P TFMP
Plant uptake factor	0 0 0	Fluazifop-P-butyl Fluazifop-P TFMP
Vapour pressure (20°C)	$1.2\ 10^{-4}$ Pa 0 Pa 0 Pa	Fluazifop-P-butyl Fluazifop-P TFMP
Aqueous solubility (20°C)	0.93 mg/L 780 mg/L 6000 mg/L	Fluazifop-P-butyl Fluazifop-P TFMP
Formation fraction	1 0.4	Fluazifop-P-butyl to Fluazifop-P Fluazifop-P to TFMP
EU endpoints - LoEP after evaluation of confirmatory data, June 2014		
K_{FOC}	3394 L/kg 48.7 L/kg 24.7 L/kg	Fluazifop-P-butyl Fluazifop-P TFMP
Freundlich exponent (1/n)	1 0.9 0.84	Fluazifop-P-butyl Fluazifop-P[1] TFMP
DT_{50} soil (20°C/pF2)	0.30 d 9.1 d 75.3 d	Fluazifop-P-butyl[2] Fluazifop-P TFMP
Rate Constants: k total (d^{-1}) Fluazifop-P-butyl to Fluazifop-P (d^{-1}) k total (d^{-1}) Fluazifop-P to CO_2/NER (d^{-1}) Fluazifop-P to TFMP (d^{-1}) k total (d^{-1}) TFMP to CO_2/NER (d^{-1})	 2.31049 2.31049 0.07617 0.04570 0.03047 0.00921 0.00921	 Fluazifop-P-butyl: ln(2)/ DT_{50} Based on FF of 1 Fluazifop-P: ln(2)/ DT_{50} Based on FF of (1-0.4) Based on FF of 0.4 TFMP: ln(2)/ DT_{50} Based on FF of 1
Danish endpoints - Calculated from LoEP after evaluation of confirmatory data, June 2014		
K_{FOC}	3394 L/kg 39.2 L/kg 16.32 L/kg	Fluazifop-P-butyl[3] Fluazifop-P TFMP
Freundlich exponent (1/n)	1 0.9 0.85	Fluazifop-P-butyl[4] Fluazifop-P[1] TFMP

Parameter	Value	Comment
DT_{50} soil (20°C/pF2)	0.3 d 17.5 d 144.34 d	Fluazifop-P-butyl[2] Fluazifop-P TFMP
Rate Constants:		
k total (d^{-1})	2.31049	Fluazifop-P-butyl: ln(2)/ DT_{50}
Fluazifop-P-butyl to Fluazifop-P (d^{-1})	2.31049	Based on FF of 1
k total (d^{-1})	0.03961	Fluazifop-P: ln(2)/ DT_{50}
Fluazifop-P to CO_2/NER (d^{-1})	0.02377	Based on FF of (1-0.4)
Fluazifop-P to TFMP (d^{-1})	0.01584	Based on FF of 0.4
k total (d^{-1})	0.00480	TFMP: ln(2)/ DT_{50}
TFMP to CO_2/NER (d^{-1})	0.00480	Based on FF of 1

1. 1/n values is considered uncertain therefore the default value of 0.9 was used for exposure calculation.
2. Shortest laboratory value, worst-case for metabolites.
3. Only one value available.
4. No 1/n available, so 1 is a default.

Table A12-2: FOCUSMACRO 4.4.2 input parameters for ***fluazifop-P*** and ***TFMP*** ("Compound 10", 5-(trifluoromethyl)-2(1H)-pyridinone)

Parameter	Value	Comment
Common endpoints - LoEP after evaluation of confirmatory data, June 2014		
Application rate/dates	See Table A5-4 See Table A5-6	Every third year (sugar beet) Every year (grass)
Molecular weight	327.4 g/mol 163 g/mol	Fluazifop-P TFMP
Vapour pressure (20°C)	0 Pa 0 Pa	Fluazifop-P TFMP
Aqueous solubility (20°C)	780 mg/L 6000 mg/L	Fluazifop-P TFMP
Plant uptake factor	0 0	Fluazifop-P TFMP
Formation fraction	0.4	Fluazifop-P to TFMP[1,2]
EU endpoints - LoEP after evaluation of confirmatory data, June 2014		
K_{FOC}	48.7 L/kg 24.7 L/kg	Fluazifop-P TFMP
Freundlich exponent (1/n)	0.9 0.84	Fluazifop-P[4] TFMP
DT_{50} soil (20°C/pF2)	9.1 d 75.3 d	Fluazifop-P TFMP
Danish endpoints - Calculated from LoEP after evaluation of confirmatory data, June 2014		
K_{FOC}	39.2 L/kg 16.32 L/kg	Fluazifop-P TFMP
Freundlich exponent (1/n)	0.9 0.85	Fluazifop-P[3] TFMP
DT_{50} soil (20°C/pF2)	17.5 d 144.34 d	Fluazifop-P TFMP

1. Equivalent to 0.199 on a mass basis for entry into MACRO.
2. MACRO can only model one parent to one metabolite, therefore due to the short half-life of fluazifop-P-butyl, 0.3 days, fluazifop-P-butyl to fluazifop-P is not modelled. Instead fluazifop-P to TFMP is simulated, using an adjusted application rate based on molecular weight – see Table A6-4 (sugar beet) and Table A6-6 (grass).
3. 1/n values is considered uncertain therefore the default value of 0.9 was used for exposure calculation

Table A12-3: Application parameters for PECgw ***fluazifop-P-butyl*** to ***sugarbeet***– used for PELMO (fluazifop-P-butyl to fluazifop-p and TFMP) - ***higher dose rate***

Crop	Application rate	Growth stage	Application date	EU endpoints		Danish endpoints	
				Interception rate[2]	Effective rate for soil loading	Deposition[3]	Effective rate for soil loading
Sugarbeet[1]	375 g/ha	20 – 39	15/06	70%	112.5 g/ha	32%	120 g/ha
	375 g/ha	20 – 39	01/07	70%	112.5 g/ha	32%	120 g/ha
	375 g/ha	20 – 39	15/07	70%	112.5 g/ha	8%	30 g/ha

[1] *Note, application is every third year.*
[2.] *The values are taken from the new guidance, EFSA (2014).*
[3.] *The values are taken from the Danish Evaluation Framework (2014).*

Table A12-4: Application parameters for PECgw ***fluazifop-P*** to ***sugarbeet***– used for MACRO (fluazifop-P to TFMP) - ***higher dose rate***

Crop	Application rate[2]	Growth stage	Application timing	EU endpoints		Danish endpoints	
				Interception rate[3]	Effective rate for soil loading	Deposition[4]	Effective rate for soil loading
Sugarbeet[1]	320.23 g/ha	20 – 39	15/06	70%	96.1 g/ha	32%	102.5 g/ha
	320.23 g/ha	20 – 39	01/07	70%	96.1 g/ha	32%	102.5 g/ha
	320.23 g/ha	20 – 39	15/07	70%	96.1 g/ha	8%	25.6 g/ha

[1] *Note, application is every third year.*
[2.] *Application adjusted based on molecular weight correction (327.4/383.4) and formation fraction of 1 from fluazifop-p-butyl to fluazifop-p*
[3.] *The values are taken from the new guidance, EFSA (2014).*
[4.] *The values are taken from the Danish Evaluation Framework (2014).*

Table A12-5: Application parameters for PECgw ***fluazifop-P-butyl*** to ***grass***– used for PELMO (fluazifop-P-butyl to fluazifop-P and TFMP) - ***lower dose rate***

Crop	Application rate	Growth stage	Application date	EU endpoints		Danish endpoints	
				Interception rate[1]	Effective rate for soil loading	Deposition[2]	Effective rate for soil loading
Grass	188 g/ha	-	20/04	90%	18.8 g/ha	10%	18.8 g/ha
	188 g/ha	-	05/05	90%	18.8 g/ha	10%	18.8 g/ha
	188 g/ha	-	20/05	90%	18.8 g/ha	10%	18.8 g/ha

[1.] *The values are taken from the new guidance, EFSA (2014).*
[2.] *The values are taken from the Danish Evaluation Framework (2014).*

Table A12-6: Application parameters for PECgw ***fluazifop-P*** to ***grass***– used for MACRO (fluazifop-P to TFMP) - ***lower dose rate***

Crop	Application rate[1]	Growth stage	Application date	EU endpoints		Danish endpoints	
				Interception rate[2]	Effective rate for soil loading	Deposition[3]	Effective rate for soil loading
Grass	160.54 g/ha	-	20/04	90%	16.05 g/ha	10%	16.05 g/ha
	160.54 g/ha	-	05/05	90%	16.05 g/ha	10%	16.05 g/ha
	160.54 g/ha	-	20/05	90%	16.05 g/ha	10%	16.05 g/ha

1. Application adjusted based on molecular weight correction (327.4/383.4) and formation fraction of 1 from fluazifop-p-butyl to fluazifop-p
2. The values are taken from the new guidance, EFSA (2014).
3. The values are taken from the Danish Evaluation Framework (2014).

A13 Glyphosate and AMPA

Table A13- 1: FOCUSPELMO 5.5.3 input parameters for ***glyphosate*** and ***AMPA***

Parameter	Value	Comment
Common endpoints – draft LoEP 2015		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A6-3	Every year
Molecular weight	169.1 g/mol 111 g/mol	Glyphosate AMPA
Plant uptake factor	0 0	Glyphosate AMPA
Vapour pressure (25°C)	1.31×10^{-5} Pa 8×10^{-3} Pa	Glyphosate AMPA
Aqueous solubility (20°C)	10500 mg/L 56000 mg/L	Glyphosate AMPA
Formation fraction	0.64 0.36 1	Glyphosate to CO_2 bound residues Glyphosate to AMPA AMPA to CO_2 bound residues
EU endpoints – draft LoEP 2015		
K_{FOC}	15844 L/kg 9749 L/kg	Glyphosate AMPA
Freundlich exponent (1/n)	0.914 0.853	Glyphosate AMPA
DT_{50} soil (20°C/pF2)	20.51 d 88.84 d	Glyphosate AMPA
Rate Constants:		
k total (d^{-1})	0.03380	Glyphosate: ln(2)/ DT_{50}
Glyphosate to AMPA (d^{-1})	0.01217	Based on FF of 0.36
Glyphosate to CO_2/NER (d^{-1})	0.02163	Based on a FF of (1- 0.36)
k total (d^{-1})	0.00780	AMPA: ln(2)/ DT_{50}
AMPA to CO_2/NER (d^{-1})	0.00780	Based on FF of 1
Danish endpoints – Calculated from draft LoEP 2015		
K_{FOC}	3482 L/kg 3330 L/kg	Glyphosate AMPA
Freundlich exponent (1/n)	0.96 0.8	Glyphosate AMPA
DT_{50} soil (20°C/pF2)	42 d 154 d	Glyphosate AMPA
Rate Constants:		
k total (d^{-1})	0.01650	Glyphosate: ln(2)/ DT_{50}
Glyphosate to AMPA (d^{-1})	0.00594	Based on FF of 0.36
Glyphosate to CO_2/NER (d^{-1})	0.01056	Based on a FF of (1- 0.36)
k total (d^{-1})	0.00450	AMPA: ln(2)/ DT_{50}
AMPA to CO_2/NER (d^{-1})	0.00450	Based on FF of 1

[1] *The aqueous solubility was measured at 20°C, however, in PELMO vapour pressure and aqueous solubility are required to be put in the same temperature, therefore the aqueous solubility at 20°C is assumed to be the aqueous solubility at 25°C.*

Table A13-2: FOCUSMACRO 4.4.2 input parameters for ***glyphosate*** and ***AMPA***

Parameter	Value	Comment
Common endpoints – draft LoEP 2015		
Application rate/dates	See Table A6-3	Every year
Molecular weight	169.1 g/mol 111 g/mol	Glyphosate AMPA
Vapour pressure (25°C)	1.31×10^{-5} Pa 8×10^{-3} Pa	Glyphosate AMPA
Aqueous solubility (20°C)	10500 mg/L 56000 mg/L	Glyphosate AMPA
Molar enthalpy of dissolution	27000 J/mol	Model default
Plant uptake factor	0 0	Glyphosate AMPA
Formation fraction	0.36	Glyphosate to AMPA[1]
EU endpoints – draft LoEP 2015		
K_{FOC}	15844 L/kg 9749 L/kg	Glyphosate AMPA
Freundlich exponent (1/n)	0.914 0.853	Glyphosate AMPA
DT_{50} soil (20°C/pF2)	20.51 d 88.84 d	Glyphosate AMPA
Danish endpoints – draft LoEP 2015		
K_{FOC}	3482 L/kg 3330 L/kg	Glyphosate AMPA
Freundlich exponent (1/n)	0.96 0.8	Glyphosate AMPA
DT_{50} soil (20°C/pF2)	42 d 154 d	Glyphosate AMPA

1. Equivalent to 0.236 on a mass basis for entry into MACRO.

Table A13-3: Application parameters for PECgw for ***glyphosate***

Crop	Application rate	Growth stage	Application date	EU endpoints		Danish endpoints	
				Interception rate[1]	Effective rate for soil loading	Deposition[2]	Effective rate for soil loading
Peas[3,4]	1080 g/ha	80 – 99	15/07	85%	162 g/ha	15%	162 g/ha
	1080 g/ha	80 – 99	01/08	85%	162 g/ha	15%	162 g/ha
	1080 g/ha	80 – 99	20/08	85%	162 g/ha	15%	162 g/ha
Winter wheat[5]	1080 g/ha	>90	15/07	80%	216 g/ha	18%	194.4 g/ha
	1080 g/ha	>90	01/08	80%	216 g/ha	18%	194.4 g/ha
	1080 g/ha	>90	15/08	80%	216 g/ha	18%	194.4 g/ha
Spring barley[6]	1080 g/ha	>90	01/08	80%	216 g/ha	18%	194.4 g/ha
	1080 g/ha	>90	15/08	80%	216 g/ha	18%	194.4 g/ha
	1080 g/ha	>90	30/08	80%	216 g/ha	18%	194.4 g/ha

[1.] *The values are taken from the new guidance, EFSA (2014).*
[3.] *The values are taken from the Danish Evaluation Framework (20014).*
[3.] *FOCUS surrogate crop in MACRO is legumes, in PELMO peas (animals) is available.*
[4]*. No Danish deposition data available, therefore the EU interception rate has been used to calculate deposition.*
[5.] *FOCUS surrogate crop is winter cereals.*
[6.] *FOCUS surrogate crop is spring cereals.*

A14 Ioxynil

Table A14-1: FOCUSPELMO 5.5.3 input parameters for ***ioxynil***

Parameter	Value	Comment
Common endpoints – Review report for the active substance ioxynil 2004		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A16-3	Every year
Molecular weight	370.9 g/mol	Ioxynil
Plant uptake factor	0.5	Ioxynil
Vapour pressure (20°C)	2.04×10^{-6} Pa	Ioxynil
Aqueous solubility (20°C)	38.9 mg/L (pH 7)	Ioxynil
Individual rate correction in soil:		
temperature	20°C	-
Q_{10}	2.2	EFSA recommended value
relative moisture	100%	-
moisture exponent	0.7	Model default
EU endpoints – Review report for the active substance ioxynil 2004		
K_{FOC}	303 L/kg	Ioxynil
Freundlich exponent (1/n)	0.92	Ioxynil
DT_{50} soil (20°C/pF2)	2.37 d	Ioxynil
Danish endpoints – Calculated from review report for the active substance ioxynil 2004		
K_{FOC}	175.6 L/kg	Ioxynil
Freundlich exponent (1/n)	0.93	Ioxynil
DT_{50} soil (20°C/pF2)	2.72 d	Ioxynil

Table A14-2: FOCUSMACRO 4.4.2 input parameters for ***ioxynil***

Parameter	Value	Comment
Common endpoints - Review report for the active substance ioxynil 2004		
Application rate/dates	See Table A16-3	Every year
Molecular weight	370.9 g/mol	Ioxynil
Vapour pressure (20°C)	2.04×10^{-6} Pa	Ioxynil
Aqueous solubility (20°C)	38.9 mg/L (pH 7)	Ioxynil
Plant uptake factor	0.5	Ioxynil
Effect of temperature MACRO Exponent (1/K)	0.0790	Model default
EU endpoints - Review report for the active substance ioxynil 2004		
K_{FOC}	303 L/kg	Ioxynil
Freundlich exponent (1/n)	0.92	Ioxynil
DT_{50} soil (20°C/pF2)	2.37 d	Ioxynil
Danish endpoints – Calculated from review report for the active substance ioxynil 2004		
K_{FOC}	175.6 L/kg	Ioxynil
Freundlich exponent (1/n)	0.93	Ioxynil
DT_{50} soil (20°C/pF2)	2.72 d	Ioxynil

Table A14-3: Application parameters for PECgw for ***ioxynil***

Crop	Application rate[2]	Growth stage	Application date	EU endpoints		Danish endpoints	
				Interception rate[3]	Effective rate for soil loading	Deposition[4]	Effective rate for soil loading
Winter wheat[1]	200 g/ha	11 - 12	20/9	0%	200 g/ha	77%	140 g/ha
	200 g/ha	11 - 12	15/10	0%	200 g/ha	77%	140 g/ha
	200 g/ha	11 - 12	30/10	0%	200 g/ha	77%	140 g/ha

1. Surrogate crop winter cereals.
2. This is the old GAP, current GAP is 40 g/ha, but most tests in PLAP are done with 200 g/ha.
3. The values are taken from the new guidance, EFSA (2014).
4. The values are taken from the Danish Evaluation Framework (2014).

A15 Metalaxyl-M, CGA62826 and CGA108906

Table A15-1: FOCUSPELMO 5.5.3 input parameters for ***metalaxyl-M***, ***CGA62826*** (~NOA409045) and ***CGA108906*** (~SYN546520)

Parameter	Value	Comment
Common endpoints – LoEP 2015		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A7-3	Every third year
Molecular weight	279.3 g/mol 265.3 g/mol 295.3 g/mol	Metalaxyl-M CGA62826 CGA108906
Plant uptake factor	0 0 0	Metalaxyl-M CGA62826 CGA108906
Vapour pressure	0.0033 Pa(25° C) 1 x 10^{-5} Pa (20° C) 1 x 10^{-5} Pa (20° C)	Metalaxyl-M CGA62826 CGA108906
Aqueous solubility (25°C)	26000 mg/L 265000 mg/L 265000 mg/L	Metalaxyl-M[1] CGA62826 CGA108906
Formation fraction	0.783 0.47	Metalaxyl-M to CGA62826 CGA62826 to CGA108906
EU endpoints –LoEP 2015		
K_{FOC}	40 L/kg 12.1 L/kg 15.2 L/kg	Metalaxyl-M CGA62826 (NOA409045) CGA108906(SYN546520)
Freundlich exponent (1/n)	0.955 0.928 1.1	Metalaxyl-M CGA62826 CGA108906
DT_{50} soil (20°C/pF2)	6.5 d 31.3 d 96.8 d	Metalaxyl-M CGA62826 CGA108906
Rate Constants:		
k total (d^{-1})	0.10664	Metalaxyl-M: ln(2)/ DT_{50}
Metalaxyl-M to CGA62826 (d^{-1})	0.08350	Based on FF of 0.783
Metalaxyl-M to CO_2/NER (d^{-1})	0.02134	Based on a FF of (1- 0.783)
k total (d^{-1})	0.02215	CGA62826: ln(2)/ DT_{50}
CGA62826 to CGA108906 (d^{-1})	0.01041	Based on FF of 0.47
CGA62826 to CO_2/NER (d^{-1})	0.01174	Based on a FF of (1- 0.47)
k total (d^{-1})	0.00716	CGA108906: ln(2)/ DT_{50}
CGA108906 to CO_2/NER (d^{-1})	0.00716	Based on FF of 1
Danish endpoints - Calculated from LoEP 2015		
K_{FOC}	30.56 L/kg 8.89 L/kg 2.6 L/kg	Metalaxyl-M CGA62826 CGA108906
Freundlich exponent (1/n)	0.966 0.951 1.225	Metalaxyl-M CGA62826 CGA108906

Parameter	Value	Comment
DT_{50} soil (20°C/pF2)	14.6 d 98.04 d 202.7 d	Metalaxyl-M CGA62826 CGA108906
Rate Constants:		
k total (d^{-1})	0.04747	Metalaxyl-M: ln(2)/ DT_{50}
Metalaxyl-M to CGA62826 (d^{-1})	0.03717	Based on FF of 0.783
Metalaxyl-M to CO_2/NER (d^{-1})	0.01030	Based on a FF of (1- 0.783)
k total (d^{-1})	0.00707	CGA62826: ln(2)/ DT_{50}
CGA62826 to CGA108906 (d^{-1})	0.00332	Based on FF of 0.47
CGA62826 to CO_2/NER (d^{-1})	0.00375	Based on a FF of (1- 0.47)
k total (d^{-1})	0.00342	CGA108906: ln(2)/ DT_{50}
CGA108906 to CO_2/NER (d^{-1})	0.00342	Based on FF of 1

[1] *The aqueous solubility was measured at 20°C, however, in PELMO vapour pressure and aqueous solubility are required to be put in the same temperature, therefore the aqueous solubility at 20°C is assumed to be the aqueous solubility at 25°C.*

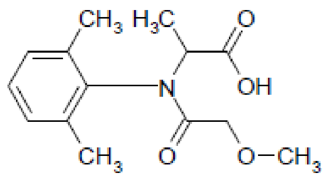
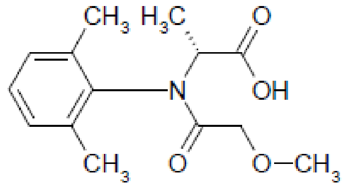
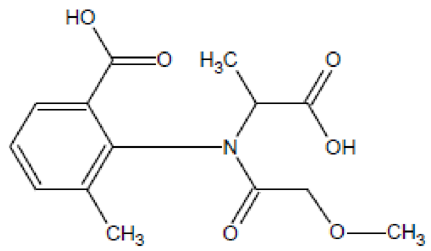
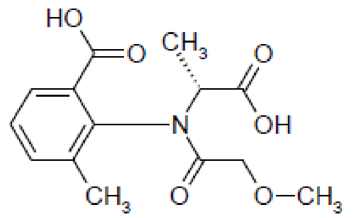
(a)	**CGA62826**	(RS)-2-[(2,6-Dimethyl-phenyl)-(2-methoxy-acetyl)-amino]-propionic acid CC(N(C(=O)COC)c1c(C)cccc1C)C(=O)O	
	NOA409045	(R)-2-[(2,6-Dimethyl-phenyl)-(2-methoxy-acetyl)-amino]-propionic acid C[C@@H](N(C(=O)COC)c1c(C)cccc1C)C(=O)O	
(b)	**CGA108906**	2-[((RS)-1-Carboxy-ethyl)-(2-methoxy-acetyl)-amino]-3-methyl-benzoic acid CC(N(C(=O)COC)c1c(C)cccc1C(=O)O)C(=O)O	
	SYN546520	2-[((R)-1-Carboxy-ethyl)-(2-methoxy-acetyl)-amino]-3-methyl-benzoic acid C[C@@H](N(C(=O)COC)c1c(C)cccc1C(=O)O)C(=O)O	

Figure A15-1: Schematic diagrams of (a) ***CGA108906*** (~SYN546520) and (b) ***CGA62826*** (~NOA409045)

Table A15-2: FOCUSMACRO 4.4.2 input parameters for ***metalaxyl-M*** and ***CGA62826***[1]

Parameter	Value	Comment
Common endpoints - LoEP 2015		
Application rate/dates	See Table A7-3	Every third year
Molecular weight	279.3 g/mol 265.3 g/mol	Metalaxyl-M CGA62826
Vapour pressure	0.0033 Pa (25° C) 1 x 10^{-5} Pa (20° C)	Metalaxyl-M CGA62826
Aqueous solubility (25°C)	26000 mg/L 265000 mg/L	Metalaxyl-M CGA62826
Plant uptake factor	0 0	Metalaxyl-M CGA62826
Formation fraction	0.783	Metalaxyl-M to CGA62826[2]
EU endpoints –LoEP 2015		
K_{FOC}	40 L/kg 15.2 L/kg	Metalaxyl-M CGA62826
Freundlich exponent (1/n)	0.955 0.928	Metalaxyl-M CGA62826
DT_{50} soil (20°C/pF2)	6.5 d 31.3 d	Metalaxyl-M CGA62826
Danish endpoints - LoEP 2015		
K_{FOC}	30.56 L/kg 8.89 L/kg	Metalaxyl-M CGA62826
Freundlich exponent (1/n)	0.966 0.951	Metalaxyl-M CGA62826
DT_{50} soil (20°C/pF2)	14.6 d 98.04 d	Metalaxyl-M CGA62826

[1.] As MACRO can only model parent to one metabolite, only metalaxyl-M to CGA62826 has been modelled.
[2] Equivalent to 0.744 on a mass basis for entry into MACRO.

Table A15-3: Application parameters for PECgw ***metalaxyl-M***

Crop	Application rate	Growth stage	Application date	EU endpoints: Interception rate[2]	EU endpoints: Effective rate for soil loading	Danish endpoints: Deposition[3]	Danish endpoints: Effective rate for soil loading
Potatoes[1]	77.6 g/ha 77.6 g/ha 77.6 g/ha	60 60 60	01/07 10/07 20/07	85% 85% 85%	11.64 g/ha 11.64 g/ha 11.64 g/ha	8% 8% 8%	6.208 g/ha 6.208 g/ha 6.208 g/ha

[1] Note, application is every third year.
[2.] The values are taken from the new guidance, EFSA (2014).
[3.] The values are taken from the Danish Evaluation Framework (2014).

