REGISTRATION REPORT

Part B

Section 8

Environmental Fate

Detailed summary of the risk assessment

Product code: **Nordox 75 WG**

Chemical active substance(s):

Copper (I) oxide (Cu_2O), 750 g/kg

Interzonal

NATIONAL ASSESSMENT

Poland

(Authorization in accordance to Art. 43)

Applicant: Nordox AS

Submission date: 31/01/2022

Evaluation date: December 2022

MS Finalisation date: dd/mm/yyyy

Version history

When	What
31/01/2022	Original version from the applicant Nordox AS for Art. 43 submission. All new data and information are marked in yellow.
12/2022	zRMS version for comments

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Submission and Evaluation of Copper compounds under Art.43 of 1107/2009

General observation: Deviation from standard Guidance Documents and EFSA conclusion is necessary and unavoidable for Copper.

The RMS and EFSA are held to assess plant protection products according to the existing methodology described in a series of guidance documents (GDs). Those have been developed for synthetic, organic molecules, and are in most cases not applicable to minerals and Copper. This has led to an EFSA conclusion that indicated a number of critical concerns, or assessments that could not be finalized, which do not reflect any realistic risk, but rather illustrate the inappropriateness of the current GDs for the assessment of Copper. This can easily be seen in a number of endpoints that suggest a high risk exists at concentrations below natural background of this essential micronutrient. **This has been recognized by EFSA, the RMS and several MS (see comments from DE and IT in the Peer review Report), and the EU Commission has mandated EFSA with the development with a Copper specific guidance (Mandate No. 2019-0036).**
Art.43 submissions and their evaluation by MS are unfortunately due before this GD will be available. The current EFSA conclusion and list of endpoints could at best be considered as a first tier, and applicants as well as MS are required to deviate from the standard procedures described in the GD for the following reasons:

- The current GD do not consider bio-availability; for an essential, ubiquitous micronutrient that is a metal it is indispensable to provide assessment methodologies that consider the bioavailability and the potentially toxic fraction in each real-world exposure scenario. Total concentrations do not result in any meaningful outcome.
- Data normalisation to enable comparison of toxicological lab and field data as well as data obtained with different bioavailable fractions is a pre-requisite to allow a realistic assessment of potential risk. Simplistic worst-case scenarios will always indicate a high risk already at naturally occurring concentrations.
- For a homeostatically tight controlled essential element the application of assessment factors is meaningless. The question whether an excess exposure or deficiency leads to an adverse disruption of the homeostatic control cannot be approached in this way. Further, the exceptional data richness of the Copper dossier and more than 100 years of experience with the use as fungicide make safety factors unnecessary.

These unique features of Copper are already considered in the assessment of Copper under separate legislation (REACH, BPD). While COM directed EFSA in their mandate to take advantage of those methodologies, TF members have to anticipate their use and in their proposed assessments of the critical areas of concern identified in the EFSA conclusion. This should be reviewed once the new GD is available and no use should be cancelled until then.

Submission and Evaluation of Copper compounds under Art.43 of 1107/2009

General observation: Copper compounds should not be considered as Candidate for Substitution (CfS).

The implementing Regulation (EU) 2018/1981 is renewing the approval of the active substance Copper compounds as candidate for substitution (CfS), in accordance with Regulation (EC) 1107/2009. Whereas (12) considers that Copper compounds are persistent and toxic in accordance with points 3.7.2.1 and 3.7.2.3 of Annex II to Regulation (EC) 1107/2009 (PBT assessment), and fulfil the condition set in the second indent of point 4 of Annex II to Regulation (EC) 1107/2009.
The EUCuTF disagrees with the approval as CfS. The conditions in Annex to Regulation (EC) 1107/2009 lack the exemption of inorganic compounds like Copper minerals from the PBT assessment as it has been established under other chemical legislations like REACh and BPD. As laid down in those legislations, the term persistence is meaningless for an element or mineral, due to its natural occurrence. Persistence per se is therefore not a relevant parameter and consequently a PBT assessment is not carried out for inorganic compounds under REACh and BPD. The recent mandate from COM to EFSA directs the development of a guidance towards methods and procedures available under those legislations better adapted for the assessment of inorganic compounds, where the relevant parameter is their bioavailability. This should include an exempt statement regarding the PBT assessment to harmonize the assessment of the same compounds under different legislations.
It should be noted that persistence of minerals is considered not relevant for being categorized as low-risk active substance according to Regulation (EU) 2017/1432. This is clearly not compatible with the same parameter leading to a classification as CfS under the same Regulation (EC) 1107/2009.
The EUCuTF is of the opinion that Copper compounds should not be considered CfS, and have lodged an action for annulment against Regulation (EU) 2018/1981 and renewing the approval of the active substance Copper compounds as candidate for substitution (case number T-153/19 European Union Task Force v. European Commission).