A16 Metamitron and metamitron-desamino

Table A16-1: FOCUSPELMO 5.5.3 input parameters for ***metamitron*** and ***metamitron-desamino***

Parameter	Value	Comment
Common endpoints – LoEP, 2008		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A8-1	Every third year
Application depth	0 cm	Model default
Molecular weight	202.2 g/mol 187.2 g/mol	Metamitron Metamitron-desamino
Plant uptake factor	0.5 0.5	Metamitron Metamitron-desamino
Vapour pressure	7.44×10^{-7} Pa (25°C) 7.71×10^{-9} Pa (20°C)	Metamitron Metamitron-desamino
Aqueous solubility (25°C)	1680 mg/L 399.9 mg/L	Metamitron Metamitron-desamino
Formation fraction	0.5 0.5 1	Metamitron to CO_2 bound residues Metamitron to Metamitron-desamino Metamitron-desamino to CO_2 bound residues
EU endpoints - LoEP, 2008		
K_{FOC}	86.4 L/kg 102.5 L/kg	Metamitron Metamitron-desamino
Freundlich exponent (1/n)	0.78 0.78	Metamitron Metamitron-desamino
DT_{50} soil (20°C/pF2)	19.0 d 30.5 d	Metamitron Metamitron-desamino
Rate Constants:		
k total (d^{-1})	0.03648	Metamitron: ln(2)/ DT_{50}
Metamitron to Metamitron-desamino (d^{-1})	0.01824	Based on FF of 0.5
Metamitron to CO_2/NER (d^{-1})	0.01824	Based on a FF of (1- 0.5)
k total (d^{-1})	0.02273	Metamitron-desamino: ln(2)/ DT_{50}
Metamitron-desamino to CO_2/NER (d^{-1})	0.02273	Based on FF of 1
Danish endpoints - Zonal evaluation of Metamitron 700 WG.		
K_{FOC}	55.8 L/kg 67.8 L/kg	Metamitron Metamitron-desamino
Freundlich exponent (1/n)	0.82 0.79	Metamitron Metamitron-desamino
DT_{50} soil (20°C/pF2)	22.9 d 35.0 d	Metamitron Metamitron-desamino

Parameter	Value	Comment
Rate Constants:		
k total (d^{-1})	0.03026	Metamitron: ln(2)/ DT_{50}
Metamitron to Metamitron-desamino (d^{-1})	0.01513	Based on FF of 0.5
Metamitron to CO_2/NER (d^{-1})	0.01513	Based on a FF of (1- 0.5)
k total (d^{-1})	0.01980	Metamitron-desamino: ln(2)/ DT_{50}
Metamitron-desamino to CO_2/NER (d^{-1})	0.01980	Based on FF of 1

Table A16-2: FOCUSMACRO 4.4.2 input parameters for ***metamitron*** and ***metamitron-desamino***

Parameter	Value	Comment
Common endpoints – LoEP, 2008		
Application rate/dates	See Table A8-3	Every third year
Molecular weight	202.2 g/mol 187.2 g/mol	Metamitron Metamitron-desamino
Vapour pressure	7.44×10^{-7} Pa (25°C) 7.71×10^{-9} Pa (20°C)	Metamitron Metamitron-desamino
Aqueous solubility (25°C)	1680 mg/L 399.9 mg/L	Metamitron Metamitron-desamino
Plant uptake factor	0.5 0.5	Metamitron Metamitron-desamino
Formation fraction	0.5	Metamitron to Metamitron-desamino[1]
EU endpoints - LoEP, 2008		
K_{FOC}	86.4 L/kg 102.5 L/kg	Metamitron Metamitron-desamino
Freundlich exponent (1/n)	0.78 0.78	Metamitron Metamitron-desamino
DT_{50} soil (20°C/pF2)	19.0 d 30.5 d	Metamitron Metamitron-desamino
Danish endpoints - Zonal evaluation of Metamitron 700 WG.		
K_{FOC}	55.8 L/kg 67.8 L/kg	Metamitron Metamitron-desamino
Freundlich exponent (1/n)	0.82 0.79	Metamitron Metamitron-desamino
DT_{50} soil (20°C/pF2)	22.9 d 35.0 d	Metamitron Metamitron-desamino

[1.] *Equivalent to 0.463 on a mass basis for entry into MACRO.*

Table A16-3: Application parameters for PECgw – ***metamitron***

Crop	Application rate	Number of applications per year	Number of days between applications	Growth stage[2]	Application date for the first application	EU endpoints		Danish endpoints	
						Interception rate[3,4]	Effective rate for soil loading	Deposition[3,5]	Effective rate for soil loading
Sugar beet[1]	700 g/ha 700 g/ha 700 g/ha	3	7 days	10-12 10-12 10-12	01/05 12/05 25/05	20% 20% 20%	560 g/ha 560 g/ha 560 g/ha	100% 98% 81%	700 g/ha 686 g/ha 567 g/ha

[1] Note, application is every third year.
[2] BBCH 10 – 18, for the first application: 10 – 12.
[3] Same interception/deposition for all three applications.
[4] The values are taken from the new guidance, EFSA (2014).
[5] The values are taken from the Danish Evaluation Framework (2014).

A17 Metrafenone

Table A17-1: FOCUSPELMO 5.5.3 input parameters for ***metrafenone***

Parameter	Value	Comment
Common endpoints – LoEP 2006		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A24-3	Every year
Molecular weight	409.27 g/mol	Metrafenone
Plant uptake factor	0.5	Metrafenone
Vapour pressure (20°C)	$1.53x10^{-4}$ Pa	Metrafenone
Aqueous solubility (20°C)	0.492 mg/L (pH 7)	Metrafenone
Individual rate correction in soil:		
temperature	20ºC	-
Q_{10}	2.2	EFSA recommended value
relative moisture	100%	-
moisture exponent	0.7	Model default
EU endpoints – LoEP 2006		
K_{FOC}	3105 L/kg	Metrafenone
Freundlich exponent (1/n)	0.91	Metrafenone
DT_{50} soil (20°C/pF2)	250.6 d	Metrafenone
Danish endpoints – Calculated from LoEP 2006		
K_{FOC}	2057 L/kg	Metrafenone
Freundlich exponent (1/n)	0.94	Metrafenone
DT_{50} soil (20°C/pF2)	304.2 d	Metrafenone

Table A17-2: FOCUSMACRO 4.4.2 input parameters for ***metrafenone***

Parameter	Value	Comment
Common endpoints – LoEP 2006		
Application rate/dates	See Table A24-3	Every year
Molecular weight	409.27 g/mol	Metrafenone
Vapour pressure (20°C)	$1.53x10^{-4}$ Pa	Metrafenone
Aqueous solubility (20°C)	0.492 mg/L (pH 7)	Metrafenone
Plant uptake factor	0.5	Metrafenone
Effect of temperature MACRO Exponent (1/K)	0.0790	Model default
EU endpoints – LoEP 2006		
K_{FOC}	3105 L/kg	Metrafenone
Freundlich exponent (1/n)	0.91	Metrafenone
DT_{50} soil (20°C/pF2)	250.6 d	Metrafenone
Danish endpoints – Calculated from LoEP 2006		
K_{FOC}	2057 L/kg	Metrafenone
Freundlich exponent (1/n)	0.94	Metrafenone
DT_{50} soil (20°C/pF2)	304.2 d	Metrafenone

Table A17-3: Application parameters for PECgw for ***metrafenone***

Crop	Application rate	Number application per year	Number of days between applications	Growth stage[2]	Application date	EU endpoints		Danish endpoints	
						Interception rate[3]	Effective rate for soil loading	Deposition[4]	Effective rate for soil loading
Winter wheat[1]	150 g/ha	2	21 days	30	15/05	80%	30 g/ha	42%	63 g/ha
	150 g/ha	2	21 days	51	15/06	90%	15 g/ha	4%	6 g/ha
	150 g/ha	2	21 days	70	15/07	80%	30 g/ha	4%	6 g/ha

1. Surrogate crop winter cereals.
2. GAP: 30 – 79, which is May to July.
3. The values are taken from the new guidance, EFSA (2014).
4. The values are taken from the Danish Evaluation Framework (2014).

A18 Metribuzin, metribuzin-diketo and metribuzin-desamino-diketo

Table A18-1: FOCUSPELMO 5.5.3 input parameters for ***metribuzin***, ***metribuzin-diketo*** and ***metribuzin-desamino-diketo***

Parameter	Value	Comment
Common endpoints – LoEP, corrected by DE in January 2012 (according to the EFSA conclusion)		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A9-3	Every third year
Molecular weight	214.3g/mol 184.19 g/mol 169.18 g/mol	Metribuzin Metribuzin-diketo Metribuzin-desamino-diketo
Plant uptake factor	0.5 0.5 0.5	Metribuzin Metribuzin-diketo Metribuzin-desamino-diketo
Vapour pressure (25°C)	1.21×10^{-4} Pa 2.57×10^{-6} Pa 2.24×10^{-6} Pa	Metribuzin Metribuzin-diketo Metribuzin-desamino-diketo
Aqueous solubility (20°C)	1165 mg/L 1650 mg/L 5350 mg/L	Metribuzin[1] Metribuzin-diketo Metribuzin-desamino-diketo
Formation fraction	0.5 1.0 1.0	Metribuzin to Metribuzin-diketo Metribuzin-diketo to Metribuzin-desamino-diketo Metribuzin-desamino-diketo to CO_2 bound residues
EU endpoints – LoEP, corrected by DE in January 2012 (according to the EFSA conclusion)		
K_{FOC}	37.1 L/kg 48.3 L/kg 32.6 L/kg	Metribuzin Metribuzin-diketo Metribuzin-desamino-diketo
Freundlich exponent (1/n)	0.91 0.95 0.94	Metribuzin Metribuzin-diketo Metribuzin-desamino-diketo
DT_{50} soil (20°C/pF2)	9.6 d 5.0 d 14.3 d	Metribuzin Metribuzin-diketo Metribuzin-desamino-diketo
Rate Constants:		
k total (d^{-1})	0.07220	Metribuzin: ln(2)/ DT_{50}
Metribuzin to metribuzin-diketo (d^{-1})	0.03610	Based on FF of 0.5
Metribuzin to CO_2/NER (d^{-1})	0.03610	Based on a FF of (1- 0.5)
k total (d^{-1})	0.13863	Metribuzin-diketo: ln(2)/ DT_{50}
Metribuzin-diketo to Metribuzin-desamino-diketo (d^{-1})	0.13863	Based on FF of 1
k total (d^{-1})	0.04847	Metribuzin-desamino-diketo: ln(2)/DT50
Metribuzin-desamino-diketo to CO_2/NER (d^{-1})	0.04847	Based on FF of 1

Parameter	Value	Comment
Danish endpoints[2]		
K_{FOC}	15 L/kg 44.1 L/kg 28.6 L/kg	Metribuzin Metribuzin-diketo Metribuzin-desamino-diketo
Freundlich exponent (1/n)	1.14 0.98 0.98	Metribuzin Metribuzin-diketo Metribuzin-desamino-diketo
DT_{50} soil (20°C/pF2)	15.7 d 5.3 d 17.9 d	Metribuzin Metribuzin-diketo Metribuzin-desamino-diketo
Rate Constants:		
k total (d^{-1})	0.04415	Metribuzin: ln(2)/ DT_{50}
Metribuzin to metribuzin-diketo (d^{-1})	0.02207	Based on FF of 0.5
Metribuzin to CO_2/NER (d^{-1})	0.02207	Based on a FF of (1- 0.5)
k total (d^{-1})	0.13078	Metribuzin-diketo: ln(2)/ DT_{50}
Metribuzin-diketo to Metribuzin-desamino-diketo (d^{-1})	0.13078	Based on FF of 1
k total (d^{-1})	0.03872	Metribuzin-desamino-diketo: ln(2)/ DT_{50}
Metribuzin-desamino-diketo to CO_2/NER (d^{-1})	0.03872	Based on FF of 1

[1] The aqueous solubility was measured at 20°C, however, in PELMO vapour pressure and aqueous solubility are required to be put in the same temperature, therefore the aqueous solubility at 20°C is assumed to be the aqueous solubility at 25°C.

[2.] Metribuzin is no longer on the DK market, and hence there are no recent DK assessments. The endpoints have been calculated from the EU endpoints (LoEP, corrected by DE in January 2012 (according to the EFSA conclusion.

Table A18-2: FOCUSMACRO 4.4.2 input parameters for ***metribuzin*** and ***metribuzin-diketo***[1]

Parameter	Value	Comment
Common endpoints – LoEP, corrected by DE in January 2012 (according to the EFSA conclusion)[1]		
Application rate/dates	See Table A9-3	Every third year
Molecular weight	214.3g/mol 184.19 g/mol	Metribuzin Metribuzin-diketo
Vapour pressure (25°C)	1.21×10^{-4} Pa 2.57×10^{-6} Pa	Metribuzin Metribuzin-diketo
Aqueous solubility (20°C)	1165 mg/L 1650 mg/L	Metribuzin Metribuzin-diketo
Molar enthalpy of dissolution	27000 J/mol	Model default
Plant uptake factor	0.5 0.5	Metribuzin Metribuzin-diketo
Formation fraction	0.5	Metribuzin to Metribuzin-diketo[2]
EU endpoints – LoEP, corrected by DE in January 2012 (according to the EFSA conclusion)		
K_{FOC}	37.1 L/kg 48.3 L/kg	Metribuzin Metribuzin-diketo
Freundlich exponent (1/n)	0.91 0.95	Metribuzin Metribuzin-diketo
DT_{50} soil (20°C/pF2)	9.6 d 5.0 d	Metribuzin Metribuzin-diketo
Danish endpoints[3]		
K_{FOC}	15 L/kg 44.1 L/kg	Metribuzin Metribuzin-diketo
Freundlich exponent (1/n)	1.14 0.98	Metribuzin Metribuzin-diketo
DT_{50} soil (20°C/pF2)	15.7 d 5.3 d	Metribuzin Metribuzin-diketo

1. As MACRO can only model parent to one metabolite, only metribuzin to metribuzin-diketo has been modelled.
2. Equivalent to 0.430 on a mass basis for entry into MACRO.
3. Metribuzin is no longer on the DK market, and hence there are no recent DK assessments. The endpoints have been calculated from the EU endpoints (LoEP, corrected by DE in January 2012 (according to the EFSA conclusion).

Table A18-3: Application parameters for PECgw ***metribuzin***

Crop	Application rate	Growth stage	Application date	EU endpoints		Danish endpoints	
				Interception rate[2]	Effective rate for soil loading	Deposition[3]	Effective rate for soil loading
Potatoes[1]	120 g/ha 120 g/ha 120 g/ha	Pre-emergence	10/04 25/04 10/05	0% 0% 0%	120 g/ha 120 g/ha 120 g/ha	100% 100% 100%	120 g/ha 120 g/ha 120 g/ha

1 Note, application is every third year.
2. The values are taken from the new guidance, EFSA (2014).
3. The values are taken from the Danish Evaluation Framework (2014).

A19 Pendimethalin

Table A19-1: FOCUSPELMO 5.5.3 input parameters for ***pendimethalin***

Parameter	Value	Comment
Common endpoints – New RAR from 2015 (LoEP not yet available)		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A25-3	Every year
Molecular weight	281.3 g/mol	Pendimethalin
Plant uptake factor	0.5	Pendimethalin
Vapour pressure (20°C)	3×10^{-4} Pa	Pendimethalin
Aqueous solubility (20°C)	0.330 mg/L	Pendimethalin
EU endpoints – New RAR from 2015 (LoEP not yet available)		
K_{FOC}	13792 L/kg	Pendimethalin
Freundlich exponent (1/n)	0.954	Pendimethalin
DT_{50} soil (20°C/pF2)	97.5 d	Pendimethalin
Danish endpoints – Calculated from the new RAR from 2015 (LoEP not yet available)		
K_{FOC}	10080 L/kg	Pendimethalin
Freundlich exponent (1/n)	0.969	Pendimethalin
DT_{50} soil (20°C/pF2)	157 d	Pendimethalin

Table A19-2: FOCUSMACRO 4.4.2 input parameters for ***pendimethalin***

Parameter	Value	Comment
Common endpoints – New RAR from 2015 (LoEP not yet available)		
Application rate/dates	See Table A25-3	Every year
Molecular weight	281.3 g/mol	Pendimethalin
Vapour pressure (20°C)	3×10^{-4} Pa	Pendimethalin
Aqueous solubility (20°C)	0.330 mg/L	Pendimethalin
Plant uptake factor	0.5	Pendimethalin
EU endpoints – New RAR from 2015 (LoEP not yet available)		
K_{FOC}	13792 L/kg	Pendimethalin
Freundlich exponent (1/n)	0.954	Pendimethalin
DT_{50} soil (20°C/pF2)	97.5 d	Pendimethalin
Danish endpoints – Calculated from the new RAR from 2015 (LoEP not yet available)		
K_{FOC}	10080 L/kg	Pendimethalin
Freundlich exponent (1/n)	0.969	Pendimethalin
DT_{50} soil (20°C/pF2)	157 d	Pendimethalin

Table A19-3: Application parameters for PECgw for ***pendimethalin***

Crop	Application rate	Growth stage[2]	Application date	EU endpoints		Danish endpoints	
				Interception rate[3]	Effective rate for soil loading	Deposition[4]	Effective rate for soil loading
Winter wheat[1]	2000 g/ha	0	15/09	0%	2000 g/ha	100%	2000 g/ha
	2000 g/ha	6	01/10	0%	2000 g/ha	100%	2000 g/ha
	2000 g/ha	13	15/10	0%	2000 g/ha	77%	1540 g/ha

1. Surrogate crop winter cereals.
2. GAP: BBCH 0 – 13.
3. The values are taken from the new guidance, EFSA (2014).
4. The values are taken from the Danish Evaluation Framework (2014). Note, values are not provided for BBCH 0 or 6, therefore 100% deposition has been assumed.

A20 Picolinafen and CL153815

Table A20-1: FOCUSPELMO 5.5.3 input parameters for ***picolinafen*** and ***CL 153815***

Parameter	Value	Comment
Common endpoints – New RAR from 2015 (LoEP not yet available)		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A26-3	Every year
Molecular weight	376.3 g/mol 283.3 g/mol	Picolinafen CL 153815
Plant uptake factor	0 0	Picolinafen CL 153815
Vapour pressure (20°C)	1.7×10^{-7} Pa 1.7×10^{-7} Pa	Picolinafen CL 153815[1]
Aqueous solubility (20°C)	0.047 mg/L (pH 7) 1000 mg/L	Picolinafen CL 153815 (default value)
Formation fraction	1 1	Picolinafen to CL 153815 CL 153815 to CO_2 bound residues
EU endpoints – New RAR from 2015 (LoEP not yet available)		
K_{FOC}	22475 L/kg 440 L/kg	Picolinafen CL 153815
Freundlich exponent (1/n)	0.993 0.955	Picolinafen CL 153815
DT_{50} soil (20°C/pF2)	6.1 d 29.0 d	Picolinafen CL 153815
Rate Constants: k total (d^{-1}) Picolinafen to CL 153815 (d^{-1}) k total (d^{-1}) CL 153815 to CO_2/NER (d^{-1})	 0.1136 0.1136 0.0239 0.0239	 Picolinafen: ln(2)/ DT_{50} Based on FF of 1 CL 153815: ln(2)/ DT_{50} Based on FF of 1
Danish endpoints – Calculated from new RAR from 2015 (LoEP not yet available)		
K_{FOC}	16260 L/kg 296.8 L/kg	Picolinafen CL 153815
Freundlich exponent (1/n)	1.01 0.99	Picolinafen CL 153815
DT_{50} soil (20°C/pF2)	8.38 d 44.98 d	Picolinafen CL 153815
Rate Constants: k total (d^{-1}) Picolinafen to CL 153815 (d^{-1}) k total (d^{-1}) CL 153815 to CO_2/NER (d^{-1})	 0.0827 0.0827 0.0154 0.0154	 Picolinafen: ln(2)/ DT_{50} Based on FF of 1 CL 153815: ln(2)/ DT_{50} Based on FF of 1

[1] *As parent.*

Table A20-2: FOCUSMACRO 4.4.2 input parameters for ***picolinafen*** and ***CL 153815***

Parameter	Value	Comment
Common endpoints – New RAR from 2015 (LoEP not yet available)		
Application rate/dates	See Table A26-3	Every year
Molecular weight	376.3 g/mol 283.3 g/mol	Picolinafen CL 153815
Vapour pressure (20°C)	1.7×10^{-7} Pa 1.7×10^{-7} Pa	Picolinafen CL 153815[1]
Aqueous solubility (20°C)	0.047 mg/L (pH 7) 1000 mg/L	Picolinafen CL 153815 (default value)
Plant uptake factor	0 0	Picolinafen CL 153815
Formation fraction	1	Picolinafen to CL 153815[2]
EU endpoints – New RAR from 2015 (LoEP not yet available)		
K_{FOC}	22475 L/kg 440 L/kg	Picolinafen CL 153815
Freundlich exponent (1/n)	0.993 0.955	Picolinafen CL 153815
DT_{50} soil (20°C/pF2)	6.1 d 29.0 d	Picolinafen CL 153815
Danish endpoints – calculated from new RAR from 2015 (LoEP not yet available)		
K_{FOC}	16260 L/kg 296.8 L/kg	Picolinafen CL 153815
Freundlich exponent (1/n)	1.01 0.99	Picolinafen CL 153815
DT_{50} soil (20°C/pF2)	8.38 d 44.98 d	Picolinafen CL 153815

1. As parent.
2. Equivalent to0.753 on a mass basis for entry into MACRO.

Table A20-3: Application parameters for PECgw for ***picolinafen***

Crop	Application rate	Growth stage	Application date	EU endpoints		Danish endpoints	
				Interception rate[2]	Effective rate for soil loading	Deposition[3]	Effective rate for soil loading
Winter wheat[1]	100 g/ha 100 g/ha 100 g/ha	11-12 11-12 11-12	20/09 05/10 20/10	0% 0% 0%	100 g/ha 100 g/ha 100 g/ha	77% 77% 77%	77 g/ha 77 g/ha 77 g/ha

1. Surrogate crop winter cereals.
2. The values are taken from the new guidance, EFSA (2014).
3. The values are taken from the Danish Evaluation Framework (2014).

A21 Pirimicarb and pirimicarb-desmethyl-formamido

Table A21-1: FOCUSPELMO 5.5.3 input parameters for ***pirimicarb*** and ***pirimicarb-desmethyl-formamido*** (R34885)

Parameter	Value	Comment
Common endpoints – LoEP 2005 and Footprint		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A10-3	Every year
Molecular weight	238.3 g/mol 124.2 g/mol	Pirimicarb Pirimicarb-desmethyl-formamido
Plant uptake factor	0.5 0.5	Pirimicarb Pirimicarb-desmethyl-formamido
Vapour pressure (20°C)	4.3×10^{-4} Pa 12.797 Pa	Pirimicarb Pirimicarb-desmethyl-formamido
Aqueous solubility (20°C)	3100 mg/L(pH 7.4) 4070 mg/L	Pirimicarb Pirimicarb-desmethyl-formamido
Formation fraction	0.62 0.38 1	Pirimicarb to CO_2 bound residues Pirimicarb to Pirimicarb-desmethyl-formamido Pirimicarb-desmethyl-formamido to CO_2 bound residues
EU endpoints – LoEP 2005		
K_{FOC}	290 L/kg 269 L/kg	Pirimicarb Pirimicarb-desmethyl-formamido
Freundlich exponent (1/n)	0.85 0.92	Pirimicarb Pirimicarb-desmethyl-formamido
DT_{50} soil (20°C/pF2)	150 d 18 d	Pirimicarb (worst-case lab) Pirimicarb-desmethyl-formamido
Rate Constants: k total (d^{-1}) Pirimicarb to Pirimicarb-desmethyl-formamido (d^{-1}) Pirimicarb to CO_2/NER (d^{-1}) k total (d^{-1}) Pirimicarb-desmethyl-formamido to CO_2/NER (d^{-1})	 0.00462 0.00176 0.00286 0.03851 0.03851	 Pirimicarb: ln(2)/ DT_{50} Based on FF of 0.38 Based on a FF of (1- 0.38) Pirimicarb-desmethyl-formamido: ln(2)/ DT_{50} Based on FF of 1
Danish endpoints – DK evaluation of Pirimor in 2011		
K_{FOC}	63.6 L/kg 117 L/kg	Pirimicarb Pirimicarb-desmethyl-formamido
Freundlich exponent (1/n)	0.89 0.94	Pirimicarb Pirimicarb-desmethyl-formamido
DT_{50} soil (20°C/pF2)	150 d 21.8 d	Pirimicarb (worst-case lab) Pirimicarb-desmethyl-formamido

Parameter	Value	Comment
Rate Constants:		
k total (d^{-1})	0.00462	Pirimicarb: ln(2)/ DT_{50}
Pirimicarb to Pirimicarb-desmethyl-formamido (d^{-1})	0.00176	Based on FF of 0.38
Pirimicarb to CO_2/NER (d^{-1})	0.00286	Based on a FF of (1- 0.38)
k total (d^{-1})	0.03180	Pirimicarb-desmethyl-formamido: ln(2)/ DT_{50}
Pirimicarb-desmethyl-formamido to CO_2/NER (d^{-1})	0.03180	Based on FF of 1

Table A21-2: FOCUSMACRO 4.4.2 input parameters for ***pirimicarb*** and ***pirimicarb-desmethyl-formamido***

Parameter	Value	Comment
Common endpoints– LoEP 2005 and Footprint		
Application rate/dates	See Table A10-3	Every year
Molecular weight	238.3 g/mol 124.2 g/mol	Pirimicarb Pirimicarb-desmethyl-formamido
Vapour pressure (20°C)	4.3×10^{-4} Pa 12.797 Pa	Pirimicarb Pirimicarb-desmethyl-formamido
Aqueous solubility (20°C)	3100 mg/L(pH 7.4) 4070 mg/L	Pirimicarb Pirimicarb-desmethyl-formamido
Plant uptake factor	0.5 0.5	Pirimicarb Pirimicarb-desmethyl-formamido
Formation fraction	0.38	Pirimicarb to Pirimicarb-desmethyl-formamido[1]
EU endpoints– LoEP 2005		
K_{FOC}	290 L/kg 269 L/kg	Pirimicarb Pirimicarb-desmethyl-formamido
Freundlich exponent (1/n)	0.85 0.92	Pirimicarb Pirimicarb-desmethyl-formamido
DT_{50} soil (20°C/pF2)	150 d 18 d	Pirimicarb Pirimicarb-desmethyl-formamido
Danish endpoints – DK evaluation of Pirimor in 2011		
K_{FOC}	63.6 L/kg 117 L/kg	Pirimicarb Pirimicarb-desmethyl-formamido
Freundlich exponent (1/n)	0.89 0.94	Pirimicarb Pirimicarb-desmethyl-formamido
DT_{50} soil (20°C/pF2)	150 d 21.8 d	Pirimicarb Pirimicarb-desmethyl-formamido

[1.] Equivalent to 0.198 on a mass basis for entry into MACRO.

Table A21-3: Application parameters for PECgw for ***pirimicarb***

Crop	Application rate	Growth stage[1]	Application date	EU endpoints		Danish endpoints	
				Interception rate[2]	Effective rate for soil loading	Deposition[3]	Effective rate for soil loading
Sugar beet	150 g/ha	13-19	01/06	20%	120 g/ha	81%[4]	121.5 g/ha
	150 g/ha	20-39	25/06	70%	45 g/ha	32%[5]	48 g/ha
	150 g/ha	40-45	01/08	90%	15 g/ha	8%[6]	12 g/ha

[1.] *The GAP says 13 – 45 which is June – October.*
[2.] *The values are taken from the new guidance, EFSA (2014).*
[3.] *The values are taken from the Danish Evaluation Framework (2014).*
[4.] *BBCH 15-18.*
[3.] *BBCH 30-35.*
[4.] *BBCH 39, which is the highest BBCH in the table.*

A22 Propiconazole

Table A22-1: FOCUSPELMO 5.5.3 input parameters for ***propiconazole***

Parameter	Value	Comment
Common endpoints – Danish registration report for Barclay 2013		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A17-3	Every year
Molecular weight	342 g/mol	Propiconazole
Plant uptake factor	0.5	Propiconazole
Vapour pressure (25°C)	5.6×10^{-5} Pa	Propiconazole
Aqueous solubility (20°C)	150 mg/L (pH 5.2)	Propiconazole[1]
EU endpoints – Danish registration report for Barclay 2013		
K_{FOC}	685 L/kg	Propiconazole
Freundlich exponent (1/n)	0.9	Propiconazole, default
DT_{50} soil (20°C/pF2)	65 d	Propiconazole, calculated from field DT_{50}
Danish endpoints – Danish registration report for Barclay 2013		
K_{FOC}	537 L/kg	Propiconazole
Freundlich exponent (1/n)	0.9	Propiconazole, default
DT_{50} soil (20°C/pF2)	133 d	Propiconazole, 80^{th} percentile from field DT_{50} data

[1] *The aqueous solubility was measured at 20°C, however, in PELMO vapour pressure and aqueous solubility are required to be put in the same temperature, therefore the aqueous solubility at 20°C is assumed to be the aqueous solubility at 25°C.*

Table A22-2: FOCUSMACRO 4.4.2 input parameters for ***propiconazole***

Parameter	Value	Comment
Common endpoints – Danish registration report for Barclay 2013		
Application rate/dates	See Table A17-3	Every year
Molecular weight	342 g/mol	Propiconazole
Vapour pressure (25°C)	5.6×10^{-5} Pa	Propiconazole
Aqueous solubility (20°C)	150 mg/L (pH 5.2)	Propiconazole
Molar enthalpy of dissolution	27000 J/mol	Model default
Plant uptake factor	0.5	Propiconazole
EU endpoints – Danish registration report for Barclay 2013		
K_{FOC}	685 L/kg	Propiconazole (median)
Freundlich exponent (1/n)	0.9	Propiconazole, default
DT_{50} soil (20°C/pF2)	65 d	Propiconazole, calculated from field DT_{50}
Danish endpoints – Danish registration report for Barclay 2013		
K_{FOC}	537 L/kg	Propiconazole
Freundlich exponent (1/n)	0.9	Propiconazole, default
DT_{50} soil (20°C/pF2)	133 d	Propiconazole, 80^{th} percentile from field DT_{50} data

Table A22-3: Application parameters for PECgw for ***propiconazole***

Crop	Application rate	Growth stage[2]	Application date	EU endpoints		Danish endpoints	
				Interception rate[3]	Effective rate for soil loading	Deposition[4]	Effective rate for soil loading
Spring barley[1]	125 g/ha	26	15/05	20%	100 g/ha	49%[5]	61.25 g/ha
	125 g/ha	35	01/06	80%	25 g/ha	27%	33.75 g/ha
	125 g/ha	51	15/06	90%	12.5 g/ha	18%[6]	22.4 g/ha

[1.] *Surrogate crop spring cereals.*
[2.] *GAP: BBCH 26 – 51, May – June.*
[3.] *The values are taken from the new guidance, EFSA (2014).*
[4.] *The values are taken from the Danish Evaluation Framework (2014)..*
[5.] *Average of deposition at BBCH 20-24 and BBCH 28-32.*
[6.] *BBCH 50.*

A23 Prosulfocarb

Table A23-1: FOCUSMACRO 4.4.2 input parameters for ***prosulfocarb***

Parameter	Value	Comment
Common endpoints – LoEP 2007		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A18-3	Every year
Molecular weight	251.4 g/mol	Prosulfocarb
Plant uptake factor	0	Prosulfocarb
Vapour pressure (20°C)	7.9 x 10^{-4} Pa	Prosulfocarb
Aqueous solubility (20°C)	13 mg/L (pH 6.1)	Prosulfocarb
EU endpoints – LoEP 2007		
K_{FOC}	1693 L/kg	Prosulfocarb
Freundlich exponent (1/n)	0.96	Prosulfocarb
DT_{50} soil (20°C/pF2)	11.9 d	Prosulfocarb
Danish endpoints – Danish evaluation of Boxer, 2012 and calculated from LoEP		
K_{FOC}	1369 L/kg	Prosulfocarb
Freundlich exponent (1/n)	1.00	Prosulfocarb
DT_{50} soil (20°C/pF2)	20 d	Prosulfocarb

Table A23-2: FOCUSMACRO 4.4.2 input parameters for ***prosulfocarb***

Parameter	Value	Comment
Common endpoints EU endpoints – LoEP 2007		
Application rate/dates	See Table A18-3	Every year
Molecular weight	251.4 g/mol	Prosulfocarb
Vapour pressure (20°C)	7.9 x 10^{-4} Pa	Prosulfocarb
Aqueous solubility (20°C)	13 mg/L (pH 6.1)	Prosulfocarb
Plant uptake factor	0	Prosulfocarb
EU endpoints EU endpoints – LoEP 2007		
K_{FOC}	1693 L/kg	Prosulfocarb
Freundlich exponent (1/n)	0.96	Prosulfocarb
DT_{50} soil (20°C/pF2)	11.9 d	Prosulfocarb
Danish endpoints – Danish evaluation of Boxer, 2012 and calculated from LoEP		
K_{FOC}	1369 L/kg	Prosulfocarb
Freundlich exponent (1/n)	1.00	Prosulfocarb
DT_{50} soil (20°C/pF2)	20 d	Prosulfocarb

Table A23-3: Application parameters for PECgw for ***prosulfocarb***

Crop	Application rate	Growth stage[2]	Application date	EU endpoints		Danish endpoints	
				Interception rate[3]	Effective rate for soil loading	Deposition[4]	Effective rate for soil loading
Winter wheat[1]	4000 g/ha	0	20/09	0%	4000 g/ha	100%	4000 g/ha
	4000 g/ha	11	05/10	0%	4000 g/ha	77%	3080 g/ha
	4000 g/ha	19	20/10	0%	4000 g/ha	77%[5]	3080 g/ha

1. *Surrogate crop winter cereals.*
2. *GAP: BBCH 0 – 21. Autumn application in PLAP.*
3. *The values are taken from the new guidance, EFSA (2014).*
4. *The values are taken from the Danish Evaluation Framework (2014).*
5. *As for BBCH 11 – 13.*

A24 Pyridate and PHCP

Table A24-1: FOCUSPELMO 5.5.3 input parameters for ***pyridate*** and ***PHCP*** (pyridafol)

Parameter	Value	Comment
Common endpoints – LoEP, revised 2015, and Footprint		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A19-3	Every year
Molecular weight	378.9 g/mol 206.6 g/mol	Pyridate PHCP
Plant uptake factor	0 0	Pyridate PHCP
Vapour pressure (25°C)	9.98×10^{-7} Pa 1.94×10^{-7} Pa	Pyridate PHCP
Aqueous solubility (20°C)	1.49 mg/L (pH 7) 1638 mg/L	Pyridate[1] PHCP
Formation fraction	1	Pyridate to PHCP (Pyridafol)
EU endpoints – LoEP, revised 2015		
K_{FOC}	223800 L/kg 41.5 L/kg	Pyridate (HPLC method) PHCP
Freundlich exponent (1/n)	1 0.77	Pyridate (default) PHCP
DT_{50} soil (20°C/pF2)	1.0 d 11.5 d	Pyridate (lab + field) PHCP (field)
Rate Constants: k total (d^{-1}) Pyridate to PHCP (d^{-1}) k total (d^{-1}) PHCP to CO_2/NER (d^{-1})	 0.6931 0.6931 0.0603 0.0603	 Pyridate: ln(2)/ DT_{50} Based on FF of 1 PHCP: ln(2)/ DT_{50} Based on FF of 1
Danish endpoints – Calculated from LoEP revised 2015		
K_{FOC}	223800 L/kg 18.4 L/kg	Pyridate (HPLC method) PHCP
Freundlich exponent (1/n)	1 0.83	Pyridate PHCP
DT_{50} soil (20°C/pF2)	2.12 d 29.72 d	Pyridate (lab+field) PHCP (field)
Rate Constants: k total (d^{-1}) Pyridate to PHCP (d^{-1}) k total (d^{-1}) PHCP to CO_2/NER (d^{-1})	 0.3270 0.3270 0.0233 0.0233	 Pyridate: ln(2)/ DT_{50} Based on FF of 1 PHCP: ln(2)/ DT_{50} Based on FF of 1

[1]. The aqueous solubility was measured at 20°C, however, in PELMO vapour pressure and aqueous solubility are required to be put in the same temperature, therefore the aqueous solubility at 20°C is assumed to be the aqueous solubility at 25°C.

Table A24-2: FOCUSMACRO 4.4.2 input parameters for ***pyridate*** and ***PHCP***

Parameter	Value	Comment
Common endpoints – LoEP, revised 2015, and Footprint		
Application rate/dates	See Table A19-3	Every year
Molecular weight	378.9 g/mol 206.6 g/mol	Pyridate PHCP
Vapour pressure (25°C)	9.98×10^{-7} Pa 1.94×10^{-7} Pa	Pyridate PHCP
Aqueous solubility (20°C)	1.49 mg/L (pH 7) 1638 mg/L	Pyridate PHCP
Plant uptake factor	0 0	Pyridate PHCP
Formation fraction	1	Pyridate to PHCP[1]
EU endpoints – LoEP revised 2015		
K_{FOC}	223800 L/kg 41.5 L/kg	Pyridate (HPLC method) PHCP
Freundlich exponent (1/n)	1 0.77	Pyridate (default) PHCP
DT_{50} soil (20°C/pF2)	1.0 d 11.5 d	Pyridate (lab + field) PHCP (field)
Danish endpoints – Calculated from LoEP 2015		
K_{FOC}	223800 L/kg 18.4 L/kg	Pyridate (HPLC method) PHCP
Freundlich exponent (1/n)	1 0.83	Pyridate PHCP
DT_{50} soil (20°C/pF2)	2.12 d 29.72 d	Pyridate (lab + field) PHCP (field)

[1.] Equivalent to 0.545on a mass basis for entry into MACRO.

Table A24-3: Application parameters for PECgw for ***pyridate***

Crop	Application rate	Number of application per year	Number of days between applications	Growth stage	Application date	EU endpoints		Danish endpoints	
						Interception rate[1]	Effective rate for soil loading	Deposition[2]	Effective rate for soil loading
Maize	240 g/ha	2	14	10	10/05	25%	180 g/ha	75%	180 g/ha
	240 g/ha	2	14	19	25/05	25%	180 g/ha	75%	180 g/ha
	240 g/ha	2	14	29	10/06	50%	120 g/ha	50%	120 g/ha

[1.] *The values are taken from the new guidance, EFSA (2014).*
[2.] *The values are taken from the Danish Evaluation Framework (2014).*

A25 Rimsulfuron and PPU

Table A25-1: FOCUSPELMO 5.5.3 input parameters for ***rimsulfuron*** and ***PPU***

Parameter	Value	Comment
	Common endpoints – LoEP 2005	
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A11-3	Every third year
Molecular weight	431.45 g/mol 337 g/mol	Rimsulfuron PPU
Plant uptake factor	0.5 0.5	Rimsulfuron PPU
Vapour pressure (20°C)	8.9×10^{-7} Pa 8.9×10^{-7} Pa	Rimsulfuron PPU[1]
Aqueous solubility (20°C)	7300 mg/L (pH 7) 7300 mg/L (pH 7)	Rimsulfuron PPU[1]
pKa	20	Note, Rimsulfuron is a weak acid (pKa 4), however, pH dependant sorption was not considered during the modelling
Formation fraction	0.43 0.57 1	Rimsulfuron to CO_2 bound residues Rimsulfuron to PPU PPU to CO_2 bound residues
	EU endpoints – LoEP 2005	
K_{FOC}	47 L/kg 42 L/kg	Rimsulfuron PPU
Freundlich exponent (1/n)	1.02 0.94	Rimsulfuron PPU
DT_{50} soil (20°C/pF2)	22 d 140 d	Rimsulfuron PPU
Rate Constants:		
k total (d^{-1})	0.03151	Rimsulfuron: ln(2)/ DT_{50}
Rimsulfuron to PPU (d^{-1})	0.01796	Based on FF of 0.57
Rimsulfuron to CO_2/NER (d^{-1})	0.01355	Based on a FF of (1- 0.57)
k total (d^{-1})	0.00495	PPU: ln(2)/ DT_{50}
PPU to CO_2/NER (d^{-1})	0.00495	Based on FF of 1
	Danish endpoints – Danish evaluation 2011	
K_{FOC}	37.6 L/kg 37 L/kg	Rimsulfuron PPU
Freundlich exponent (1/n)	1.08 0.95	Rimsulfuron PPU
DT_{50} soil (20°C/pF2)[1]	38.8 d 375.2 d	Rimsulfuron PPU
Rate Constants:	0.01786	Rimsulfuron: ln(2)/ DT_{50}
k total (d^{-1})	0.01018	Based on FF of 0.57
Rimsulfuron to PPU (d^{-1})	0.00768	Based on a FF of (1- 0.43)
Rimsulfuron to CO_2/NER (d^{-1})	0.001847	PPU: ln(2)/ DT_{50}
k total (d^{-1})	0.001847	Based on FF of 1
PPU to CO_2/NER (d^{-1})		

1. As parent.
2. These are lab values. A Tier 2 was done using field DT_{50}.

Table A25-2: FOCUSMACRO 4.4.2 input parameters for ***rimsulfuron*** and ***PPU***

Parameter	Value	Comment
Common endpoints – LoEP 2005		
Application rate/dates	See Table A11-3	Every third year
Molecular weight	431.45 g/mol 337 g/mol	Rimsulfuron PPU
Vapour pressure (20°C)	8.9×10^{-7} Pa 8.9×10^{-7} Pa	Rimsulfuron PPU[1]
Aqueous solubility (20°C)	7300 mg/L (pH 7) 7300 mg/L (pH 7)	Rimsulfuron PPU[1]
Molar enthalpy of dissolution	27000 J/mol	Model default
Plant uptake factor	0.5 0.5	Rimsulfuron PPU
Formation fraction	0.57	Rimsulfuron to PPU[2]
EU endpoints – LoEP 2005		
K_{FOC}	47 L/kg 42 L/kg	Rimsulfuron PPU
Freundlich exponent (1/n)	1.02 0.94	Rimsulfuron PPU
DT_{50} soil (20°C/pF2)	22 d 140 d	Rimsulfuron PPU
Danish endpoints – Danish evaluation 2011		
K_{FOC}	37.6 L/kg 37 L/kg	Rimsulfuron PPU
Freundlich exponent (1/n)	1.08 0.95	Rimsulfuron PPU
DT_{50} soil (20°C/pF2)	38.8 d 375.2 d	Rimsulfuron PPU

1. As parent.
2. Equivalent to 0.445 on a mass basis for entry into MACRO.

Table A25-3: Application parameters for PECgw for ***rimsulfuron***

Crop	Application rate	Growth stage[2]	Application date	EU endpoints: Interception rate[3]	EU endpoints: Effective rate for soil loading	Danish endpoints: Deposition[4]	Danish endpoints: Effective rate for soil loading
Potatoes[1]	7.5 g/ha	0 – 9	25/04	0%	7.5 g/ha	100%	7.5 g/ha
	7.5 g/ha	18 – 19	15/05	15%	6.375 g/ha	97%	7.275 g/ha
	7.5 g/ha	30 – 32	10/06	60%	3 g/ha	91%	6.825 g/ha

1. Application every third year.
2. GAP says BBCH 0 – 32 which is April –June.
3. The values are taken from the new guidance, EFSA (2014).
4. The values are taken from the Danish Evaluation Framework (2014).

A26 Tebuconazole and 1,2,4-triazol

Table A26-1: FOCUSPELMO 5.5.3 input parameters for ***tebuconazole*** and ***1,2,4-triazol***

Parameter	Value	Comment
Common endpoints - LoEP 2014 and UK evaluation of 1,2,4-triazole 2013		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A12-3	Every year
Molecular weight	307.8 g/mol 69.1 g/mol	Tebuconazole 1,2,4-triazol
Plant uptake factor	0 0	Tebuconazole 1,2,4-triazol
Vapour pressure (20°C)	1.3×10^{-6} Pa 0 Pa	Tebuconazole 1,2,4-triazol (default)
Aqueous solubility (20°C)	36 mg/L 730,000 mg/L	Tebuconazole 1,2,4-triazol
EU endpoints – LoEP 2014 and UK evaluation of 1,2,4-triazole 2013		
Formation fraction	0.489 0.511 1 1	Tebuconazole to 1,2,4-triazol (fast) Tebuconazole to 1,2,4-triazol (slow) 1,2,4-triazol (fast) to CO_2 bound residues 1,2,4-triazol (slow) to CO_2 bound residues
K_{FOC}	769 L/kg 89 L/kg	Tebuconazole 1,2,4-triazol
Freundlich exponent (1/n)	0.845 0.92	Tebuconazole 1,2,4-triazol
DT_{50} soil (20°C/pF2)	39.3 d 1.7 d 60.5 d	Tebuconazole 1,2,4-triazol (fast) 1,2,4-triazol (slow)
Rate Constants fast phase:		
k total (d^{-1})	0.01764	Tebuconazole: ln(2)/ DT_{50}
Tebuconazole to 1,2,4-triazol (fast) (d^{-1})	0.00863	Based on FF of: 0.489
Tebuconazole to 1,2,4-triazol (slow) (d^{-1})	0.00901	Based on a FF of 0.511
k total (d^{-1})	0.40773	1,2,4-triazol (fast): ln(2)/ DT_{50}
1,2,4-triazol (fast) to CO_2/NER (d^{-1})	0.40773	Based on FF of 1
k total (d^{-1})	0.01146	1,2,4-triazol (slow): ln(2)/ DT_{50}
1,2,4-triazol (slow) to CO_2/NER (d^{-1})	0.01146	Based on FF of 1
Danish endpoints – From DK evaluations 2015		
Formation fraction	0.655 0.345 1 1	Tebuconazole to 1,2,4-triazol (fast) Tebuconazole to 1,2,4-triazol (slow) 1,2,4-triazol (fast) to CO_2 bound residues 1,2,4-triazol (slow) to CO_2 bound residues
K_{FOC}	451 L/kg 70.6 L/kg	Tebuconazole 1,2,4-triazol
Freundlich exponent (1/n)	0.955 0.96	Tebuconazole 1,2,4-triazol
DT_{50} soil (20°C/pF2)	41 d 2.5 d 70.7 d	Tebuconazole 1,2,4-triazol (fast) 1,2,4-triazol (slow)

Parameter	Value	Comment
Rate Constants fast phase:		
k total (d^{-1})	0.01691	Tebuconazole: ln(2)/ DT_{50}
Tebuconazole to 1,2,4-triazol (fast) (d^{-1})	0.01108	Based on FF of: 0.655
Tebuconazole to 1,2,4-triazol (slow) (d^{-1})	0.00583	Based on a FF of 0.345
k total (d^{-1})	0.27726	1,2,4-triazol (fast): ln(2)/ DT_{50}
1,2,4-triazol (fast) to CO_2/NER (d^{-1})	0.27726	Based on FF of 1
k total (d^{-1})	0.00980	1,2,4-triazol (slow): ln(2)/ DT_{50}
1,2,4-triazol (slow) to CO_2/NER (d^{-1})	0.00980	Based on FF of 1

Table A26-2: FOCUSMACRO 4.4.2 input parameters for ***tebuconazole*** and ***1,2,4-triazol***

Parameter	Value	Comment
Common endpoints – LoEP 2014 and UK evaluation of 1,2,4-triazole 2013		
Application rate/dates	See Table A12-3	Every year
Molecular weight	307.8 g/mol 69.1 g/mol	Tebuconazole 1,2,4-triazol
Vapour pressure (20°C)	1.3×10^{-6} Pa 0 Pa	Tebuconazole 1,2,4-triazol (default)
Aqueous solubility (20°C)	36 mg/L 730,000 mg/L	Tebuconazole 1,2,4-triazol
Plant uptake factor	0 0	Tebuconazole 1,2,4-triazol
EU endpoints – LoEP 2014 and UK evaluation of 1,2,4-triazole 2013		
Formation fraction	0.489 0.511	Tebuconazole to 1,2,4-triazol (fast)[1,2] Tebuconazole to 1,2,4-triazol (slow)[1,3]
K_{FOC}	769 L/kg 89 L/kg	Tebuconazole 1,2,4-triazol
Freundlich exponent (1/n)	0.845 0.92	Tebuconazole 1,2,4-triazol
DT_{50} soil (20°C/pF2)	39.3 d 1.7 d 60.5 d	Tebuconazole 1,2,4-triazol (fast) 1,2,4-triazol (slow)
Danish endpoints – From DK evaluations 2015		
Formation fraction	0.655 0.345	Tebuconazole to 1,2,4-triazol (fast)[1,4] Tebuconazole to 1,2,4-triazol (slow)[1,5]
K_{FOC}	451 L/kg 70.6 L/kg	Tebuconazole 1,2,4-triazol
Freundlich exponent (1/n)	0.955 0.96	Tebuconazole 1,2,4-triazol
DT_{50} soil (20°C/pF2)	41 d 2.5 d 70.7 d	Tebuconazole 1,2,4-triazol (fast) 1,2,4-triazol (slow)

1. MACRO can only model parent to one metabolite, therefore, tebuconazole to 1,2,4-triazol (fast) will be modelled and in a separate run tebuconazole to 1,2,4-triazol (slow).
2. Equivalent to 0.110 on a mass basis for entry into MACRO.
3. Equivalent to 0.147 on a mass basis for entry into MACRO.
4. Equivalent to 0.115 on a mass basis for entry into MACRO.
5. Equivalent to 0.077 on a mass basis for entry into MACRO.

Table A26-3: Application parameters for PECgw for ***tebuconazole***

Crop	Application rate[2]	Growth stage[3]	Application date	EU endpoints		Danish endpoints	
				Interception rate[4]	Effective rate for soil loading	Deposition[5]	Effective rate for soil loading
Winter wheat[1]	500 g/ha	30 – 32	01/06	80%	100 g/ha	42%	210 g/ha
	500 g/ha	40 – 45	20/06	90%	50 g/ha	10%	50 g/ha
	500 g/ha	50 – 69	15/07	90%	50 g/ha	4%	20 g/ha

1. Surrogate crop winter cereals.
2. Due to the bi-phasic modelling being considered for 1,2,4-triazole and that 1/n <1, the application rate 250 g/ha has been doubled and the output divided by two.
3. GAP: BBCH 30 – 69, which is June and July.
4. The values are taken from the new guidance, EFSA (2014).
5. The values are taken from the Danish Evaluation Framework (2014).

A27 Terbuthylazine, desethyl-terbuthylazine and desisopropyl-atrazine

Table A27-1: FOCUSPELMO 5.5.3 input parameters for ***terbuthylazine***, ***desethyl-terbuthylazine*** (MT1), ***desisopropyl-atrazine*** (MT13)

Parameter	Value	Comment
Common endpoints – LoEP and DAR 2011 and Footprint		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A13-3	Every year
Molecular weight	229.7 g/mol 201.7 g/mol 211.3 g/mol	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
Plant uptake factor	0.5 0.5 0.5	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
Vapour pressure (25°C)	0.00012 Pa 0.00035 Pa 7.6×10^{-7} Pa	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
Aqueous solubility (20°C)	8.5 mg/L 327.1 mg/L 7.19 mg/L	Terbuthylazine[1] Desethyl-terbuthylazine Desisopropyl-atrazine
Formation fraction	0.343 0.45 0.207 1 1	Terbuthylazine to CO_2 bound residues Terbuthylazine to Desethyl-terbuthylazine Terbuthylazine to Desisopropyl-atrazine Desethyl-terbuthylazine to CO_2 bound residues Desisopropyl-atrazine to CO_2 bound residues
Individual rate correction in soil: temperature Q_{10} relative moisture moisture exponent	 20ºC 2.2 100% 0.7	 - EFSA recommended value - Model default

Parameter	Value	Comment
EU endpoints – LoEP 2011		
K_{FOC}	231 L/kg 72.2 L/kg 187 L/kg	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
Freundlich exponent (1/n)	0.93 0.91 0.91	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
DT_{50} soil (20°C/pF2)	19.4 d 29.6 d 305 d	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
Rate Constants:		
k total (d^{-1})	0.03573	Terbuthylazine: ln(2)/ DT_{50}
Terbuthylazine to desethyl-terbuthylazine (d^{-1})	0.01608	Based on FF of 0.45
Terbuthylazine to desisopropyl-atrazine (d^{-1})	0.00740	Based on FF of 0.207
Terbuthylazine to CO_2/NER (d^{-1})	0.01226	Based on a FF of (1- 0.45-0.207)
k total (d^{-1})	0.02342	Desethyl-terbuthylazine: ln(2)/ DT_{50}
Desethyl-terbuthylazine to CO_2/NER (d^{-1})	0.02342	Based on FF of 1
k total (d^{-1})	0.00227	Desisopropyl-atrazine: ln(2)/ DT_{50}
Desisopropyl-atrazine to CO_2/NER (d^{-})	0.00227	Based on FF of 1
Danish endpoints – Calculated from LoEP 2011		
K_{FOC}	189.4 L/kg 63.9 L/kg 154.8 L/kg	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
Freundlich exponent (1/n)	0.95 0.94 0.90	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
DT_{50} soil (20°C/pF2)	31.02 d 57.7 d 418.8 d	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
Rate Constants:		
k total (d^{-1})	0.02235	Terbuthylazine: ln(2)/ DT_{50}
Terbuthylazine to desethyl-terbuthylazine (d^{-1})	0.01006	Based on FF of 0.45
Terbuthylazine to desisopropyl-atrazine (d^{-1})	0.00463	Based on FF of 0.207
Terbuthylazine to CO_2/NER (d^{-1})	0.00766	Based on a FF of (1- 0.45-0.207)
k total (d^{-1})	0.01201	Desethyl-terbuthylazine: ln(2)/ DT_{50}
Desethyl-terbuthylazine to CO_2/NER (d^{-1})	0.01201	Based on FF of 1
k total (d^{-1})	0.00166	Desisopropyl-atrazine: ln(2)/ DT_{50}
Desisopropyl-atrazine to CO_2/NER (d^{-})	0.00166	Based on FF of 1

[1] *The aqueous solubility was measured at 20°C, however, in PELMO vapour pressure and aqueous solubility are required to be put in the same temperature, therefore the aqueous solubility at 20°C is assumed to be the aqueous solubility at 25°C.*

Table A27-2: FOCUSMACRO 4.4.2 input parameters for ***terbuthylazine***, ***desethyl-terbuthylazine***, ***desisopropyl-atrazine***

Parameter	Value	Comment
Common endpoints – LoEP and DAR 2011 and Footprint		
Application rate/dates	See Table A13-3	Every year
Molecular weight	229.7 g/mol 201.7 g/mol 211.3 g/mol	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
Vapour pressure (25°C)	0.00012 Pa 0.00035 Pa 7.6×10^{-7} Pa	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
Aqueous solubility (20°C)	8.5 mg/L 327.1 mg/L 7.19 mg/L	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
Plant uptake factor	0.5 0.5 0.5	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
Effect of temperature MACRO Exponent (1/K)	0.0790	Model default
Formation fraction	0.45 0.207	Terbuthylazine to Desethyl-terbuthylazine[1,2] Terbuthylazine to Desisopropyl-atrazine [1,3]
EU endpoints – LoEP 2011		
K_{FOC}	231 L/kg 72.2 L/kg 187 L/kg	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
Freundlich exponent (1/n)	0.93 0.91 0.91	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
DT_{50} soil (20°C/pF2)	19.4 d 29.6 d 305 d	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
Danish endpoints – Calculated from the LoEP 2011		
K_{FOC}	189.4 L/kg 63.9 L/kg 154.8 L/kg	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
Freundlich exponent (1/n)	0.95 0.94 0.90	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine
DT_{50} soil (20°C/pF2)	31.02 d 57.7 d 418.8 d	Terbuthylazine Desethyl-terbuthylazine Desisopropyl-atrazine

1. MACRO can only model parent to one metabolite, therefore, terbuthylazine to desethyl-terbuthylazine will be modelled in a separate run to terbuthylazine to desisopropyl-atrazine.
2. Equivalent to 0.395 on a mass basis for entry into MACRO.
3. Equivalent to 0.190on a mass basis for entry into MACRO.

Table A27-3: Application parameters for PECgw for ***terbuthylazine***

Crop	Application rate	Growth stage	Application date	EU endpoints		Danish endpoints	
				Interception rate[1]	Effective rate for soil loading	Deposition[2]	Effective rate for soil loading
Maize	500 g/ha	05 – 09	01/05	0%	500 g/ha	100 %	500 g/ha
	500 g/ha	10 – 15	15/05	25%	375 g/ha	75 %	375 g/ha
	500 g/ha	15 – 19	30/05	25%	375 g/ha	75 %	375 g/ha

1. The values are taken from the new guidance, EFSA (2014).
2. The values are taken from the Danish EPA Guidance (2014).

A28 Triasulfuron and IN-A4098

Table A28-1: FOCUSPELMO 5.5.3 input parameters for ***triasulfuron*** and ***IN-A4098*** **(CGA150829)**

Parameter	Value	Comment
Common endpoints – LoEP 2015 and Footprint		
Application mode	Soil	With correction of rate for crop interception
Application rate/dates	See Table A27-3	Every year
Molecular weight	401.8 g/mol 140.1 g/mol	Triasulfuron IN-A4098
Plant uptake factor	0 0	Triasulfuron IN-A4098
Vapour pressure (25°C)	2.1×10^{-6} Pa 0 Pa	Triasulfuron IN-A4098 (default)
Aqueous solubility (20°C)	815 mg/L 1000 mg/L	Triasulfuron[1] IN-A4098 (default)
Formation fraction	0.77 0.23 1	Triasulfuron to CO_2 bound residues Triasulfuron to IN-A4098 IN-A4098to CO_2 bound residues
EU endpoints – LoEP 2015		
K_{FOC}	10.6 L/kg 45.5 L/kg	Triasulfuron IN-A4098
Freundlich exponent (1/n)	0.85 0.90	Triasulfuron IN-A4098
DT_{50} soil (20°C/pF2)	59.1 d 146.5 d	Triasulfuron IN-A4098 (median without defaults values)
Rate Constants:		
k total (d^{-1})	0.01173	Triasulfuron: ln(2)/ DT_{50}
Triasulfuron to IN-A4098 (d^{-1})	0.00270	Based on FF of 0.23
Triasulfuron to CO_2/NER (d^{-1})	0.00903	Based on a FF of (1- 0.23)
k total (d^{-1})	0.00473	IN-A4098: ln(2)/ DT_{50}
IN-A4098 to CO_2/NER (d^{-1})	0.00473	Based on FF of 1
Danish endpoints – Calculated from LoEP 2015		
K_{FOC}	8.7 L/kg 19.14 L/kg	Triasulfuron IN-A4098
Freundlich exponent (1/n)	0.90 0.936	Triasulfuron IN-A4098
DT_{50} soil (20°C/pF2)	85.42 d 201.6 d	Triasulfuron IN-A4098 (without defaults)
Rate Constants:		
k total (d^{-1})	0.00812	Triasulfuron: ln(2)/ DT_{50}
Triasulfuron to IN-A4098 (d^{-1})	0.00187	Based on FF of 0.23
Triasulfuron to CO_2/NER (d^{-1})	0.00625	Based on a FF of (1- 0.23)
k total (d^{-1})	0.00344	IN-A4098: ln(2)/ DT_{50}
IN-A4098 to CO_2/NER (d^{-1})	0.00344	Based on FF of 1

[1.] The aqueous solubility was measured at 20°C, however, in PELMO vapour pressure and aqueous solubility are required to be put in the same temperature, therefore the aqueous solubility at 20°C is assumed to be the aqueous solubility at 25°C.

Table A28-2: FOCUSMACRO 4.4.2 input parameters for ***triasulfuron*** and ***IN-A4098***

Parameter	Value	Comment
Common endpoints – LoEP 2015		
Application rate/dates	See Table A27-3	Every year
Molecular weight	401.8 g/mol 140.1 g/mol	Triasulfuron IN-A4098
Vapour pressure (25°C)	2.1×10^{-6} Pa 0 Pa	Triasulfuron IN-A4098 (default)
Aqueous solubility (20°C)	815 mg/L 1000 mg/L	Triasulfuron IN-A4098 (default)
Molar enthalpy of dissolution	27000 J/mol	Model default
Plant uptake factor	0 0	Triasulfuron IN-A4098
Formation fraction	0.23	Triasulfuron to IN-A4098[1]
EU endpoints – LoEP 2015		
K_{FOC}	10.6 L/kg 45.5 L/kg	Triasulfuron IN-A4098
Freundlich exponent (1/n)	0.85 0.90	Triasulfuron IN-A4098
DT_{50} soil (20°C/pF2)	59.1 d 146.5 d	Triasulfuron IN-A4098 (median without defaults values)
Danish endpoints – Calculated from LoEP 2015		
K_{FOC}	8.7 L/kg 19.14 L/kg	Triasulfuron IN-A4098
Freundlich exponent (1/n)	0.90 0.936	Triasulfuron IN-A4098
DT_{50} soil (20°C/pF2)	85.42 d 201.6 d	Triasulfuron IN-A4098 (without defaults)

1. Equivalent to 0.080 on a mass basis for entry into MACRO.

Table A28-3: Application parameters for PECgw for ***triasulfuron***

Crop	Application rate	Growth stage[2]	Application date	EU endpoints		Danish endpoints	
				Interception rate[3]	Effective rate for soil loading	Deposition[4]	Effective rate for soil loading
Spring barley[1]	4 g/ha 4 g/ha 4 g/ha	13 20 29	01/05 15/05 30/05	0% 0% 20%	4 g/ha 4 g/ha 3.2 g/ha	75% 55% 43%	3 g/ha 2.2 g/ha 1.72 g/ha

1. Surrogate crop spring cereals.
2. GAP: BBCH 13 – 29.
3. The values are taken from the new guidance, EFSA (2014).
4. The values are taken from the Danish Evaluation Framework (2014).

Appendix B
Quality Assurance Check Selection

A quality assurance check (QC) was undertaken, which involved setting up and re-running 10% of the 612 simulations. The QC was split accordingly below, with the number representing the number of active substance (and metabolites, if relevant) that have been chosen:

	EU Endpoints	DK endpoints
Hamburg	11	11
Karup	11	11
Langvad	11	11

A full list of the compounds , scenarios, endpoints, crops and application number is outlined below. The re-modelled runs are highlighted in yellow for Hamburg - PELMO, green for Karup - MACRO and orange for Langvad - MACRO.

Compound	Crop	Pelmo - Hamburg			Macro - Karup			Macro - Langvad		
		EU Endpoints								
		App 1	App 2	App3	App 1	App 2	App3	App 1	App 2	App3
Azoxystrobin	Spring barley									
(CyPM)										
Bentazone	Maize									
Bentazone	Spring barley									
Bentazone	Peas									
Bentazone	White clover									
Bifenox	Spring barley									
(Bifenox acid)										
Diflufenican	Red Fescue									
(AE-B107137)										
Ethofumesate	Sugar beet									
Fluazifop-P-butyl	Sugar beet				n/a	n/a	n/a	n/a	n/a	n/a
(Fluazifop-P)										
(TFMP)										
Glyphosate	Peas									
(AMPA)										
Glyphosate	Winter wheat									
(AMPA)										
Glyphosate	Spring barley									
(AMPA)										
Metalaxyl-M	Potatoes									
(CGA 62826)										
(CGA 108906)					n/a	n/a	n/a	n/a	n/a	n/a
Metamitron	Sugar beet									
(Metamitron-desamino)										
Metribuzin	Potatoes									
(Metribuzin-diketo)										
(Metribuzin-desamino-diketo)					n/a	n/a	n/a	n/a	n/a	n/a
Picolinafen	Winter wheat									
(CL153815)										
Pirimicarb	Sugar beet									
(Pirimicarb-desmethyl-formamido)										
Rimsulfuron	Potatoes									
(PPU)										
Tebuconazole	Winter wheat									
(1,2,4 triazol - fast)										
(1,2,4 triazol - slow)										
Terbuthylazine	Maize									
(Desethyl-terbuthylazine)										
(Desisopropyl-atrazine)										
Dimethoate	Spring barley									
Epoxiconazole	Winter wheat									
Ioxynil	Winter wheat									
Metrafenone	Winter wheat									
Pendimethalin	Winter wheat									
Propiconazole	Spring barley									
Prosulfocarb	Winter wheat									
Pyridate	Maize									
(PHCP)										
Aminopyralid	Spring barley									
Bromoxynil	Winter wheat									
Chlormequat	Winter wheat									
Triasulfuron	Spring barley									
(IN-A4098)										

Compound	Crop	Pelmo - Hamburg			Macro - Karup			Macro - Langvad		
		DK Endpoints								
		App 1	App 2	App3	App 1	App 2	App3	App 1	App 2	App3
Azoxystrobin	Spring barley									
(CyPM)										
Bentazone	Maize									
Bentazone	Spring barley									
Bentazone	Peas									
Bentazone	White clover									
Bifenox	Spring barley									
(Bifenox acid)										
Diflufenican	Red Fescue									
(AE-B107137)										
Ethofumesate	Sugar beet									
Fluazifop-P-butyl	Sugar beet				n/a	n/a	n/a	n/a	n/a	n/a
(Fluazifop-P)										
(TFMP)										
Glyphosate	Peas									
(AMPA)										
Glyphosate	Winter wheat									
(AMPA)										
Glyphosate	Spring barley									
(AMPA)										
Metalaxyl-M	Potatoes									
(CGA 62826)										
(CGA 108906)					n/a	n/a	n/a	n/a	n/a	n/a
Metamitron	Sugar beet									
(Metamitron-desamino)										
Metribuzin	Potatoes									
(Metribuzin-diketo)										
(Metribuzin-desamino-diketo)					n/a	n/a	n/a	n/a	n/a	n/a
Picolinafen	Winter wheat									
(CL153815)										
Pirimicarb	Sugar beet									
(Pirimicarb-desmethyl-formamido)										
Rimsulfuron	Potatoes									
(PPU)										
Tebuconazole	Winter wheat									
(1,2,4 triazol - fast)										
(1,2,4 triazol - slow)										
Terbuthylazine	Maize									
(Desethyl-terbuthylazine)										
(Desisopropyl-atrazine)										
Dimethoate	Spring barley									
Epoxiconazole	Winter wheat									
Ioxynil	Winter wheat									
Metrafenone	Winter wheat									
Pendimethalin	Winter wheat									
Propiconazole	Spring barley									
Prosulfocarb	Winter wheat									
Pyridate	Maize									
(PHCP)										
Aminopyralid	Spring barley									
Bromoxynil	Winter wheat									
Chlormequat	Winter wheat									
Triasulfuron	Spring barley									
(IN-A4098)										

Appendix C
Comparison of PECgw at 1 m and 2.5 m depth using FOCUS MACRO 4.4.2

Introduction

The Danish national regulatory scenarios Karup and Langvad, which are set up in FOCUS MACRO 4.4.2, apply a reporting depth of 2.5 m (bottom of the profile – layer 15). At Langvad, this represents a depth below the artificial drains present at 1.3 m. For EU regulatory modelling the reporting depth (including Châteaudun set-up in MACRO) is 1 m. In Karup and Langvad 1 m depth corresponds to layer 11 in the soil profile. This 1 m depth is chosen primarily to circumvent the lack of ability to predict the horizontal flow component in groundwater (FOCUS, 2009) by focusing on the zone with mainly vertical flow and thereby make one-dimensional models applicable.

To evaluate whether the reporting depth of 2.5 m in the two Danish national regulatory scenarios will result in a less vulnerable outcome than that at a 1 m depth PECgw was estimated for three pesticides: bentazone, ethofumesate and epoxiconazole. The model input parameters used were based on the EU approach and the DK approach as outlined in Section 2.1.1.

Materials and Methods

Three pesticides were chosen in order to compare the effect of the difference in reporting depth on predicted environmental concentrations in groundwater (PECgw). The choice of pesticides (Table C1) was based on selecting a range of K_{FOC} and DT_{50} values. The simulations were performed utilising EU and Danish input parameters (detailed in Appendix A). The key input parameters are shown for the three pesticides in Table C1.

In the methods outlined in Section 2.1.1 for each crop, three application dates were considered as required according to the Danish assessment framework. For the purpose of this comparison the first individual application was selected (Table C1).

Table C1: Overview table of key input parameters for the ***bentazone, ethofumesat**e* and ***epoxiconazole.***

	Bentazone	Ethofumesate	Epoxiconazole
Crop	Maize	Sugarbeet	Winter wheat
Number of applications	1	3	1
Application date	20/05	01/05, 10/05 and 19/05	15/05
	Every year	Every third year	Every year
Application rate	480 g/ha	173 g/ha	125 g/ha
		EU approach	
Interception rate	25%	20%	80%
Effective soil loading	360 g/ha	138.4 g/ha	25 g/ha
K_{FOC}	30.2 L/kg	118 L/kg	1073.1 L/kg
1/n	0.97	0.905	0.836
DT_{50}	7.5 days	26.2 days	103.7 days
		DK approach	
Deposition rate	75%	100%	42%
Effective soil loading	360 g/ha	173 g/ha	52.5 g/ha
K_{FOC}	13.58 L/kg	69.8 L/kg	360 L/kg
1/n	1	0.93	0.888
DT_{50}	12.2 days	49.92 days	136.7 days

The PECgw results were evaluated in-line with the Danish Guidance the results are presented as number of exceedances > 0.1 µg/L. Only one of the 20 annual averages is allowed to exceed the threshold of 0.1 µg/L (this is relevant for applications every year, *i.e.* bentazone and epoxiconazole).

When applications are every third year, as for ethofumesate, the model is run for 60 years (+ a 6 year warm-up not included in the results calculation) and all 60 years are evaluated. In this case only three PECgw values are allowed to exceed the 0.1 µg/L threshold. In addition, results are presented for the PECgw of the second highest, when applications are every year, and the fourth highest, when applications are every third year. These concentrations will be referred to as 95th percentiles from this point forward.

Results

The results in Table C2 present the number of exceedances greater than 0.1 µg/L and the 95th percentile PECgw (µg/L) for bentazone, ethofumesate and epoxiconazole at both 1 m depth and 2.5 m depth using the EU approach to deriving inputs and the DK approach. The results highlighted in orange indicate where there would be a change in the conclusions drawn and leaching risk category assigned because of the difference in the reporting depth between 1m and 2.5m.

Table C2: ***PECgw*** 95th percentile and number of applications greater than 0.1 µg /L for ***bentazone, ethofumesate*** and ***epoxiconazole*** in the Danish national scenarios ***Karup*** and ***Langvad*** at ***1 m*** and ***2.5 m*** reporting depth applying the EU and DK approach to deriving input parameters.

	Karup (MACRO)				**Langvad (MACRO)**			
	EU		**DK**		**EU**		**DK**	
	1m	**2.5m**	**1m**	**2.5m**	**1m**	**2.5m**	**1m**	**2.5m**
Bentazone	0.060 (0)	0.055 (0)	2.029 (20)	1.468 (20)	1.06 (5)	0.478 (10)	0.219 (17)	1.180 (20)
Ethofumesate[1]	0.012 (0)	0.012 (0)	2.476 (60)	2.177 (60)	0.451 (16)	1.114 (30)	2.055 (60)	3.894 (60)
Epoxiconazole	<LOD (0)	<LOD (0)	0.022 (0)	0.006 (0)	<LOD (0)	<LOD (0)	0.215 (7)	0.012 (0)

[1.] Note, as the application for ethofumesate is once every third year 60 years of concentration data is used to calculate the 95th percentile PECgw (using the 4th highest value).

Table C3: Summary of ***change*** in ***PECgw 95th percentile*** in the Danish national scenarios ***Karup*** and ***Langvad*** at ***1 m*** and ***2.5 m*** reporting depth applying the EU and DK approach to deriving input parameters.

	Karup (MACRO)		**Langvad (MACRO)**	
	EU	**DK**	**EU**	**DK**
Bentazone	↑	↑	↑	↓
Ethofumesate	⇔	↑	↓	↓
Epoxiconazole	⇔	↑	⇔	↑

↑: PECgw 95th percentile at 1 m depth greater than PECgw 95th percentile at 2.5 m depth
↓: PECgw 95th percentile at 1 m depth less than PECgw 95th percentile at 2.5 m depth
⇔: PECgw 95th percentile at 1 m depth the same as PECgw 95th percentile at 2.5 m depth

Typically, at 1 m depth the PECgw results are higher than those at 2.5 m depth (Table C3). However, only one of the results, epoxiconazole using Danish input parameters, would cause a change in the conclusions drawn between PECgw at 1 m reporting depth and 2.5 m reporting depth. It is worth noting the difference depends both on the scenario and the pesticide input parameters used, as can be seen in the annual average concentration time series graphs (Figure C1 – C3).

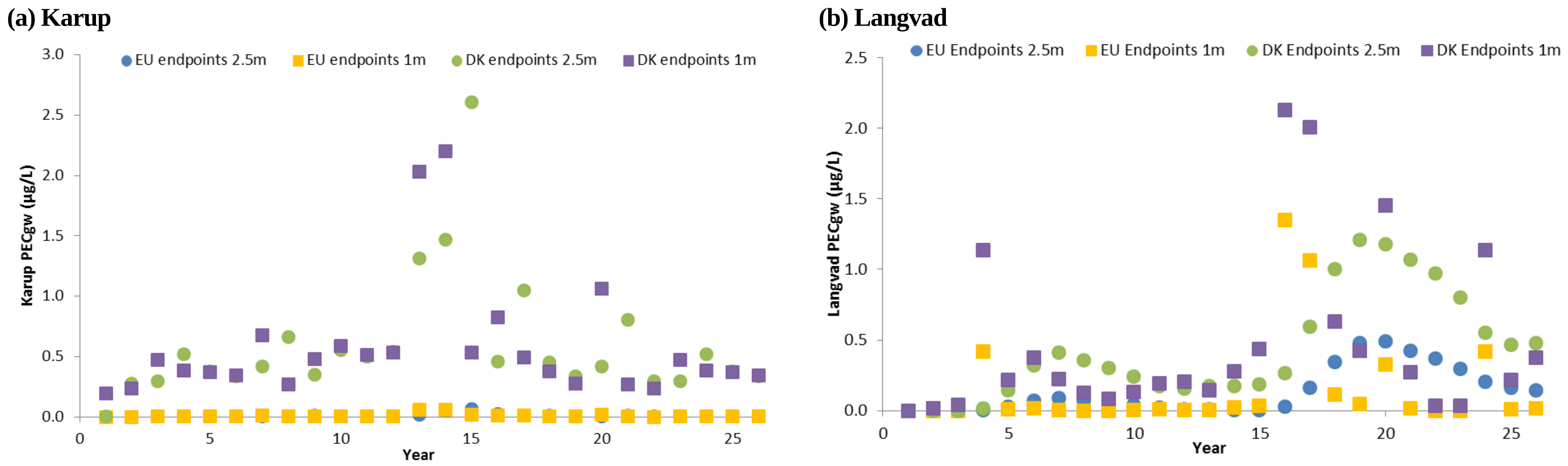


Figure C1: ***Bentazone*** annual average ***concentration*** in ***maize*** in the Danish national scenarios (a) ***Karup*** and (b) ***Langvad*** at ***1 m*** and ***2.5 m*** reporting depth applying the EU and DK approach to deriving input parameters.

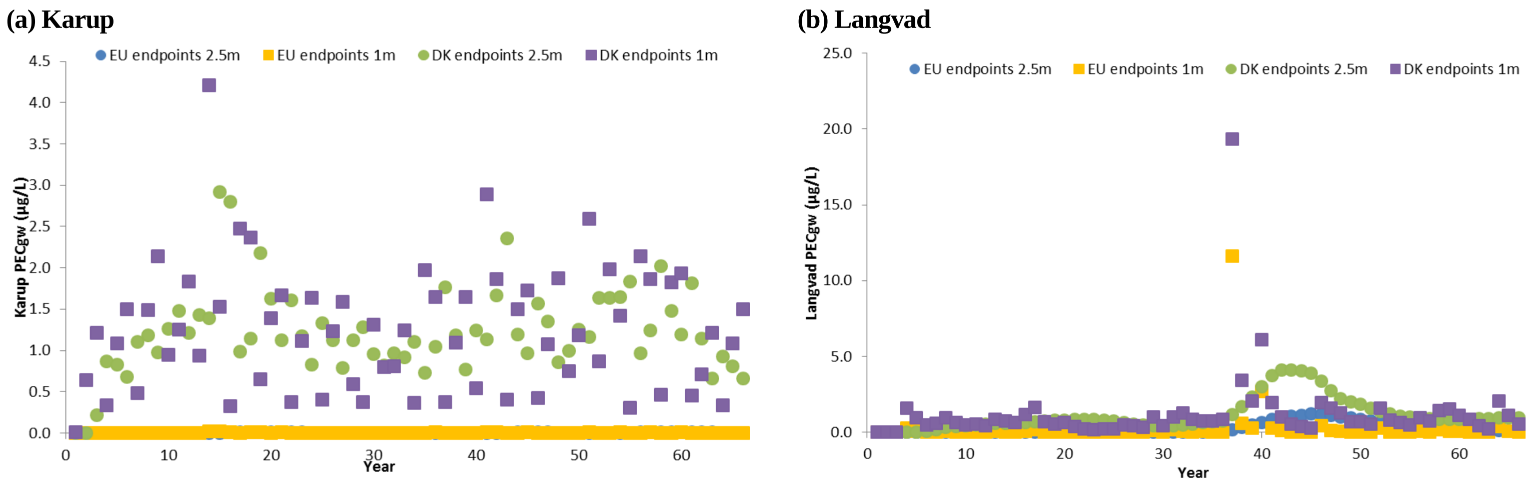


Figure C2: ***Ethofumesate*** annual average ***concentration*** in the Danish national scenarios (a) ***Karup*** and (b) ***Langvad*** at ***1 m*** and ***2.5 m*** reporting depth applying the EU and DK approach to deriving input parameters.

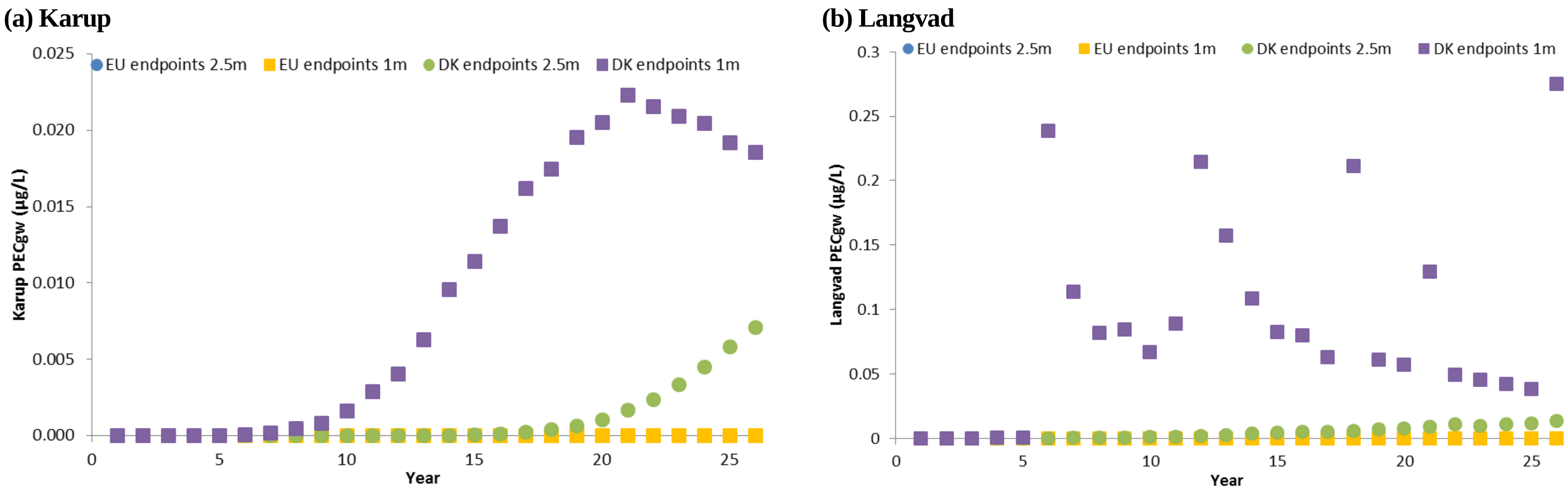


Figure C3: ***Epoxiconazole*** annual average ***concentration*** in *sugarbeet* the Danish national scenarios (a) ***Karup*** and (b**)** ***Langvad*** at ***1 m*** and ***2.5 m*** reporting depth applying the EU and DK approach to deriving input parameters

The difference in reporting depth results in a higher average annual 20-year water flux at 1 m at Langvad for all three crops (note that sugarbeet is the annual average 60-year water flux) than at 2.5 m reporting depth. This is as a result of the contribution of water to drainage at 1.3 m depth. There are no differences in the average annual 20-year water flux at Karup between the two reporting depths (Table C3). In the yearly average water fluxes, Figures C4 – C6, for maize, sugarbeet and winter wheat respectively, inter-year differences can be seen at both Karup and Langvad.

Table C4: Simulated average 20-year ***water flux*** at ***1 m*** and ***2.5 m*** depths for the two Danish national scenarios ***Karup*** and ***Langvad*** for ***maize***, ***sugarbeet*** and ***winter wheat***

	Average annual 20-year water flux (mm/year)[1]			
	Karup		**Langvad**	
	1m	**2.5m**	**1m**	**2.5m**
Maize	460	460	230	162
Sugarbeet[2]	459	459	214	153
Winter wheat	424	424	163	113

1. Not including the 6 warm-up years
2. Annual average water flux for 60 years as application of ethofumesate is every third year.

For the mass solute flux a 1 m reporting depth also results in a higher average annual 20-year solute flux at Langvad for all three crops (note that sugarbeet is the annual average 60-year solute flux) than at 2.5 m reporting depth. There are no differences in the average annual 20-year solute flux at Karup between the two reporting depths (Table C5). In the yearly average solute fluxes, Figures C4 – C6, for maize, sugarbeet and winter wheat respectively, inter-year differences can be seen at both Karup and Langvad.

Table C5: Simulated average annual ***mass flux*** at ***1 m*** and ***2.5 m*** depths for the two Danish national scenarios ***Karup*** and ***Langvad*** for ***bentazone***, ***ethofumesate*** and ***epoxiconazole***

	Average annual 20-year solute flux (mg/year)[1]							
	Karup (MACRO)				**Langvad (MACRO)**			
	EU endpoints		**DK endpoints**		**EU endpoint**		**DK endpoint**	
	1m	**2.5m**	**1m**	**2.5m**	**1m**	**2.5m**	**1m**	**2.5m**
Bentazone	0.007	0.007	0.326	0.326	0.035	0.028	0.120	0.084
Ethofumesate*	0.002	0.002	0.600	0.600	0.068	0.044	0.279	0.186
Epoxiconazole	<LOD	<LOD	0.005	0.001	<LOD	<LOD	0.019	0.001

1. Not including the 6 warm-up years
2. Note, as the application for ethofumesate is once every third year 60 years of concentration data is used to calculate the pseudo-95th percentile PECgw (using the 4th highest value).

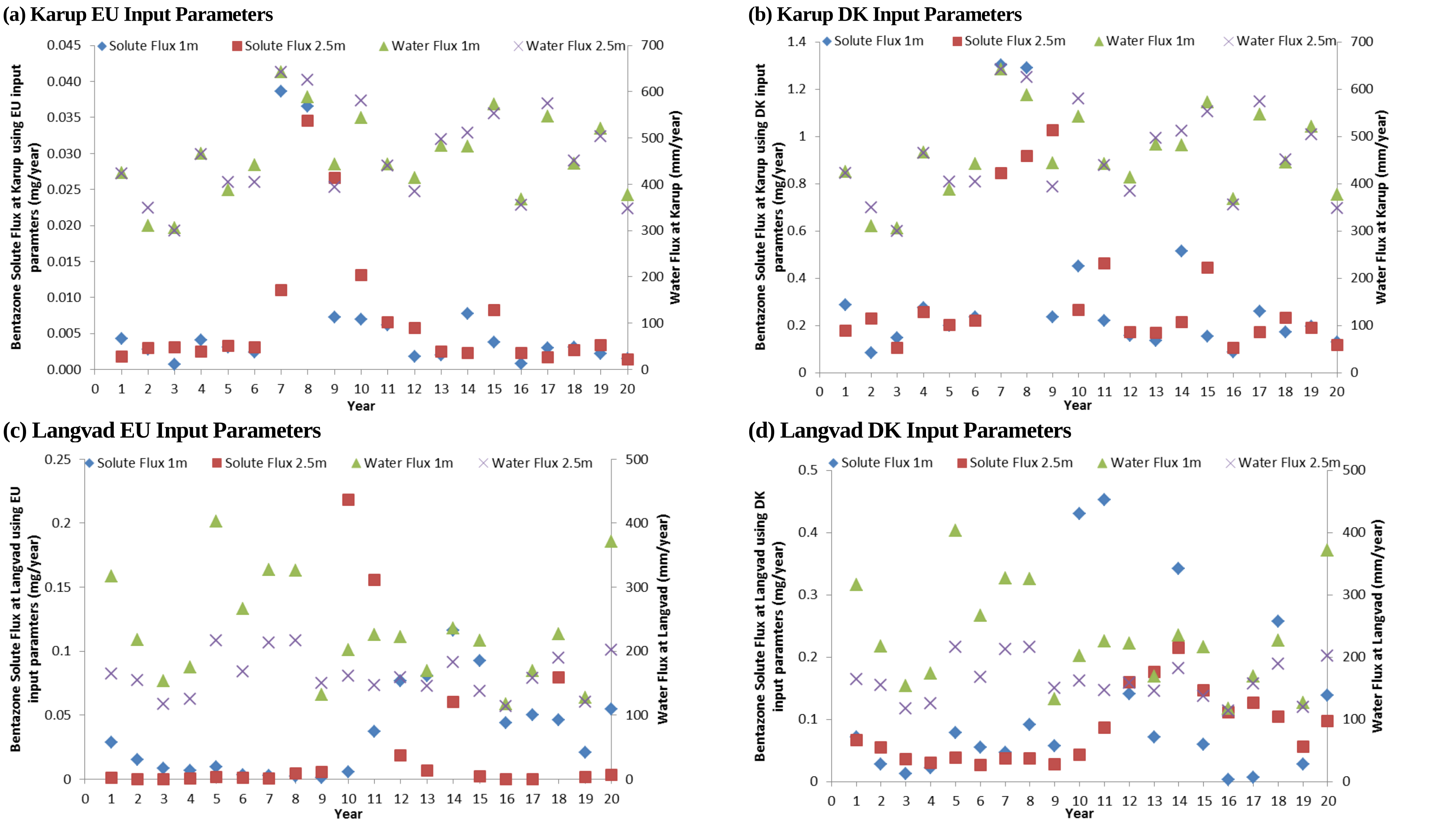


Figure C4: ***Bentazone*** annual average ***solute flux*** and annual average ***water flux*** from ***maize*** at (a) ***Karup*** using ***EU*** input parameters, (b) ***Karup*** using ***DK*** input parameters, (c) ***Langvad*** using ***EU*** input parameters, and (d) ***Langvad*** using ***DK*** input parameters.

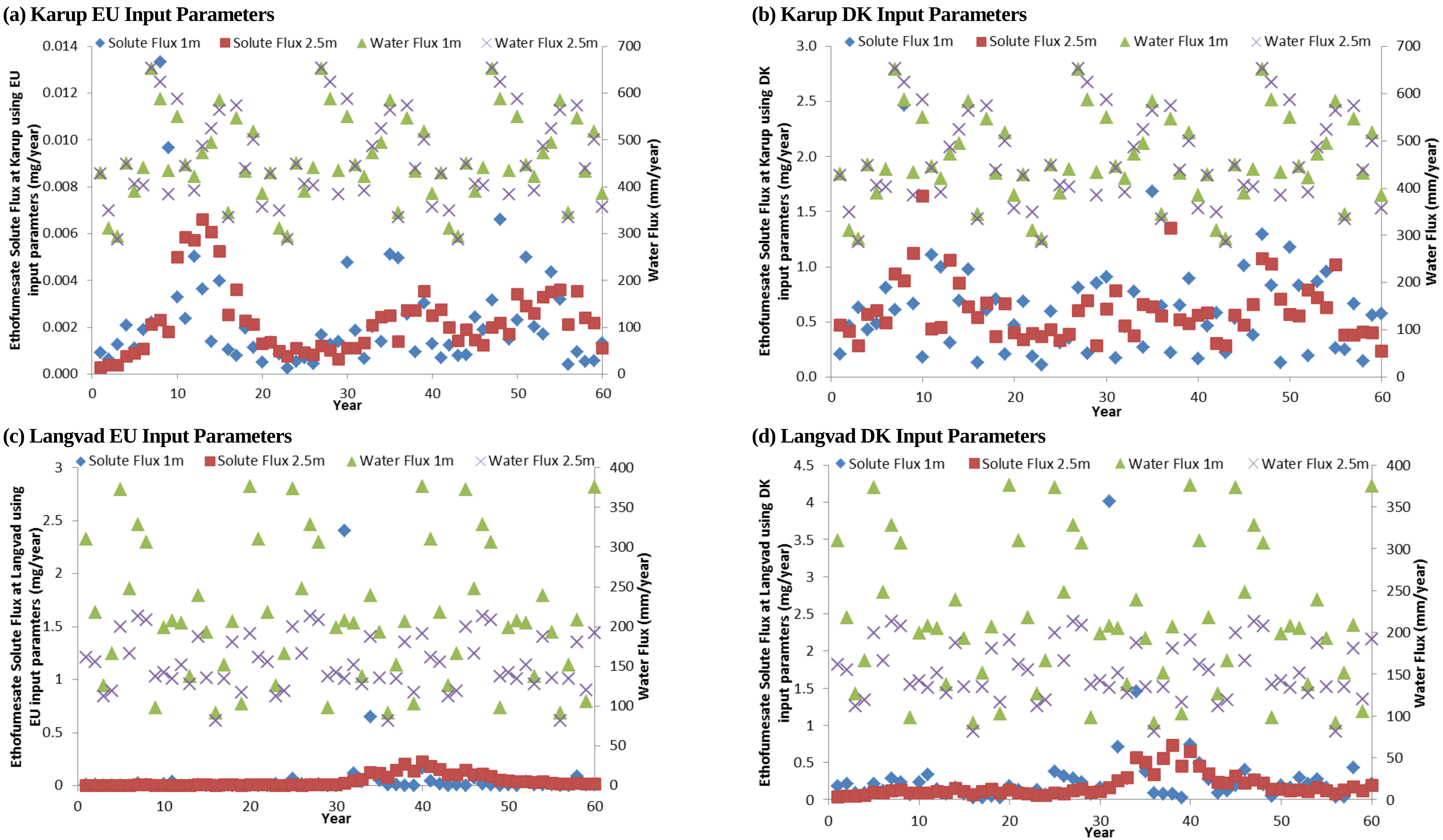


Figure C5: ***Ethofumesate*** annual average ***solute flux*** and annual average ***water flux*** from ***sugarbeet*** at (a) ***Karup*** using ***EU*** input parameters, (b) ***Karup*** using ***DK*** input parameters, (c) ***Langvad*** using ***EU*** input parameters, and (d) ***Langvad*** using ***DK*** input parameters.

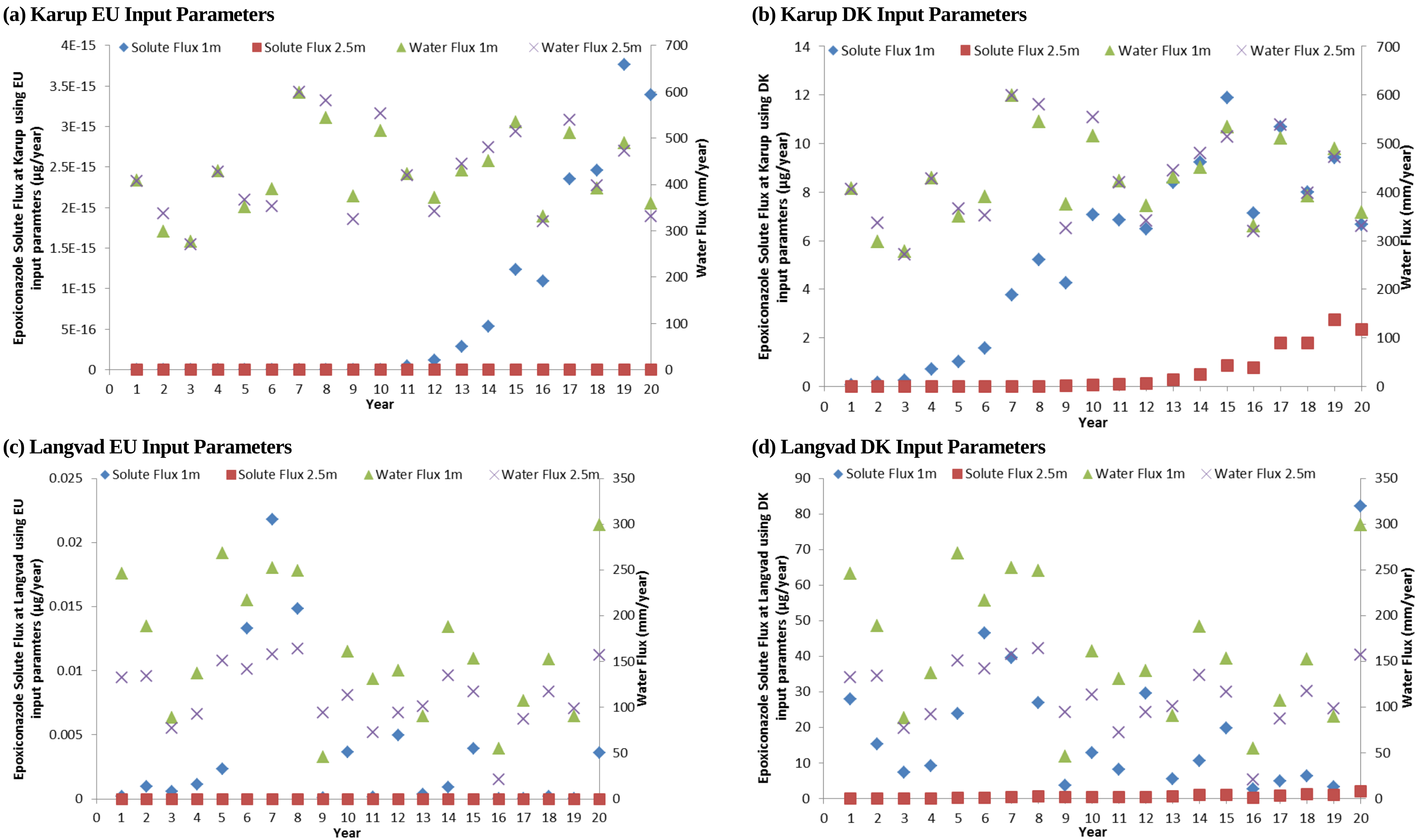


Figure C6: ***Epoxiconazole*** annual average ***solute flux*** and annual average ***water flux*** from ***winter wheat*** at (a) ***Karup*** using ***EU*** input parameters, (b) ***Karup*** using ***DK*** input parameters, (c) ***Langvad*** using ***EU*** input parameters, and (d) ***Langvad*** using ***DK*** input parameters.

Conclusions

PECgw was estimated for three pesticides: bentazone, ethofumesate and epoxiconazole, using model input parameters based on the EU approach and the DK approach for two Danish regulatory scenarios Karup and Langvad using MACRO 4.4.2. Simulations were carried out at two reporting depths 1 m and 2.5 m.

A difference in concentrations, water flux and solute flux was seen between the two reporting depths, typically with higher concentrations, water fluxes and solute fluxes at 1 m depth. The difference was more pronounced at Langvad than Karup due the presence of field drains in the Langvad scenario at 1.3 m depth. However, from the selection of twelve simulations run, the conclusion drawn between passing and failing the 0.1 μg/L limit only changed for one simulation.

Appendix D
Pesticide and metabolite full results tables

For each selected pesticide, with associated metabolites, the following results are presented:

- For each regulatory scenario PECgw for the three individual application dates considering the EU and DK parameter selection and the EU and DK output evaluation. The 80th percentile PECgw is presented in tables ending -1 and the number of exceedances and 95th percentile PECgw in tables ending -2.
- Number of groundwater samples collected from horizontal or vertical screens where the compound was not detected (nd), detected in concentrations below 0.1µg/L or detected above 0.1µg/L at each PLAP-field across the 1999-2013 monitoring period. Presented in tables ending -3.
- All PLAP applications of the selected pesticides specified for each field and each crop. Presented in tables ending -4.

D1 Aminopyralid

Table D1-1: PECgw ***80th percentile*** for ***aminopyralid*** applications to ***spring barley***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L)					
			Hamburg 1m depth (PELMO)[1]		Karup 2.5 m depth (MACRO)[1]		Langvad 2.5 m depth (MACRO)[1]	
			EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]
Aminopyralid	7.5 g/ha, 21-32	01 May	0.029	0.058	0.039	0.049	0.023	0.033
		10 May	0.032	0.053	0.043	0.048	0.025	0.030
		20 May	0.007	0.050	0.010	0.050	0.004	0.022

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D1-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***aminopyralid*** applications to ***spring barley***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1]					
			Hamburg 1m depth (PELMO)		Karup 2.5 m depth (MACRO)		Langvad 2.5 m depth (MACRO)	
			EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]
Aminopyralid	7.5 g/ha, 21-32	01 May	0.043 (1)	0.067 (1)	0.055 (0)	0.079 (0)	0.027 (0)	0.037 (0)
		10 May	0.048 (1)	0.065 (1)	0.059 (0)	0.073 (0)	0.026 (0)	0.032 (0)
		20 May	0.013 (0)	0.067 (1)	0.014 (0)	0.081 (0)	0.005 (0)	0.025 (0)

1 An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D1-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***aminopyralid***

	Field	Horizontal screens			Vertical screens		
		nd	<0.1	≥0.1	nd	<0.1	≥0.1
Aminopyralid	Tylstrup	14	-	-	70	-	-
	Estrup	23	-	-	37	-	-

Table D1-4: ***Applications*** with ***aminopyralid*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Spring barley	No	Tylstrup	Mustang forte	29	25-05	2012	8
	No	Estrup	Mustang forte	23	18-05	2012	8

D2 Azoxystrobin and CyPM

Table D2-1: PECgw ***80th percentile*** for ***azoxystrobin*** application to ***spring barley***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L)					
			Hamburg 1m depth (PELMO)[1]		Karup 2.5 m depth (MACRO)[1]		Langvad 2.5 m depth (MACRO)[1]	
			EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]
Azoxystrobin	250 g/ha, 30 - 59	05 June	<0.001	0.115	<0.001	0.134	0.001	0.279
		20 June	<0.001	0.057	<0.001	0.071	0.001	0.150
		10 July	<0.001	0.032	<0.001	0.040	<0.001	0.106
CyPM		05 June	<0.001	2.501	<0.001	1.875	0.001	1.364
		20 June	<0.001	1.375	<0.001	1.065	0.001	0.722
		10 July	<0.001	0.806	<0.001	0.630	<0.001	0.486

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D2-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***azoxystrobin*** application to ***spring barley***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1]					
			Hamburg 1m depth (PELMO)		Karup 2.5 m depth (MACRO)		Langvad 2.5 m depth (MACRO)	
			EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]
Azoxystrobin	250 g/ha, 30 - 59	05 June	<0.001 (0)	0.135 (6)	<0.001 (0)	0.136 (8)	0.001 (0)	0.327 (13)
		20 June	<0.001 (0)	0.067 (0)	<0.001 (0)	0.073 (0)	0.001 (0)	0.171 (19)
		10 July	<0.001 (0)	0.036 (0)	<0.001 (0)	0.042 (0)	<0.001 (0)	0.122 (5)
CyPM		05 June	<0.001 (0)	2.747 (20)	<0.001 (0)	1.952 (20)	0.001 (0)	1.458 (19)
		20 June	<0.001 (0)	1.487 (20)	<0.001 (0)	1.099 (19)	0.001 (0)	0.770 (17)
		10 July	<0.001 (0)	0.874 (20)	<0.001 (0)	0.657 (18)	<0.001 (0)	0.518 (15)

1 An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D2-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***azoxystrobin*** and ***CYPM***

Compound	Field	Horizontal screens			Vertical screens		
		nd	<0.1	≥0.1	nd	<0.1	≥0.1
Azoxystrobin	Tylstrup				216	-	-
	Jyndevad				233	-	-
	Silstrup	133	-	-	253	-	-
	Estrup	148	1	-	418	1	-
	Faardrup	92	-	-	194	-	-
CYPM	Tylstrup				216	-	-
	Jyndevad				233	-	-
	Silstrup	162	8	-	308	20	-
	Estrup	136	12	1	414	5	-
	Faardrup	92	-	-	194	-	-

Table D2-4: *Applications* with *azoxystrobin* on PLAP fields within the period 1999-2013

Crop	Under sown?	Field	Product	BBCH at application	Application date	Year	Dose a.i. [g/ha]
Spring barley	No	Tylstrup	Amistar	58	23-06	2009	250
	No	Silstrup	Amistar	52	30-06	2005	250
	Yes	Silstrup	Amistar	59	24-06	2009	250
	No	Silstrup	Amistar	47	26-06	2013	250
	No	Estrup	Amistar	57	22-06	2004	250
	No	Estrup	Amistar	57	29-06	2006	250
	No	Estrup	Amistar	49	04-06	2009	250
	No	Estrup	Amistar	50	13-06	2012	250
	No	Faardrup	Amistar	52	02-07	2010	250
Winter wheat	No	Tylstrup	Amistar	69	17-06	2008	250
	No	Jyndevad	Amistar	36	18-05	2005	250
	No	Jyndevad	Amistar	65	11-06	2008	250
	No	Silstrup	Amistar	59	14-06	2004	250
	No	Silstrup	Amistar	53	04-06	2014	250
	No	Estrup	Amistar	65	13-06	2008	250
	Yes	Estrup	Amistar	59	02-06	2014	250
	No	Faardrup	Amistar	50	03-06	2004	250
	No	Faardrup	Amistar	32	15-05	2014	250
Grass	Yes	Silstrup	Amistar		24-06	2009	250
Potatoes	No	Jyndevad	Amistar	61	06-07	2010	125

D3 Bentazone

Table D3-1: PECgw ***80th percentile*** for ***bentazone*** application to ***maize, spring barley, peas*** and ***white clover***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1] EU/EU[2]	Hamburg DK/EU[3]	Karup 2.5 m depth (MACRO)[1] EU/EU[2]	Karup DK/EU[3]	Langvad 2.5 m depth (MACRO)[1] EU/EU[2]	Langvad DK/EU[3]
			Maize					
Bentazone	480 g/ha, BBCH 14	20 May	0.013	0.444	0.017	1.050	0.373	1.005
		30 May	0.022	0.621	0.021	1.025	1.637	2.530
		05 June	0.030	0.751	0.020	0.980	3.000	3.760
			Spring Barley (Spring Cereals)					
Bentazone	600 g/ha, BBCH 12-25	01 May	0.014	0.561	0.032	1.271	0.344	0.906
		15 May	0.018	0.522	0.033	1.234	0.453	0.787
		30 May	0.027	0.684	0.036	1.060	0.963	1.287
			Peas (Legumes)					
Bentazone	480 g/ha, BBCH 10-19	01 May	0.006	0.490	0.014	1.263	0.220	1.085
		15 May	0.009	0.318	0.019	0.819	0.361	0.755
		30 May	0.017	0.216	0.021	0.336	0.797	0.560
			White Clover (Established Grass)					
Bentazone	1440 g/ha	01 May	0.002	0.150	0.011	0.461	0.019	0.096
		15 May	0.004	0.162	0.010	0.601	0.053	0.145
		30 May	0.007	0.217	0.009	0.482	0.004	0.125

[1.] PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
[2.] EU parameter selection and EU output evaluation (80th percentile PECgw).
[3.] DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D3-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***bentazone*** application to ***maize, spring barley, peas*** and ***white clover***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1] Hamburg 1m depth (PELMO) EU/DK[2]	Hamburg DK/DK[3]	Karup 2.5 m depth (MACRO) EU/DK[2]	Karup DK/DK[3]	Langvad 2.5 m depth (MACRO) EU/DK[2]	Langvad DK/DK[3]
			Maize					
Bentazone	480 g/ha, BBCH 14	20 May	0.032 (1)	0.880 (20)	0.055 (0)	1.468 (20)	0.478 (10)	1.180 (20)
		30 May	0.047 (1)	1.355 (20)	0.025 (0)	1.379 (20)	2.109 (12)	3.903 (20)
		05 June	0.081 (1)	2.085 (20)	0.035 (0)	1.658 (20)	3.917 (13)	6.071 (20)
			Spring Barley (Spring Cereals)					
Bentazone	600 g/ha, BBCH 12-25	01 May	0.037(1)	0.893 (20)	0.063 (0)	1.696 (20)	0.398 (8)	1.217 (20)
		15 May	0.043 (1)	0.872 (20)	0.068 (0)	1.468 (20)	0.524 (8)	0.958 (20)
		30 May	0.068 (1)	1.443 (20)	0.054 (1)	1.319 (20)	1.121 (9)	1.461 (20)
			Peas (Legumes)					
Bentazone	480 g/ha, BBCH 10-19	01 May	0.023 (1)	0.734 (20)	0.026 (0)	1.651 (20)	0.327 (6)	1.454 (20)
		15 May	0.030 (1)	0.509 (19)	0.040 (0)	1.026 (20)	0.538 (8)	0.980 (18)
		30 May	0.040 (1)	0.423 (18)	0.033 (0)	0.446 (20)	1.173 (9)	0.811 (13)
			White Clover (Established Grass)					
Bentazone	1440 g/ha	01 May	0.009 (0)	0.240 (10)	0.014 (0)	0.571 (20)	0.020 (1)	0.105 (3)
		15 May	0.013 (0)	0.273 (12)	0.016 (0)	0.647 (20)	0.056 (1)	0.160 (10)
		30 May	0.017 (0)	0.451 (16)	0.012 (0)	0.685 (20)	0.004 (0)	0.126 (11)

[1] An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
[2.] EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
[3.] DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D3-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***bentazone***

	Field	Horizontal screens			Vertical screens		
		nd	<0.1	≥0.1	nd	<0.1	≥0.1
Bentazone	Tylstrup				330	-	-
	Jyndevad	10	1	-	510	-	-
	Silstrup	133	8	1	244	18	2
	Estrup	127	15	-	445	1	-
	Faardrup	110	5	1	252	4	3

Table D3-4: ***Applications*** with ***bentazone*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Maize	No	Tylstrup	Laddok TE	15	08-06	2005	500
	No	Jyndevad	Fighter 480	14-15	26-05	2012	480
	No	Estrup	Laddok TE	14	08-06	2005	500
	No	Faardrup	Laddok TE	12	27-05	2005	500
Spring barley	No	Tylstrup	Basagran M75	23	15-05	2009	375
	No	Jyndevad	Basagran M75	30	11-05	2009	375
	Yes	Silstrup	Fighter 480	24	19-05	2009	600
	No	Estrup	Basagran M75	26	14-05	2009	375
	No	Faardrup	Fighter 480	24-26	01-06	2010	600
	No	Faardrup	Fighter 480	24-29	18-05	2012	600
Pea	No	Jyndevad	Fighter 480	13-14	07-05	2013	192
	No	Jyndevad	Bentazone 480	14-15	16-05	2013	240
	No	Jyndevad	Basagran 480	15	05-05	2004	480
	No	Silstrup	Basagran 480	14	17-05	2003	480
	No	Estrup	Basagran 480	33	22-05	2001	480
	No	Estrup	Fighter 480	12	16-05	2013	480
Clover	Yes	Faardrup	Fighter 480		14-05	2013	1440
Grass	Yes	Silstrup	Fighter 480		19-05	2009	600

D4 Bifenox and bifenox acid

Table D4-1: PECgw ***80th percentile*** for ***bifenox*** application to ***spring barley***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1] EU/EU[2]	Hamburg DK/EU[3]	Karup 2.5 m depth (MACRO)[1] EU/EU[2]	Karup DK/EU[3]	Langvad 2.5 m depth (MACRO)[1] EU/EU[2]	Langvad DK/EU[3]
Bifenox	576 g/ha, 21-22	01 May	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		15 May	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		30 May	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bifenox acid		01 May	0.189	0.740	0.189	0.615	1.347	1.556
		15 May	0.119	0.457	0.127	0.397	1.090	1.125
		30 May	0.125	0.467	0.137	0.412	1.163	1.178

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D4-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***bifenox*** application to ***spring barley***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1] Hamburg 1m depth (PELMO) EU/DK[2]	Hamburg DK/DK[3]	Karup 2.5 m depth (MACRO) EU/DK[2]	Karup DK/DK[3]	Langvad 2.5 m depth (MACRO) EU/DK[2]	Langvad DK/DK[3]
Bifenox	576 g/ha, 21-22	01 May	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		15 May	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		30 May	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
Bifenox acid		01 May	0.286 (13)	0.892 (20)	0.194 (10)	0.645 (18)	1.624 (19)	1.766 (19)
		15 May	0.180 (6)	0.554 (20)	0.130 (8)	0.413 (16)	1.312 (18)	1.274 (19)
		30 May	0.187 (6)	0.563 (20)	0.140 (9)	0.428 (16)	1.368 (19)	1.308 (19)

1 An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D4-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***bifenox*** and ***bifenox acid***

	Field	Horizontal screens nd	Horizontal <0.1	Horizontal ≥0.1	Vertical screens nd	Vertical <0.1	Vertical ≥0.1
Bifenox	Tylstrup	8	-	-	41	-	-
	Jyndevad	4	-	-	216	2	-
	Silstrup	62	-	-	116	5	-
	Estrup	61	-	-	132	-	-
	Faardrup	30	-	-	74	-	-
Bifenox acid	Tylstrup	8	-	-	41	-	-
	Jyndevad	4	-	-	166	-	-
	Silstrup	52	4	6	103	3	14
	Estrup	63	-	-	133	-	1
	Faardrup	30	-	-	73	-	-

Table D4-4: ***Applications*** with ***bifenox*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Spring barley	No	Tylstrup	Fox 480 SC	22	21-05	2012	576
	No	Jyndevad	Fox 480 SC	20	27-04	2009	576
	No	Estrup	Fox 480 SC	21	01-05	2009	576
	No	Estrup	Fox 480 SC	22	15-05	2012	576
Grass	Yes	Silstrup	Fox 480 SC	25	09-09	2009	720
	Yes	Silstrup	Fox 480 SC	20	16-09	2011	720
Winter rape	No	Estrup	Fox 480 SC	14	30-09	2009	360
Winter wheat	No	Estrup	Fox 480 SC	29	26-04	2011	576

D5 Bromoxynil

Table D5-1: PECgw ***80th percentile*** for ***bromoxynil*** applications to ***winter wheat***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1] EU/EU[2]	DK/EU[3]	Karup 2.5 m depth (MACRO)[1] EU/EU[2]	DK/EU[3]	Langvad 2.5 m depth (MACRO)[1] EU/EU[2]	DK/EU[3]
Bromoxynil	200 g/ha, 12-19	20 Sept.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		15 Oct.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		30 Oct.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

[1.] PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
[2.] EU parameter selection and EU output evaluation (80th percentile PECgw).
[3.] DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D5-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***bromoxynil*** applications to ***winter wheat***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1] Hamburg 1m depth (PELMO) EU/DK[2]	DK/DK[3]	Karup 2.5 m depth (MACRO) EU/DK[2]	DK/DK[3]	Langvad 2.5 m depth (MACRO) EU/DK[2]	DK/DK[3]
Bromoxynil	200 g/ha, 12-19	20 Sept.	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		15 Oct.	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		30 Oct.	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)

[1] An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
[2.] EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
[3.] DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D5-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***bromoxynil***

	Field	Horizontal screens nd	<0.1	≥0.1	Vertical screens nd	<0.1	≥0.1
Bromoxynil	Tylstrup	-	-	-	192	-	-
	Jyndevad	-	-	-	218	-	-
	Estrup	41	-	-	125	-	-
	Faardrup	81	-	-	225	-	-

Table D5-4: ***Applications*** with ***bromoxynil*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Winter wheat	No	Tylstrup	Oxitril	11	09-10	2002	200
	No	Jyndevad	Oxitril CM	12	19-10	2004	200
	No	Estrup	Oxitril CM	11-12	20-11	2001	200
	No	Faardrup	Briotril	9	14-10	1999	240

D6 Chlormequat

Table D6-1: PECgw ***80th percentile*** for ***chlormequat*** applications to ***winter wheat***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L)					
			Hamburg 1m depth (PELMO)[1]		Karup 2.5 m depth (MACRO)[1]		Langvad 2.5 m depth (MACRO)[1]	
			EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]
Chlormequat	698.4 g/ha, 25-32	20 April	<0.001	0.802	<0.001	0.818	0.014	0.652
		15 May	<0.001	0.958	<0.001	0.868	0.020	0.793
		30 May	<0.001	0.725	<0.001	0.611	0.003	0.610

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D6-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***chlormequat*** applications to ***winter wheat***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1]					
			Hamburg 1m depth (PELMO)		Karup 2.5 m depth (MACRO)		Langvad 2.5 m depth (MACRO)	
			EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]
Chlormequat	698.4 g/ha, 25-32	20 April	<0.001 (0)	1.236 (20)	<0.001 (0)	0.917 (20)	0.015 (0)	0.673 (19)
		15 May	<0.001 (0)	1.609 (20)	<0.001 (0)	1.016 (20)	0.022 (0)	0.811 (20)
		30 May	<0.001 (0)	1.204 (20)	<0.001 (0)	0.715 (20)	0.003 (0)	0.631 (19)

1 An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D6-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***chlormequat***

	Field	Horizontal screens			Vertical screens		
		nd	<0.1	≥0.1	nd	<0.1	≥0.1
Chlormequat	Jyndevad	-	-	-	14	-	-
	Silstrup	36	-	-	66	-	-
	Estrup	18	-	-	56	-	-

Table D6-4: ***Applications*** with ***chlormequat*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Winter wheat	No	Silstrup	Cycocel 750	31	13-04	2007	698
	No	Estrup	Cycocel 750	30	11-04	2007	698
Triticale	No	Jyndevad	Cycocel 750	30-31	13-04	2007	582

D7 Diflufenican and AE-B107317

Table D7-1: PECgw ***80th percentile*** for ***diflufenican*** application to ***red fescue (grass)***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1] EU/EU[2]	Hamburg DK/EU[3]	Karup 2.5 m depth (MACRO)[1] EU/EU[2]	Karup DK/EU[3]	Langvad 2.5 m depth (MACRO)[1] EU/EU[2]	Langvad DK/EU[3]
Diflufenican	75 g/ha	01 April	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		15 April	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		30 April	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
AE-B107137		01 April	<0.001	0.002	<0.001	0.005	<0.001	0.006
		15 April	<0.001	0.001	<0.001	0.006	<0.001	0.006
		30 April	<0.001	0.002	<0.001	0.006	<0.001	0.006

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D7-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***diflufenican*** application to ***red fescue (grass)***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1] Hamburg 1m depth (PELMO) EU/DK[2]	Hamburg DK/DK[3]	Karup 2.5 m depth (MACRO) EU/DK[2]	Karup DK/DK[3]	Langvad 2.5 m depth (MACRO) EU/DK[2]	Langvad DK/DK[3]
Diflufenican	75 g/ha	01 April	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		15 April	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		30 April	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
AE-B107137		01 April	<0.001 (0)	0.003 (0)	<0.001 (0)	0.006 (0)	<0.001 (0)	0.007 (0)
		15 April	<0.001 (0)	0.003 (0)	<0.001 (0)	0.006 (0)	<0.001 (0)	0.007 (0)
		30 April	<0.001 (0)	0.002 (0)	<0.001 (0)	0.007 (0)	<0.001 (0)	0.007 (0)

1 An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D7-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***diflufenican***

	Field	Horizontal screens nd	Horizontal screens <0.1	Horizontal screens ≥0.1	Vertical screens nd	Vertical screens <0.1	Vertical screens ≥0.1
Diflufenican	Jyndevad	12	-	-	140	-	-
	Silstrup	28	-	-	43	-	1

Table D7-4: ***Applications*** with ***diflufenican*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Grass	No	Silstrup	DFF	25	13-04	2012	75
Spring barley	No	Jyndevad	DFF	21-22	26-04	2011	125
Winter wheat	No	Silstrup	DFF	10	09-11	2012	100

D8 Dimethoate

Table D8-1: PECgw ***80th percentile*** for ***dimethoate*** applications to ***spring barley***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L)					
			Hamburg 1m depth (PELMO)[1]		Karup 2.5 m depth (MACRO)[1]		Langvad 2.5 m depth (MACRO)[1]	
			EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]
Dimethoate	250 g/ha, 33-59	01 June	<0.001	<0.001	<0.001	<0.001	0.029	0.055
		20 June	<0.001	<0.001	<0.001	0.001	<0.001	0.001
		15 July	<0.001	<0.001	<0.001	<0.001	0.027	0.080

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D8-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***dimethoate*** applications to ***spring barley***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1]					
			Hamburg 1m depth (PELMO)		Karup 2.5 m depth (MACRO)		Langvad 2.5 m depth (MACRO)	
			EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]
Dimethoate	250 g/ha, 33-59	01 June	<0.001 (0)	<0.001 (0)	<0.001 (0)	0.002 (0)	0.046 (0)	0.092 (0)
		20 June	<0.001 (0)	<0.001 (0)	<0.001 (0)	0.001 (0)	<0.001 (0)	0.002 (0)
		15 July	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	0.039 (0)	0.109 (2)

1 An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D8-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***dimethoate***

	Field	Horizontal screens			Vertical screens		
		nd	<0.1	≥0.1	nd	<0.1	≥0.1
Dimethoate	Tylstrup	-	-	-	176	-	-
	Jyndevad	-	-	-	190	-	-
	Silstrup	73	1	-	148	-	-
	Estrup	42	-	-	158	-	-
	Faardrup	58	-	-	149	-	-

Table D8-4: ***Applications*** with ***dimethoate*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Spring barley	No	Jyndevad	Perfekthion 500 S	65	25-06	2003	300
	No	Silstrup	Perfekthion 500	32	16-07	2001	300
	No	Estrup	Perfekthion 500 S	39	15-06	2000	200
	No	Estrup	Perfekthion 500 S	69	05-07	2000	200
	No	Faardrup	Perfekthion 500	37	04-06	2002	200
Winter wheat	No	Tylstrup	Perfekthion 500 S	70	08-06	2003	300

D9 Epoxiconazole

Table D9-1: PECgw ***80th percentile*** for ***epoxiconazole*** applications to ***winter wheat***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L)					
			Hamburg 1m depth (PELMO) [1]		Karup 2.5 m depth (MACRO) [1]		Langvad 2.5 m depth (MACRO) [1]	
			EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]
Epoxiconazole	125 g/ha, 31-69	15 May	<0.001	0.011	<0.001	0.003	<0.001	0.011
		10 June	<0.001	0.001	<0.001	<0.001	<0.001	0.001
		05 July	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D9-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***epoxiconazole*** applications to ***winter wheat***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1]					
			Hamburg 1m depth (PELMO)		Karup 2.5 m depth (MACRO)		Langvad 2.5 m depth (MACRO)	
			EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]
Epoxiconazole	125 g/ha, 31-69	15 May	<0.001 (0)	0.012 (0)	<0.001 (0)	0.006 (0)	<0.001 (0)	0.012 (0)
		10 June	<0.001 (0)	0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	0.001 (0)
		05 July	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)

1 An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D9-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***epoxiconazole***

	Field	Horizontal screens			Vertical screens		
		nd	<0.1	≥0.1	nd	<0.1	≥0.1
Epoxiconazole	Tylstrup	-	-	-	199	-	-
	Jyndevad	-	-	-	323	1	-
	Silstrup	62	-	-	117	-	-
	Estrup	19	-	-	69	-	-
	Faardrup	66	-	-	143	-	-

Table D9-4: ***Applications*** with ***epoxiconazole*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Winter wheat	No	Silstrup	Opus	59	07-06	2007	125
	No	Estrup	Opus	57	31-05	2007	125
Spring barley	No	Tylstrup	Opus	59	03-07	2006	125
	No	Jyndevad	Opus	50	08-06	2006	125
	No	Jyndevad	Opus	51	07-05	2007	125
	No	Jyndevad	Bell	44	26-05	2009	101
	No	Faardrup	Opus	52	29-06	2006	125

D10 Ethofumesate

Table D10-1: PECgw ***80th percentile*** for ***ethofumesate*** application to ***sugar beet – higher dose rate***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1] EU/EU[2]	Hamburg DK/EU[3]	Karup 2.5 m depth (MACRO)[1] EU/EU[2]	Karup DK/EU[3]	Langvad 2.5 m depth (MACRO)[1] EU/EU[2]	Langvad DK/EU[3]
Ethofumesate	3 applications 173 g/ha, 9 day interval, BBCH 10-15, application every 3rd year	01 May	0.002	0.741	0.006	1.618	0.797	1.775
		15 May	0.002	0.891	0.007	1.618	1.207	2.247
		30 May	0.003	0.707	0.010	1.345	0.633	1.663

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D10-2: PECgw ***80th percentile*** for ***ethofumesate*** application to ***sugar beet – lower dose rate***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1] EU/EU[2]	Hamburg DK/EU[3]	Karup 2.5 m depth (MACRO)[1] EU/EU[2]	Karup DK/EU[3]	Langvad 2.5 m depth (MACRO)[1] EU/EU[2]	Langvad DK/EU[3]
Ethofumesate	2 applications 35 g/ha, 9 day interval, BBCH 10-15, application every 3rd year	01 May	<0.001	0.070	<0.001	0.153	0.074	0.228
		15 May	<0.001	0.082	<0.001	0.151	0.098	0.256
		30 May	<0.001	0.080	<0.001	0.138	0.084	0.222

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D10-3: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***ethofumesate*** application to ***sugar beet – higher dose rate***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 60 years in brackets[1] Hamburg 1m depth (PELMO) EU/DK[2]	Hamburg DK/DK[3]	Karup 2.5 m depth (MACRO) EU/DK[2]	Karup DK/DK[3]	Langvad 2.5 m depth (MACRO) EU/DK[2]	Langvad DK/DK[3]
Ethofumesate	3 appl. 173 g/ha, 9 d interval, 10-15, appl. every 3rd year	01 May	0.005 (0)	1.382 (60)	0.012 (0)	2.177 (60)	1.114 (30)	3.894 (60)
		15 May	0.008 (0)	1.875 (55)	0.013 (0)	2.118 (60)	1.692 (30)	5.309 (60)
		30 May	0.015 (0)	2.237 (58)	0.010 (0)	1.847 (60)	0.980 (30)	2.792 (60)

1 The PECgw 95th percentile is calculated as the fourth highest value considering all 60 individual years, an exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L considering all 60 individual years.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D10-4: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***ethofumesate*** application to ***sugar beet – lower dose rate***

	Appl. Rate and BBCH	**Appl. Date**	**PECgw (µg/L) and number of exceedances in 60 years in brackets[1]**					
			Hamburg 1m depth (PELMO)		**Karup 2.5 m depth (MACRO)**		**Langvad 2.5 m depth (MACRO)**	
			EU/DK[2]	**DK/DK[3]**	**EU/DK[2]**	**DK/DK[3]**	**EU/DK[2]**	**DK/DK[3]**
Ethofumesate	2 appl. 35 g/ha, 9 d interval, 10-15, appl. every 3rd year	01 May	<0.001 (0)	0.107 (7)	<0.001 (0)	0.185 (43)	0.110 (7)	0.465 (29)
		15 May	<0.001 (0)	0.199 (10)	0.001 (0)	0.183 (41)	0.144 (12)	0.538 (22)
		30 May	0.001 (0)	0.247 (8)	0.001 (0)	0.169 (33)	0.128 (10)	0.405 (21)

[1] The PECgw 95th percentile is calculated as the fourth highest value considering all 60 individual years, an exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L considering all 60 individual years.
[2.] EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
[3.] DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D10-5: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***ethofumesate***

	Field	**Horizontal screens**			**Vertical screens**		
		nd	<0.1	≥0.1	nd	<0.1	≥0.1
Ethofumesate	Silstrup	169	2	-	355	3	-
	Estrup	46	-	-	158	-	-
	Faardrup	104	-	-	227	25	6

Table D10-6: ***Applications*** with ***ethofumesate*** on PLAP fields within the period 1999-2013

Crop	**Under-sown?**	**Field**	**Product**	**BBCH at appl.**	**Appl. Date**	**Year**	**Dose a.i. [g/ha]**
Sugar beet	No	Faardrup	Betanal Optima	10	21-05	2001	173
	No	Faardrup	Betanal Optima	11	30-05	2001	173
	No	Faardrup	Betanal Optima	15	15-06	2001	173
	No	Faardrup	Ethosan	11	30-04	2009	350
	No	Faardrup	Ethosan	14	11-05	2009	350
Fodder beet	No	Silstrup	Betanal Optima	11	22-05	2000	115
	No	Silstrup	Betanal Optima	11-15	15-06	2000	115
	No	Silstrup	Betanal Optima	33	12-07	2000	115
	No	Silstrup	Tramat 500 SC	13	30-05	2008	35
	No	Silstrup	Tramat 500 SC	15	17-06	2008	35
	No	Estrup	Betanal Optima	10	08-05	2003	115
	No	Estrup	Betanal Optima	13	22-05	2003	115
	No	Estrup	Betanal Optima	25	16-06	2003	115

D11 Fluazifop-P-butyl, fluazifop-P and TFMP

Table D11-1: PECgw ***80th percentile*** for ***fluazifop-P-butyl*** applications to ***sugar beet – higher dose rate***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1]		Karup 2.5 m depth (MACRO)[1]		Langvad 2.5 m depth (MACRO)[1]	
			EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]
Fluazifop-P-butyl	375 g/ha, 20 – 39 appl. every 3rd year	15 June	<0.001	<0.001	n/a	n/a	n/a	n/a
		01 July	<0.001	<0.001	n/a	n/a	n/a	n/a
		15 July	<0.001	<0.001	n/a	n/a	n/a	n/a
Fluazifop-P		15 June	<0.001	0.019	<0.001	0.026	0.024	0.073
		01 July	<0.001	0.023	<0.001	0.035	0.065	0.163
		15 July	<0.001	0.004	<0.001	0.007	0.158	0.060
TFMP		15 June	0.350	1.225	0.287	1.001	0.191	0.990
		01 July	0.380	1.263	0.303	1.011	0.221	1.024
		15 July	0.396	0.298	0.319	0.234	0.224	0.218

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D11-2: PECgw ***80th percentile*** for ***fluazifop-P-butyl*** applications to ***grass – lower dose rate***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1]		Karup 2.5 m depth (MACRO)[1]		Langvad 2.5 m depth (MACRO)[1]	
			EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]
Fluazifop-P-butyl	188 g/ha, appl. every year	20 April	<0.001	<0.001	n/a	n/a	n/a	n/a
		05 May	<0.001	<0.001	n/a	n/a	n/a	n/a
		20 May	<0.001	<0.001	n/a	n/a	n/a	n/a
Fluazifop-P		20 April	<0.001	0.002	<0.001	0.004	<0.001	0.004
		05 May	<0.001	0.002	<0.001	0.004	0.001	0.005
		20 May	<0.001	0.003	<0.001	0.004	0.001	0.007
TFMP		20 April	0.092	0.473	0.108	0.446	0.066	0.648
		05 May	0.095	0.482	0.111	0.452	0.069	0.656
		20 May	0.096	0.478	0.115	0.461	0.072	0.650

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D11-3: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***fluazifop-P-butyl*** applications to ***sugar beet*** – ***higher dose rate***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 60 years in brackets[1] Hamburg 1m depth (PELMO)		Karup 2.5 m depth (MACRO)		Langvad 2.5 m depth (MACRO)	
			EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]
Fluazifop-P-butyl	375 g/ha, 20 – 39 appl. every 3[rd] year	15 June	<0.001 (0)	<0.001 (0)	n/a	n/a	n/a	n/a
		01 July	<0.001 (0)	<0.001 (0)	n/a	n/a	n/a	n/a
		15 July	<0.001 (0)	<0.001 (0)	n/a	n/a	n/a	n/a
Fluazifop-P		15 June	<0.001 (0)	0.055 (2)	<0.001 (0)	0.042 (1)	0.047 (0)	0.145 (8)
		01 July	<0.001 (0)	0.066 (2)	<0.001 (0)	0.051 (0)	0.148 (7)	0.341 (12)
		15 July	0.001 (0)	0.012 (0)	<0.001 (0)	0.011 (0)	0.351 (11)	0.128 (7)
TFMP		15 June	0.543 (51)	2.067 (57)	0.379 (59)	1.478 (60)	0.202 (55)	1.063 (60)
		01 July	0.562 (53)	2.105 (57)	0.404 (58)	1.514 (60)	0.233 (55)	1.084 (60)
		15 July	0.613 (56)	0.444 (52)	0.439 (60)	0.316 (48)	0.259 (55)	0.231 (58)

[1] The PECgw 95[th] percentile is calculated as the fourth highest value considering all 60 individual years, an exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L considering all 60 individual years.
[2.] EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
[3.] DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D11-4: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***fluazifop-P-butyl*** applications to ***grass*** – ***lower dose rate***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 60 years in brackets[1] Hamburg 1m depth (PELMO)		Karup 2.5 m depth (MACRO)		Langvad 2.5 m depth (MACRO)	
			EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]
Fluazifop-P-butyl	188 g/ha, appl. every year	20 April	<0.001 (0)	<0.001 (0)	n/a	n/a	n/a	n/a
		05 May	<0.001 (0)	<0.001 (0)	n/a	n/a	n/a	n/a
		20 May	<0.001 (0)	<0.001 (0)	n/a	n/a	n/a	n/a
Fluazifop-P		20 April	<0.001 (0)	0.005 (0)	<0.001 (0)	0.005 (0)	<0.001 (0)	0.004 (0)
		05 May	<0.001 (0)	0.006 (0)	<0.001 (0)	0.006 (0)	0.001 (0)	0.006 (0)
		20 May	<0.001 (0)	0.009 (0)	<0.001 (0)	0.007 (0)	0.001 (0)	0.007 (0)
TFMP		20 April	0.117 (3)	0.489 (20)	0.113 (10)	0.464 (20)	0.070 (1)	0.687 (19)
		05 May	0.117 (4)	0.491 (20)	0.114 (11)	0.469 (20)	0.074 (1)	0.698 (19)
		20 May	0.126 (4)	0.491 (20)	0.119 (15)	0.475 (20)	0.077 (1)	0.711 (19)

[1] An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
[2.] EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
[3.] DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D11-5: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***fluazifop-P-butyl***, ***fluazifop-P*** and ***TFMP***

	Field	Horizontal screens			Vertical screens		
		nd	<0.1	≥0.1	nd	<0.1	≥0.1
Fluazifop-P-butyl	Faardrup	66	-	-	166	-	-
Fluazifop-P	Tylstrup	178	-	-	65	-	-
	Jyndevad	190	-	-	51	-	-
	Silstrup	140	1	-	301	-	-
	Faardrup	87	-	-	206	5	1
TFMP	Tylstrup	3	-	-			
	Jyndevad	3	-	-			
	Silstrup	84	23	2	141	48	14
	Faardrup	43	-	-	94	-	-

Table D11-6: ***Applications*** with ***fluazifop-P-butyl*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Fodder beet	No	Silstrup	Fusilade Max	17	01-07	2008	375
	No	Silstrup	Fusilade X-tra	19	28-06	2000	375
Sugar beet	No	Faardrup	Fusilade X-tra	18	21-06	2001	375
Red fescue	No	Silstrup	Fusilade Max	30	02-05	2010	188
	No	Silstrup	Fusilade Max	25	26-04	2011	188
	No	Silstrup	Fusilade Max	25	19-04	2012	188
	No	Faardrup	Fusilade Max	37-59	21-05	2011	188
Potatoes	No	Tylstrup	Fusilade X-tra	9	27-05	2004	188
	No	Tylstrup	Fusilade X-tra	40	17-06	2004	188
Pea	No	Jyndevad	Fusilade X-tra	51	03-06	2004	250

D12 Glyphosate and AMPA

Table D12-1: PECgw ***80th percentile*** for ***glyphosate*** applications to ***peas***, ***winter wheat*** and ***spring barley***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1] EU/EU[2]	DK/EU[3]	Karup 2.5 m depth (MACRO)[1] EU/EU[2]	DK/EU[3]	Langvad 2.5 m depth (MACRO)[1] EU/EU[2]	DK/EU[3]
Peas (Legumes)								
Glyphosate	1080 g/ha, 80 - 99	15 July	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		01 August	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		20 August	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
AMPA		15 July	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		01 August	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		20 August	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Winter Wheat (Winter Cereals)								
Glyphosate	1080 g/ha, >90	15 July	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		01 August	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		15 August	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
AMPA		15 July	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		01 August	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		15 August	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Spring Barley (Spring Cereals)								
Glyphosate	1080 g/ha, >90	01 August	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		15 August	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		30 August	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
AMPA		01 August	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		15 August	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		30 August	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D12-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***glyphosate*** applications to ***peas***, ***winter wheat*** and ***spring barley***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1] Hamburg 1m depth (PELMO) EU/DK[2]	Hamburg DK/DK[3]	Karup 2.5 m depth (MACRO) EU/DK[2]	Karup DK/DK[3]	Langvad 2.5 m depth (MACRO) EU/DK[2]	Langvad DK/DK[3]
			Peas (Legumes)					
Glyphosate	1080 g/ha, 80 - 99	15 July	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		01 August	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		20 August	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
AMPA		15 July	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		01 August	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		20 August	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
			Winter Wheat (Winter Cereals)					
Glyphosate	1080 g/ha, >90	15 July	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		01 August	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		15 August	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
AMPA		15 July	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		01 August	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		15 August	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
			Spring Barley (Spring Cereals)					
Glyphosate	1080 g/ha, >90	01 August	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		15 August	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		30 August	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
AMPA		01 August	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		15 August	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		30 August	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)

[1] *An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.*
[2] *EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).*
[3] *DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).*

Table D12-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***glyphosate*** and ***AMPA***

	Field	Horizontal screens nd	Horizontal screens <0.1	Horizontal screens ≥0.1	Vertical screens nd	Vertical screens <0.1	Vertical screens ≥0.1
Glyphosate	Jyndevad				233	-	-
	Silstrup	145	3	-	255	14	-
	Estrup	211	4	1	606	38	4
	Faardrup	127	1	-	319	4	-
AMPA	Jyndevad				221	2	-
	Silstrup	140	8	-	257	12	-
	Estrup	216	1	-	642	7	-
	Faardrup	128	-	-	321	2	-

Table D12-4: ***Applications*** with ***glyphosate*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Pea	No	Estrup	Glyfonova 450 Plus	90	21-08	2013	1080
Winter wheat	Applied at Silstrup and Estrup in 2014						
Beet	Not applied in connection with beet in PLAP						
Spring barley	No	Silstrup	Glyfonova 450 Plus	87	20-08	2013	1080
	No	Tylstrup	Glyfonova 450 Plus	89	13-08	2012	1080
Triticale	No	Jyndevad	Roundup 2000	90	13-09	2007	800
No Crop	No	Jyndevad	Roundup 2000	0	22-08	1999	800
	No	Silstrup	Glyfonova 450 Plus	0	10-09	2012	2160
	No	Silstrup	Glyfonova 450 Plus	0	20-08	2013	1080
	No	Estrup	Roundup Max	0	24-09	2007	1020
	No	Estrup	Roundup Max	0	03-10	2011	1360
	No	Faardrup	Roundup 2000	0	11-08	1999	800
	No	Faardrup	Roundup 2000	0	04-10	2000	800
	No	Faardrup	Glyphogan	0	03-10	2011	1800

D13 Ioxynil

Table D13-1: PECgw ***80th percentile*** for ***ioxynil*** applications to ***winter wheat***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1]		Karup 2.5 m depth (MACRO)[1]		Langvad 2.5 m depth (MACRO)[1]	
			EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]
Ioxynil	200 g/ha, 11-12	20 Sept.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		15 Oct.	<0.001	<0.001	<0.001	<0.001	<0.001	0.003
		30 Oct.	<0.001	<0.001	<0.001	<0.001	<0.001	0.007

[1.] PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
[2.] EU parameter selection and EU output evaluation (80th percentile PECgw).
[3.] DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D13-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***ioxynil*** applications to ***winter wheat***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1] Hamburg 1m depth (PELMO)		Karup 2.5 m depth (MACRO)		Langvad 2.5 m depth (MACRO)	
			EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]
Ioxynil	200 g/ha, 11-12	20 Sept.	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		15 Oct.	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	0.003 (0)
		30 Oct.	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	0.008 (0)

[1] An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
[2.] EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
[3.] DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D13-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***ioxynil***

	Field	Horizontal screens nd	<0.1	≥0.1	Vertical screens nd	<0.1	≥0.1
Ioxynil	Tylstrup	-	-	-	198	-	-
	Jyndevad	-	-	-	218	-	-
	Estrup	41	-	-	125	-	-
	Faardrup	81	-	-	224	1	-

Table D13-4: ***Applications*** with ***ioxynil*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Winter wheat	No	Tylstrup	Oxitril	11	09-10	2002	200
	No	Jyndevad	Oxitril CM	12	19-10	2004	200
	No	Estrup	Oxitril CM	11-12	20-11	2001	200
	No	Faardrup	Briotril	9	14-10	1999	160

D14 Metalaxyl-M, CGA62826 and CGA108906

Table D14-1: PECgw ***80th percentile*** for ***metalaxyl-M*** applications to ***potatoes***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1]		Karup 2.5 m depth (MACRO)[1]		Langvad 2.5 m depth (MACRO)[1]	
			EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]
Metalaxyl-M	77.6 g/ha, 60, application every 3rd year	01 July	<0.001	0.005	<0.001	0.006	0.008	0.014
		10 July	<0.001	0.005	<0.001	0.007	0.007	0.016
		20 July	<0.001	0.007	<0.001	0.008	0.001	0.005
CGA 62826		01 July	0.173	0.338	0.121	0.227	0.076	0.244
		10 July	0.174	0.345	0.134	0.232	0.069	0.251
		20 July	0.186	0.351	0.147	0.238	0.069	0.239
CGA 108906		01 July	0.366	0.138	n/a	n/a	n/a	n/a
		10 July	0.371	0.139	n/a	n/a	n/a	n/a
		20 July	0.370	0.139	n/a	n/a	n/a	n/a

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D14-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***metalaxyl-M*** applications to ***potatoes***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1]: Hamburg 1m depth (PELMO)		Karup 2.5 m depth (MACRO)		Langvad 2.5 m depth (MACRO)	
			EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]
Metalaxyl-M	77.6 g/ha, 60, application every 3rd year	01 July	<0.001 (0)	0.014 (0)	<0.001 (0)	0.010 (0)	0.015 (0)	0.022 (0)
		10 July	<0.001 (0)	0.018 (0)	<0.001 (0)	0.013 (0)	0.030 (0)	0.030 (0)
		20 July	<0.001 (0)	0.019 (0)	<0.001 (0)	0.016 (0)	0.015 (0)	0.026 (0)
CGA 62826		01 July	0.368 (26)	0.736 (42)	0.223 (32)	0.504 (31)	0.103 (4)	0.270 (60)
		10 July	0.402 (27)	0.756 (41)	0.246 (33)	0.496 (33)	0.113 (6)	0.274 (60)
		20 July	0.454 (28)	0.763 (41)	0.266 (34)	0.496 (35)	0.106 (4)	0.264 (57)
CGA 108906		01 July	0.808 (41)	0.270 (24)	n/a	n/a	n/a	n/a
		10 July	0.812 (42)	0.277 (23)	n/a	n/a	n/a	n/a
		20 July	0.793 (42)	0.282 (21)	n/a	n/a	n/a	n/a

1 The PECgw 95th percentile is calculated as the fourth highest value considering all 60 individual years, an exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L considering all 60 individual years.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D14-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***metalaxyl-M***, ***CGA62826*** and ***CGA108906***

	Field	**Horizontal screens**			**Vertical screens**		
		nd	<0.1	≥0.1	nd	<0.1	≥0.1
Metalaxyl-M	Tylstrup	15	-	-	184	13	-
	Jyndevad	-	7	5	175	14	17
CGA62826	Tylstrup	14	1	-	182	15	-
	Jyndevad	-	4	8	137	70	-
CGA108906	Tylstrup	2	13	-	26	130	41
	Jyndevad	-	7	5	45	101	61

Table D14-4: ***Applications*** with ***metalaxyl-M*** on PLAP fields within the period 1999-2013

Crop	**Under-sown?**	**Field**	**Product**	**BBCH at appl.**	**Appl. Date**	**Year**	**Dose a.i. [g/ha]**
Potatoes	No	Tylstrup	Ridomil Gold MZ Pepite	60	09-07	2010	78
	No	Jyndevad	Ridomil Gold MZ Pepite	71	25-07	2010	78

D15 Metamitron and metamitron-desamino

Table D15-1: PECgw **80th** ***percentile*** for ***metamitron*** applications to ***sugarbeet***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L)					
			Hamburg 1m depth (PELMO)[1]		Karup 2.5 m depth (MACRO)[1]		Langvad 2.5 m depth (MACRO)[1]	
			EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]
Metamitron	3 appl., 700 g/ha, 7 days interval, 10-18, App. every 3rd year	01 May	<0.001	0.047	<0.001	0.147	1.505	2.438
		12 May	<0.001	0.060	<0.001	0.180	1.890	2.967
		25 May	<0.001	0.052	<0.001	0.118	2.322	2.869
Metamitron-desamino		01 May	<0.001	0.257	<0.001	0.404	0.690	1.328
		12 May	<0.001	0.306	<0.001	0.416	0.675	1.413
		25 May	0.001	0.277	<0.001	0.339	0.608	1.055

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D15-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***metamitron*** applications to ***sugarbeet***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1]					
			Hamburg 1m depth (PELMO)		Karup 2.5 m depth (MACRO)		Langvad 2.5 m depth (MACRO)	
			EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]
Metamitron	3 appl., 700 g/ha, 7 days interval, 10-18, App. every 3rd year	01 May	<0.001 (0)	0.409 (5)	<0.001 (0)	0.298 (24)	2.309 (30)	6.326 (60)
		12 May	<0.001 (0)	0.499 (8)	<0.001 (0)	0.283 (30)	3.059 (30)	8.253 (60)
		25 May	<0.001 (0)	0.560 (6)	<0.001 (0)	0.229 (20)	3.714 (30)	7.590 (54)
Metamitron-desamino		01 May	0.002 (0)	1.463 (34)	<0.001 (0)	0.711 (57)	0.782 (30)	1.915 (53)
		12 May	0.003 (0)	1.164 (28)	<0.001 (0)	0.755 (57)	0.782 (30)	1.991 (53)
		25 May	0.003 (0)	1.388 (28)	<0.001 (0)	0.620 (56)	0.663 (30)	1.381 (52)

1 The PECgw 95th percentile is calculated as the fourth highest value considering all 60 individual years, an exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L considering all 60 individual years.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D15-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***metamitron*** and ***metamitron-desamino***

	Field	Horizontal screens			Vertical screens		
		nd	<0.1	≥0.1	nd	<0.1	≥0.1
Metamitron	Silstrup	161	10	-	339	17	2
	Estrup	46	-	-	158	-	-
	Faardrup	104	-	-	234	20	4
Metamitron-desamino	Silstrup	165	3	3	334	23	1
	Estrup	46	-	-	157	-	-
	Faardrup	104	-	-	210	36	12

Table D15-4: ***Applications*** with ***metamitron*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Fodder beet	No	Silstrup	Goltix WG	11	22-05	2000	700
	No	Silstrup	Goltix WG	11-15	15-06	2000	700
	No	Silstrup	Goltix WG	33	12-07	2000	700
	No	Silstrup	Goliath	10	22-05	2008	350
	No	Silstrup	Goliath	13	30-05	2008	350
	No	Silstrup	Goliath	15	17-06	2008	350
	No	Silstrup	Goliath	18	04-07	2008	350
	No	Estrup	Goltix SC700	10	08-05	2003	700
	No	Estrup	Goltix SC700	13	22-05	2003	700
	No	Estrup	Goltix SC700	25	16-06	2003	700
Sugar beet	No	Faardrup	Goltix WG	10	21-05	2001	700
	No	Faardrup	Goltix WG	11	30-05	2001	700
	No	Faardrup	Goltix WG	15	15-06	2001	700
	No	Faardrup	Goliath	10	24-04	2009	700
	No	Faardrup	Goliath	11	30-04	2009	700
	No	Faardrup	Goliath	14	11-05	2009	700

D16 Metrafenone

Table D16-1: PECgw ***80th percentile*** for ***metrafenone*** applications to ***winter wheat***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1] EU/EU[2]	DK/EU[3]	Karup 2.5 m depth (MACRO)[1] EU/EU[2]	DK/EU[3]	Langvad 2.5 m depth (MACRO)[1] EU/EU[2]	DK/EU[3]
Metrafenone	2 appl., 150 g/ha, 30-79	15 May	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		15 June	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		15 July	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D16-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***metrafenone*** applications to ***winter wheat***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1] Hamburg 1m depth (PELMO) EU/DK[2]	DK/DK[3]	Karup 2.5 m depth (MACRO) EU/DK[2]	DK/DK[3]	Langvad 2.5 m depth (MACRO) EU/DK[2]	DK/DK[3]
Metrafenone	2 appl., 150 g/ha, 30-79	15 May	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		15 June	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		15 July	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)

1 An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D16-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***metrafenone***

	Field	Horizontal screens nd	<0.1	≥0.1	Vertical screens nd	<0.1	≥0.1
Metrafenone	Estrup	40	-	-	74	1	-
	Faardrup	21	-	-	46	-	-

Table D16-4: ***Applications*** with ***metrafenone*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Winter wheat	No	Estrup	Flexity	31	09-05	2011	150
	No	Estrup	Flexity	58	07-06	2011	150
Spring barley	Yes	Faardrup	Flexity	39	06-06	2012	150

D17 Metribuzin, metribuzin-diketo and metribuzin-desamino-diketo

Table D17-1: PECgw ***80th percentile*** for ***metribuzin*** applications to ***potatoes***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1 m depth (PELMO)[1] EU/EU[2]	Hamburg 1 m depth (PELMO)[1] DK/EU[3]	Hamburg 2.5 m depth (MACRO)[1] EU/EU[2]	Hamburg 2.5 m depth (MACRO)[1] DK/EU[3]	Hamburg 2.5 m depth (MACRO)[1] EU/EU[2]	Hamburg 2.5 m depth (MACRO)[1] DK/EU[3]
Metribuzin	120 g/ha, pre-emergence, application every 3rd year	10 April	<0.001	0.101	<0.001	0.344	0.019	0.263
		25 April	<0.001	0.120	<0.001	0.357	0.026	0.310
		10 May	<0.001	0.142	0.001	0.363	0.036	0.245
Metribuzin-diketo		10 April	<0.001	0.009	<0.001	0.037	0.008	0.026
		25 April	<0.001	0.010	<0.001	0.039	0.010	0.031
		10 May	<0.001	0.011	<0.001	0.036	0.012	0.026
Metribuzin-desamino-diketo		10 April	0.014	0.095	n/a	n/a	n/a	n/a
		25 April	0.016	0.095	n/a	n/a	n/a	n/a
		10 May	0.018	0.110	n/a	n/a	n/a	n/a

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D17-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***metribuzin*** applications to ***potatoes***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1] Hamburg 1 m depth (PELMO) EU/DK[2]	Hamburg 1 m depth (PELMO) DK/DK[3]	Hamburg 2.5 m depth (MACRO) EU/DK[2]	Hamburg 2.5 m depth (MACRO) DK/DK[3]	Hamburg 2.5 m depth (MACRO) EU/DK[2]	Hamburg 2.5 m depth (MACRO) DK/DK[3]
Metribuzin	120 g/ha, pre-emergence, application every 3rd year	10 April	<0.001 (0)	0.245 (15)	0.001 (0)	0.591 (26)	0.097 (3)	0.452 (33)
		25 April	0.001 (0)	0.320 (20)	0.001 (0)	0.652 (26)	0.133 (5)	0.533 (33)
		10 May	0.001 (0)	0.343 (24)	0.002 (0)	0.770 (24)	0.203 (7)	0.535 (33)
Metribuzin-diketo		10 April	<0.001 (0)	0.019 (1)	0.001 (0)	0.078 (1)	0.037 (0)	0.046 (0)
		25 April	<0.001 (0)	0.020 (1)	0.001 (0)	0.081 (2)	0.048 (0)	0.054 (0)
		10 May	0.001 (0)	0.025 (1)	0.001 (0)	0.076 (3)	0.064 (0)	0.065 (0)
Metribuzin-desamino-diketo		10 April	0.064 (1)	0.193 (19)	n/a	n/a	n/a	n/a
		25 April	0.064 (2)	0.230 (19)	n/a	n/a	n/a	n/a
		10 May	0.087 (3)	0.309 (20)	n/a	n/a	n/a	n/a

1 The PECgw 95th percentile is calculated as the fourth highest value considering all 60 individual years, an exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L considering all 60 individual years.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D17-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***metribuzin***, ***metribuzin-diketo*** and ***metribuzin-desamino-diketo***

	Field	Horizontal screens nd	Horizontal screens <0.1	Horizontal screens ≥0.1	Vertical screens nd	Vertical screens <0.1	Vertical screens ≥0.1
Metribuzin	Tylstrup	-	-	-	387	1	-
	Jyndevad	-	-	-	26	-	-
Metribuzin-diketo	Tylstrup	-	-	-	73	138	315
	Jyndevad	-	-	-	-	7	19
Metribuzin-desamino-diketo	Tylstrup	-	-	-	289	231	5
	Jyndevad	-	-	-	6	7	13

Table D17-4: ***Applications*** with ***metribuzin*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Potatoes	No	Tylstrup	Sencor WG	0	25-05	1999	140
	No	Tylstrup	Sencor WG	6	07-06	1999	105
	No	Jyndevad	Sencor WG	0	13-05	2002	140

D18 Pendimethalin

Table D18-1: ***PECgw 80th percentile*** for ***pendimethalin*** applications to ***winter wheat***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L)					
			Hamburg 1m depth (PELMO)[1]		Karup 2.5 m depth (MACRO)[1]		Langvad 2.5 m depth (MACRO)[1]	
			EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]
Pendimethalin	2000 g/ha, 0-13	15 Sept.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		01 Oct.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		15 Oct.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

[1.] PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
[2.] EU parameter selection and EU output evaluation (80th percentile PECgw).
[3.] DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D18-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***pendimethalin*** applications to ***winter wheat***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1]					
			Hamburg 1m depth (PELMO)		Karup 2.5 m depth (MACRO)		Langvad 2.5 m depth (MACRO)	
			EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]
Pendimethalin	2000 g/ha, 0-13	15 Sept.	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		01 Oct.	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		15 Oct.	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)

[1] An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
[2.] EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
[3.] DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D18-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***pendimethalin***

	Field	Horizontal screens			Vertical screens		
		nd	<0.1	≥0.1	nd	<0.1	≥0.1
Pendimethalin	Tylstrup	-	-	-	436	-	-
	Jyndevad	-	-	-	257	-	-
	Silstrup	122	-	-	222	-	-
	Estrup	41	-	-	147	-	-
	Faardrup	55	-	-	125	-	-

Table D18-4: ***Applications*** with ***pendimethalin*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Winter wheat	No	Tylstrup	Stomp	11	18-10	2007	2000
	No	Silstrup	Stomp Pentagon	<9	22-09	2006	1650
	No	Faardrup	Stomp SC	12	09-10	2007	2000
Winter rye	No	Tylstrup	Stomp SC	12	02-11	2000	800
Pea	No	Jyndevad	Stomp SC	15	05-05	2004	600
	No	Silstrup	Stomp SC	14	17-05	2003	600
	No	Estrup	Stomp SC	35	22-05	2001	600

D19 Picolinafen and CL153815

Table D19-1: PECgw ***80th percentile*** for ***picolinafen*** applications to ***winter wheat***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1]		Karup 2.5 m depth (MACRO)[1]		Langvad 2.5 m depth (MACRO)[1]	
			EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]
Picolinafen	100 g/ha, 11 - 12	20 Sept.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		05 Oct.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		20 Oct.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CL 153815		20 Sept.	<0.001	0.020	<0.001	0.022	<0.001	0.103
		05 Oct.	<0.001	0.020	<0.001	0.020	0.006	0.097
		20 Oct.	<0.001	0.018	<0.001	0.019	0.006	0.086

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D19-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***picolinafen*** applications to ***winter wheat***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1] Hamburg 1m depth (PELMO)		Karup 2.5 m depth (MACRO)		Langvad 2.5 m depth (MACRO)	
			EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]
Picolinafen	100 g/ha, 11 - 12	20 Sept.	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		05 Oct.	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		20 Oct.	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
CL 153815		20 Sept.	<0.001 (0)	0.023 (0)	<0.001 (0)	0.022 (0)	<0.001 (0)	0.110 (5)
		05 Oct.	<0.001 (0)	0.023 (0)	<0.001 (0)	0.021 (0)	0.007 (0)	0.102 (3)
		20 Oct.	<0.001 (0)	0.022 (0)	<0.001 (0)	0.019 (0)	0.006 (0)	0.090 (0)

1 An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D19-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***picolinafen*** and ***CL 153815***

	Field	Horizontal screens nd	<0.1	≥0.1	Vertical screens nd	<0.1	≥0.1
Picolinafen	Jyndevad	-	-	-	35	-	-
	Estrup	40	-	-	118	-	-
CL 153815	Jyndevad	-	-	-	35	-	-
	Estrup	40	-	-	118	-	-

Table D19-4: ***Applications*** with ***picolinafen*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Winter wheat	No	Jyndevad	Pico 750 WG	12	29-10	2007	100
	No	Estrup	Pico 750 WG	12	30-10	2007	100

D20 Pirimicarb and pirimicarb-desmethyl-formamido

Table D20- 1: PECgw ***80th percentile*** for ***pirimicarb*** applications to ***sugar beet***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1] EU/EU[2]	DK/EU[3]	Karup 2.5 m depth (MACRO)[1] EU/EU[2]	DK/EU[3]	Langvad 2.5 m depth (MACRO)[1] EU/EU[2]	DK/EU[3]
Pirimicarb	150 g/ha, 13-45	01 June	0.039	6.941	0.011	6.219	0.043	6.177
		25 June	0.004	2.729	<0.001	2.400	0.008	1.933
		01 August	<0.001	0.632	<0.001	0.551	0.001	0.420
Pirimicarb-desmethyl-formamido		01 June	0.002	0.143	0.002	0.118	0.004	0.097
		25 June	<0.001	0.057	<0.001	0.047	0.001	0.036
		01 August	<0.001	0.014	<0.001	0.012	<0.001	0.008

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D20-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***pirimicarb*** applications to ***sugar beet***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1] — Hamburg 1m depth (PELMO) EU/DK[2]	DK/DK[3]	Karup 2.5 m depth (MACRO) EU/DK[2]	DK/DK[3]	Langvad 2.5 m depth (MACRO) EU/DK[2]	DK/DK[3]
Pirimicarb	150 g/ha, 13-45	01 June	0.042 (0)	7.624 (20)	0.020 (0)	6.606 (20)	0.054 (0)	6.285 (20)
		25 June	0.005 (0)	2.832 (20)	0.001 (0)	2.474 (20)	0.010 (0)	1.960 (19)
		01 August	<0.001 (0)	0.651 (20)	<0.001 (0)	0.558 (20)	0.001 (0)	0.429 (16)
Pirimicarb-desmethyl-formamido		01 June	0.002 (0)	0.148 (20)	0.003 (0)	0.128 (17)	0.004 (0)	0.102 (2)
		25 June	<0.001 (0)	0.062 (0)	<0.001 (0)	0.050 (0)	0.001 (0)	0.037 (0)
		01 August	<0.001 (0)	0.015 (0)	<0.001 (0)	0.012 (0)	<0.001 (0)	0.009 (0)

1 An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D20-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***pirimicarb*** and ***pirimicarb-desmethyl-formamido***

	Field	Horizontal screens nd	<0.1	≥0.1	Vertical screens nd	<0.1	≥0.1
Pirimicarb	Tylstrup	-	-	-	301	-	-
	Jyndevad	-	-	-	251	-	-
	Silstrup	210	-	-	433	3	-
	Estrup	67	-	-	225	1	-
	Faardrup	116	-	-	319	2	-
Pirimicarb-desmethyl-formamido	Tylstrup	-	-	-	173	-	-
	Jyndevad	-	-	-	251	-	-
	Silstrup	160	-	-	308	-	-
	Estrup	76	-	-	261	-	-
	Faardrup	66	-	-	164	2	-

Table D20-4: ***Applications*** with ***pirimicarb*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Fodder beet	No	Silstrup	Pirimor G	31	05-07	2000	150
	No	Silstrup	Pirimor G	16	26-06	2008	150
	No	Silstrup	Pirimor G	32	09-07	2008	150
	No	Estrup	Pirimor G	40	28-07	2003	150
Sugar beet	No	Faardrup	Pirimor G	39	17-07	2001	150
Winter wheat	No	Tylstrup	Pirimor G	55	19-06	2000	125
	No	Silstrup	Pirimor G	75	20-07	2004	125
	No	Estrup	Pirimor G	65	24-06	2002	125
	No	Faardrup	Pirimor G	65	19-06	2000	125
Spring barley	No	Silstrup	Pirimor G	72	14-07	2005	125
Pea	No	Jyndevad	Pirimor G	51	03-06	2004	125
	No	Jyndevad	Pirimor G	69	16-07	2013	125
	No	Estrup	Pirimor G	53	27-06	2001	125
	No	Estrup	Pirimor G	68	13-07	2013	125
	No	Faardrup	Goliath	11	30-04	2009	700
	No	Faardrup	Goliath	14	11-05	2009	700

D21 Propiconazole

Table D21-1: PECgw ***80th percentile*** for ***propiconazole*** applications to ***spring barley***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L)					
			Hamburg 1m depth (PELMO)[1]		Karup 2.5 m depth (MACRO)[1]		Langvad 2.5 m depth (MACRO)[1]	
			EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]
Propiconazole	125 g/ha, 26-51	15 May	<0.001	0.001	<0.001	<0.001	<0.001	0.005
		01 June	<0.001	<0.001	<0.001	<0.001	<0.001	0.002
		15 June	<0.001	<0.001	<0.001	<0.001	<0.001	0.001

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D21-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***propiconazole*** applications to ***spring barley***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1]					
			Hamburg 1m depth (PELMO)		Karup 2.5 m depth (MACRO)		Langvad 2.5 m depth (MACRO)	
			EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]
Propiconazole	125 g/ha, 26-51	15 May	<0.001 (0)	0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	0.007 (0)
		01 June	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	0.003(0)
		15 June	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	0.002 (0)

1 An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D21-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***propiconazole***

	Field	Horizontal screens			Vertical screens		
		nd	<0.1	≥0.1	nd	<0.1	≥0.1
Propiconazole	Tylstrup	-	-	-	313	-	-
	Jyndevad	-	-	-	291	-	-
	Silstrup	74	-	-	148	-	-
	Estrup	86	-	-	309	2	-
	Faardrup	138	-	-	372	1	-

Table D21-4: ***Applications*** with ***propiconazole*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Spring barley	No	Faardrup	Tilt 250 EC	37	04-06	2002	125
	No	Estrup	Tilt 250 EC	37	27-05	2002	63
	No	Estrup	Tilt 250 EC	65	17-06	2002	62.5
	No	Estrup	Tilt Top	39	15-06	2000	62.5
	No	Estrup	Tilt Top	69	05-07	2000	62.5
	No	Silstrup	Tilt Top	31	21-06	2001	62.5
	No	Silstrup	Tilt Top	32	04-07	2001	62.5
	No	Jyndevad	Tilt 250 EC	41	06-06	2003	62.5
	No	Jyndevad	Tilt 250 EC	65	25-06	2003	62.5
	No	Tylstrup	Tilt Top	55	19-06	2000	125
Winter rye	No	Tylstrup	Tilt Top	37	14-05	2001	62.5
	No	Tylstrup	Tilt Top	61	13-06	2001	62.5
	No	Jyndevad	Tilt Top	43	04-05	2000	62.5
	No	Jyndevad	Tilt Top	69	07-06	2000	62.5
Winter wheat	No	Tylstrup	Tilt 250 EC	37	28-05	2003	62.5
	No	Tylstrup	Tilt 250 EC	65	17-06	2003	62.5
	No	Faardrup	Tilt Top	33	05-05	2000	62.5
	No	Faardrup	Tilt Top	55	31-05	2000	62.5

D22 Prosulfocarb

Table D22-1: PECgw ***80th percentile*** for ***prosulfocarb*** applications to ***winter wheat***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L)					
			Hamburg 1m depth (PELMO)[1]		Karup 2.5 m depth (MACRO)[1]		Langvad 2.5 m depth (MACRO)[1]	
			EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]
Prosulfocarb	4000 g/ha, 0-21	20 Sept.	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
		05 Oct.	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
		20 Oct.	<0.001	<0.001	<0.001	<0.001	<0.001	0.001

[1] PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
[2] EU parameter selection and EU output evaluation (80th percentile PECgw).
[3] DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D22-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***prosulfocarb*** applications to ***winter wheat***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1]					
			Hamburg 1m depth (PELMO)		Karup 2.5 m depth (MACRO)		Langvad 2.5 m depth (MACRO)	
			EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]
Prosulfocarb	4000 g/ha, 0-21	20 Sept.	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	0.001 (0)
		05 Oct.	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	0.001 (0)
		20 Oct.	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	0.001 (0)

[1] An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.

Table D22-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***prosulfocarb***

	Field	Horizontal screens			Vertical screens		
		nd	<0.1	≥0.1	nd	<0.1	≥0.1
Prosulfocarb	Tylstrup	7	-	-	33	-	-
	Silstrup	78	1	-	147	-	-
	Faardrup	61	-	-	126	-	-

Table D22-4: ***Applications*** with ***prosulfocarb*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Winter wheat	No	Tylstrup	Boxer EC	11	09-10	2002	2400
	No	Silstrup	Boxer EC	12	29-10	2003	3200
	No	Faardrup	Boxer	12	17-10	2003	3200
Winter rye	No	Tylstrup	Boxer	12	12-10	2012	3200

D23 Pyridate and PHCP

Table D23-1: PECgw ***80th percentile*** for ***pyridate*** applications to ***maize***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1] EU/EU[2]	Hamburg DK/EU[3]	Karup 2.5 m depth (MACRO)[1] EU/EU[2]	Karup DK/EU[3]	Langvad 2.5 m depth (MACRO)[1] EU/EU[2]	Langvad DK/EU[3]
Pyridate	2 applications, 240 g/ha, 10-29	10 May	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		25 May	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		10 June	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PHCP		10 May	<0.001	1.400	<0.001	2.546	0.349	2.631
		25 May	<0.001	1.623	<0.001	2.880	0.267	2.056
		10 June	<0.001	1.042	<0.001	2.047	0.052	1.086

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D23-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***pyridate*** applications to ***maize***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1] Hamburg 1m depth (PELMO) EU/DK[2]	Hamburg DK/DK[3]	Karup 2.5 m depth (MACRO) EU	Karup DK	Langvad 2.5 m depth (MACRO) EU	Langvad DK
Pyridate	2 applications, 240 g/ha, 10-29	10 May	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		25 May	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
		10 June	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)
PHCP		10 May	<0.001 (0)	1.639 (20)	<0.001 (0)	2.838 (20)	0.371 (8)	2.906 (20)
		25 May	<0.001 (0)	1.712 (20)	<0.001 (0)	3.374 (20)	0.300 (8)	2.175 (20)
		10 June	<0.001 (0)	1.240 (20)	<0.001 (0)	2.147 (20)	0.071 (0)	1.118 (20)

1 An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

TableD23-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***pyridate*** and ***PHCP***

	Field	Horizontal screens nd	Horizontal <0.1	Horizontal ≥0.1	Vertical screens nd	Vertical <0.1	Vertical ≥0.1
Pyridate	Jyndevad	-	-	-	116	-	-
PHCP	Jyndevad	-	-	-	184	-	-
	Silstrup	66	2	-	109	8	4

Table D23-4: ***Applications*** with ***pyridate*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Maize	No	Jyndevad	Lido	11	14-05	2001	240
	No	Jyndevad	Lido	16	30-05	2001	240
	No	Silstrup	Lido	12	19-05	2002	240
	No	Silstrup	Lido	31	03-06	2002	240

D24 Rimsulfuron and PPU

Table D24-1: PECgw ***80th percentile*** for ***rimsulfuron*** applications to ***potatoes***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1] EU/EU[2]	DK/EU[3]	Karup 2.5 m depth (MACRO)[1] EU/EU[2]	DK/EU[3]	Langvad 2.5 m depth (MACRO)[1] EU/EU[2]	DK/EU[3]
Rimsulfuron	7.5 g/ha, 0 – 32, application every 3rd year	25 April	0.008	0.054	0.011	0.070	0.018	0.061
		15 May	0.008	0.057	0.011	0.080	0.014	0.059
		10 June	0.006	0.080	0.006	0.074	0.009	0.066
PPU		25 April	0.075	0.103	0.078	0.120	0.073	0.166
		15 May	0.067	0.111	0.067	0.125	0.060	0.155
		10 June	0.037	0.122	0.030	0.104	0.027	0.143

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D24-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***rimsulfuron*** applications to ***potatoes***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1] Hamburg 1m depth (PELMO) EU/DK[2]	DK/EU[3]	Karup 2.5 m depth (MACRO) EU/DK[2]	DK/EU[3]	Langvad 2.5 m depth (MACRO) EU/DK[2]	DK/EU[3]
Rimsulfuron	7.5 g/ha, 0 – 32, application every 3rd year	25 April	0.021 (0)	0.111 (7)	0.021 (0)	0.173 (16)	0.032 (0)	0.085 (1)
		15 May	0.021 (0)	0.132 (11)	0.021 (0)	0.181 (14)	0.035 (0)	0.095 (3)
		10 June	0.019 (0)	0.188 (17)	0.012 (0)	0.163 (19)	0.014 (0)	0.084 (3)
PPU		25 April	0.098 (3)	0.150 (25)	0.108 (9)	0.182 (34)	0.079 (0)	0.169 (59)
		15 May	0.089 (2)	0.157 (31)	0.091 (0)	0.164 (32)	0.068 (0)	0.161 (59)
		10 June	0.050 (0)	0.181 (34)	0.040 (0)	0.143 (26)	0.030 (0)	0.150 (58)

1 The PECgw 95th percentile is calculated as the fourth highest value considering all 60 individual years, an exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L considering all 60 individual years.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D24-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***rimsulfuron*** and ***PPU***

	Field	Horizontal screens nd	<0.1	≥0.1	Vertical screens nd	<0.1	≥0.1
Rimsulfuron	Tylstrup	-	-	-	178	-	-
	Jyndevad	-	-	-	189	-	-
PPU	Tylstrup	-	-	-	589	58	-
	Jyndevad	-	1	6	489	361	6

Table D24-4: ***Applications*** with ***rimsulfuron*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Potatoes	No	Tylstrup	Titus WSB	7	26-05	2010	3
	No	Tylstrup	Titus WSB	15	08-06	2010	5
	No	Tylstrup	Titus	21	03-06	2004	7.5
	No	Jyndevad	Titus	10	23-05	2002	7.5
	No	Jyndevad	Titus WSB	8	27-05	2010	2.5
	No	Jyndevad	Titus WSB	21	08-06	2010	5

D25 Tebuconazole and 1,2,4-triazol

Table D25-1: PECgw ***80th percentile*** for ***tebuconazole*** applications to ***winter wheat***

	Appl. Rate and BBCH[2]	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO)[1]		Karup 2.5 m depth (MACRO)[1]		Langvad 2.5 m depth (MACRO)[1]	
			EU/EU[3]	DK/EU[4]	EU/EU[3]	DK/EU[4]	EU/EU[3]	DK/EU[4]
Tebuconazole	500 g/ha, 30 - 69	01 June	<0.001	<0.001	<0.001	<0.001	<0.001	0.021
		20 June	<0.001	<0.001	<0.001	<0.001	<0.001	0.004
		15 July	<0.001	<0.001	<0.001	<0.001	<0.001	0.002
1,2,4-Triazol[5]		01 June	0.056	0.360	0.042	0.286	0.052	0.263
		20 June	0.024	0.082	0.019	0.127	0.023	0.103
		15 July	0.025	0.031	0.019	0.024	0.027	0.024

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. Due to the bi-phasic modelling being considered for 1,2,4-triazole and that 1/n <1, the application rate 250 g/ha has been doubled and the output divided by two.
3. EU parameter selection and EU output evaluation (80th percentile PECgw).
4. DK parameter selection and EU output evaluation (80th percentile PECgw).
5. Note, the concentrations are a combination of the results from modelling 1,2,4-triazol fast phase and 1,2,4-triazol slow phase

Table D25-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***tebuconazole*** applications to ***winter wheat***

	Appl. Rate and BBCH[2]	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1] Hamburg 1m depth (PELMO)		Karup 2.5 m depth (MACRO)		Langvad 2.5 m depth (MACRO)	
			EU/DK[3]	DK/DK[4]	EU/DK[3]	DK/DK[4]	EU/DK[3]	DK/DK[4]
Tebuconazole	500 g/ha, 30 - 69	01 June	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	0.023 (0)
		20 June	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	0.005 (0)
		15 July	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	<0.001 (0)	0.002 (0)
1,2,4-Triazol[5]		01 June	0.059 (0)	0.378 (20)	0.044 (0)	0.296 (20)	0.053 (0)	0.263 (16)
		20 June	0.026 (0)	0.083 (20)	0.019 (0)	0.129 (20)	0.024 (0)	0.097 (9)
		15 July	0.026 (0)	0.028 (0)	0.019 (0)	0.025 (0)	0.028 (0)	0.024 (0)

1 An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
2. Due to the bi-phasic modelling being considered for 1,2,4-triazole and that 1/n <1, the application rate 250 g/ha has been doubled and the output divided by two.
3. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
4. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
5. Note, the concentrations are a combination of the results from modelling 1,2,4-triazol fast phase and 1,2,4-triazol slow phase.

Table D25-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***tebuconazole*** and ***1,2,4-triazole***

	Field	Horizontal screens			Vertical screens		
		nd	<0.1	≥0.1	nd	<0.1	≥0.1
Tebuconazole	Tylstrup	-	-	-	195	1	-
	Jyndevad	-	-	-	213	1	-
	Silstrup	15	-	-	23	-	-
	Estrup	39	-	-	118	3	2
	Faardrup	53	-	-	120	1	-
1,2,4-triazole	Not reported yet						

Table D25-4: ***Applications*** with ***tebuconazole*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Winter wheat	No	Tylstrup	Folicur EC250	13	16-11	2007	250
	No	Jyndevad	Folicur EC250	12	03-12	2007	250
	No	Estrup	Folicur EC250	13	22-11	2007	250
	No	Faardrup	Folicur EC250	15	20-11	2007	250
Red fescue	No	Silstrup	Folicur EC250	52	18-05	2012	250
Spring barley	No	Silstrup	Folicur EC250	50	01-07	2013	250

D26 Terbuthylazine, desethyl-terbuthylazine and desisopropyl-atrazine

Table D26-1: PECgw ***80th percentile*** for ***terbuthylazine*** applications to ***maize***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) Hamburg 1m depth (PELMO) [1] EU/EU[3]	Hamburg DK/EU[4]	Karup 2.5 m depth (MACRO) [1,2] EU/EU[3]	Karup DK/EU[4]	Langvad 2.5 m depth (MACRO) [1,2] EU/EU[3]	Langvad DK/EU[4]
Terbuthylazine	500 g/ha, 05-19	01 May	<0.001	0.009	<0.001	0.014	0.204	0.920
		15 May	<0.001	0.008	<0.001	0.010	0.189	0.797
		30 May	<0.001	0.012	<0.001	0.011	0.296	1.128
Desethyl-Terbuthylazine		01 May	0.122	2.591	0.156	3.179	0.923	2.803
		15 May	0.093	1.929	0.115	2.369	0.689	2.035
		30 May	0.132	2.209	0.131	2.492	0.664	2.060
Desisopropyl-Atrazine		01 May	2.960	5.524	3.398	6.245	1.730	3.745
		15 May	1.932	3.576	2.476	4.527	1.223	2.619
		30 May	2.198	4.031	2.482	4.568	1.247	2.663

[1] PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
[2] MACRO can only model parent to one metabolite, therefore, terbuthylazine to desethyl-terbuthylazine is modelled and in separate run to terbuthylazine to desisopropyl-atrazine.
[3] EU parameter selection and EU output evaluation (80th percentile PECgw).
[4] DK parameter selection and EU output evaluation (80th percentile PECgw).

Table D26-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***terbuthylazine*** applications to ***maize***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1] Hamburg 1m depth (PELMO) EU/DK[3]	Hamburg DK/DK[4]	Karup 2.5 m depth (MACRO) [2] EU/DK[3]	Karup DK/DK[4]	Langvad 2.5 m depth (MACRO) [2] EU/DK[3]	Langvad DK/DK[4]
Terbuthylazine	500 g/ha, 05-19	01 May	<0.001 (0)	0.014 (0)	<0.001 (0)	0.016 (0)	0.254 (7)	1.042 (14)
		15 May	<0.001 (0)	0.012 (0)	<0.001 (0)	0.012 (0)	0.236 (7)	0.907 (13)
		30 May	<0.001 (0)	0.019 (0)	<0.001 (0)	0.013 (0)	0.367 (9)	1.269 (14)
Desethyl-Terbuthylazine		01 May	0.205 (4)	3.100 (20)	0.181 (13)	3.292 (20)	0.953 (19)	2.899 (20)
		15 May	0.163 (4)	2.143 (20)	0.133 (9)	2.489 (20)	0.720 (18)	2.114 (20)
		30 May	0.231 (4)	2.935 (20)	0.146 (12)	2.607 (20)	0.711 (19)	2.126 (20)
Desisopropyl-Atrazine		01 May	3.226 (20)	5.790 (20)	3.504 (19)	6.460 (20)	2.036 (16)	4.348 (18)
		15 May	1.999 (20)	3.736 (20)	2.544 (20)	4.692 (20)	1.444 (16)	3.055 (17)
		30 May	2.400 (20)	4.291 (20)	2.562 (19)	4.742 (20)	1.470 (16)	3.102 (17)

[1] An exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
[2] MACRO can only model parent to one metabolite, therefore, terbuthylazine to desethyl-terbuthylazine is modelled and in separate run to terbuthylazine to desisopropyl-atrazine.
[3] EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
[4] DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).

Table D26-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for **terbuthylazine**, ***desethyl-terbuthylazine*** and ***desisopropyl-atrazine***

	Field	Horizontal screens			Vertical screens		
		nd	<0.1	≥0.1	nd	<0.1	≥0.1
Terbuthylazine	Tylstrup	-	-	-	179	-	-
	Jyndevad	-	-	-	260	-	-
	Silstrup	107	5	-	173	30	1
	Estrup	63	-	-	222	1	-
	Faardrup	83	5	1	149	25	20
Desethyl-terbuthylazine	Tylstrup	-	-	-	191	-	-
	Jyndevad	-	-	-	490	27	-
	Silstrup	101	32	-	113	127	2
	Estrup	50	-	-	180	-	-
	Faardrup	68	21	-	149	15	30
Desisopropyl-atrazine	Tylstrup	-	-	-	190	1	-
	Silstrup	84	-	-	148	4	-
	Estrup	62	1	-	197	26	-
	Faardrup	57	32	-	166	28	-

Table D26-4: ***Applications*** with ***terbuthylazine*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Maize	No	Tylstrup	Inter-Terbuthylazin	12	18-05	2005	680
	No	Tylstrup	Laddok TE	15	08-06	2005	500
	No	Jyndevad	Lido	11	14-05	2001	375
	No	Jyndevad	Lido	16	30-05	2001	375
	No	Silstrup	Lido	12	19-05	2002	375
	No	Silstrup	Lido	31	03-06	2002	375
	No	Estrup	Inter-Terbuthylazin	9	26-05	2005	625
	No	Estrup	Laddok TE	14	08-06	2005	500
	No	Faardrup	Inter-Terbuthylazin	9	17-05	2005	625
	No	Faardrup	Laddok TE	12	27-05	2005	500

D27 Triasulfuron and IN-A4098

Table D27-1: PECgw ***80th percentile*** for ***triasulfuron*** applications to ***spring barley***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L)					
			Hamburg 1m depth (PELMO) [1]		Karup 2.5 m depth (MACRO) [1]		Langvad 2.5 m depth (MACRO) [1]	
			EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]	EU/EU[2]	DK/EU[3]
Triasulfuron	4 g/ha, 13-29	01 May	0.303	0.533	0.216	0.328	0.167	0.341
		15 May	0.320	0.401	0.228	0.249	0.169	0.254
		30 May	0.261	0.319	0.189	0.198	0.141	0.205
IN-A4098		01 May	0.035	0.050	0.019	0.024	0.022	0.046
		15 May	0.035	0.037	0.019	0.017	0.022	0.034
		30 May	0.028	0.029	0.015	0.013	0.018	0.026

1. PELMO calculates the 80th percentile as the average between the 16th and 17th ranked values, whereas MACRO uses the 17th ranked value for the 80th percentile.
2. EU parameter selection and EU output evaluation (80th percentile PECgw).
3. DK parameter selection and EU output evaluation (80th percentile PECgw).
** Note, IN-A4098 is a metabolite formed from other sulfonylureas.*

Table D27-2: Number of ***exceedances >0.1 µg/L*** and PECgw 95th percentile for ***triasulfuron*** applications to ***spring barley***

	Appl. Rate and BBCH	Appl. Date	PECgw (µg/L) and number of exceedances in 20 years in brackets[1]					
			Hamburg 1m depth (PELMO)		Karup 2.5 m depth (MACRO)		Langvad 2.5 m depth (MACRO)	
			EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]	EU/DK[2]	DK/DK[3]
Triasulfuron	4 g/ha, 13-29	01 May	0.325 (20)	0.562 (20)	0.219 (20)	0.352 (20)	0.171 (19)	0.352 (20)
		15 May	0.340 (20)	0.419 (20)	0.231 (20)	0.259 (20)	0.176 (19)	0.261 (20)
		30 May	0.271 (20)	0.335 (20)	0.192 (19)	0.207 (20)	0.147 (18)	0.210 (20)
IN-A4098		01 May	0.035 (0)	0.057 (0)	0.021 (0)	0.025 (0)	0.023 (0)	0.049 (0)
		15 May	0.036 (0)	0.042 (0)	0.021 (0)	0.019 (0)	0.023 (0)	0.036 (0)
		30 May	0.029 (0)	0.032 (0)	0.017 (0)	0.014 (0)	0.018 (0)	0.028 (0)

1 an exceedance is considered to be any year where the average annual concentration is greater than 0.100 µg/L.
2. EU parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
3. DK parameter selection and DK output evaluation (number of exceedances >0.1 µg/L).
** Note, IN-A4098 is a metabolite formed from other sulfonylureas.*

Table D27-3: Number of ***groundwater samples*** collected within the period 1999-2013 from horizontal and vertical screens of the ***PLAP fields*** having no detections (nd), detections less than 0.1µg/L, and detections equal to or exceeding 0.1 µg/L for ***triasulfuron*** and ***IN-A4098****

	Field	Horizontal screens			Vertical screens		
		nd	<0.1	≥0.1	nd	<0.1	≥0.1
Triasulfuron	Tylstrup	-	-	-	301	-	-
IN-A4098	Tylstrup	-	-	-	291	-	-
IN-A4098**	Silstrup	77	-	-	146	-	-
	Estrup	56	-	-	203	1	-

** Note, IN-A4098 is a metabolite formed from other sulfonylureas, these results have also been included*
*** Degradation product of tribenuron-methyl*

Table D27-4: ***Applications*** with ***triasulfuron*** on PLAP fields within the period 1999-2013

Crop	Under-sown?	Field	Product	BBCH at appl.	Appl. Date	Year	Dose a.i. [g/ha]
Spring barley	No	Tylstrup	Logran 20 WG	23	13-05	2000	4

This page is left intentionally blank