8 Fate and behaviour in the environment (KCP 9)

8.1 Critical GAP and overall conclusions

Table 8.1-1: Critical use pattern of the formulated products

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Use-No. *	Member state(s)	Crop and/or situation (crop destination / purpose of crop)	F, Fn, Fpn G, Gn, Gpn or I **	Pests or Group of pests controlled (additionally: developmental stages of the pest or pest group)	**Application**				**Application rate**			PHI (days)	Remarks: e.g. g safener/ synergist per ha	**Conclusion**
					Method / Kind	Timing / Growth stage of crop & season	Max. number a) per use b) per crop/ season	Min. interval between applications (days)	kg product/ha a) max. rate per appl. b) max. total rate per crop/season	kg as/ha a) max. rate per appl. b) max. total rate per crop/season	Water L/ha min/max			Groundwater
4	PL	Strawberry	G	*Marssonina fragariae, Zythia fragariae Mycosphaerella, bacterial disease, Colletotrichum sp.*	Foliar spray	BBCH 13 - BBCH 85	a) 3 b) 3	7	a) 1.33 b) 3.99	a) 1.0 b) 3.0	200 - 800	3		
5	PL	Tomato Eggplant Pepper	G	*Phytophtora spp., Alternaria, Colletotrichum, Bacterial disease (Pseudomonas spp., Xanthomonas spp.).*	Foliar spray	BBCH 15 - BBCH 51	a) 3 b) 3	7	a) 1.33 b) 3.99	a) 1.0 b) 3.0	200-1000	10		
7	PL	Lettuce Scarole	G	*Alternaria, Bremia lactucae Bacterial disease: Erwinia spp., Pseudomonas spp. Xanthomonas spp.*	Foliar spray	BBCH12 - BBCH49	a) 3 b) 3	7	a) 1.33 b) 3.99	a) 1.0 b) 3.0	300-1000	3		
8	PL	Cucumber	G	*Alternaria, Antracnosis, Phytophtora spp.,*	Foliar spray	BBCH 15 - BBCH 89	a) 3 b) 3	7	a) 1.33 b) 3.99	a) 1.0 b) 3.0	200-1000	3		

* Use number(s) in accordance with the list of all intended GAPs in Part B, Section 0 should be given in column 1

** F: professional field use, Fn: non-professional field use, Fpn: professional and non-professional field use, G: professional greenhouse use, Gn: non-professional greenhouse use, Gpn: professional and non-professional greenhouse use, I: indoor application

Explanation for column 15 “Conclusion”

A	Safe use
R	Further refinement and/or risk mitigation measures required
C	To be confirmed by cMS
N	No safe use

Table 8.1-2: Assessed (critical) uses during approval of Copper compounds concerning the Section Environmental Fate

Crop and/or situation (a)	Member State	Product Name	F G I (b)	Pests or group of pests controlled (c)	Formulation		Application				Application rate per treatment			PHI (days) (l)	Remarks (m)
					Type (d-f)	Conc of a.i. g/kg (i)	Method kind (f-h)	Growth stage and season (j)	Number min max (k) a) per use b) per crop/ season	Interval between applications (min)	Kg a.i./hl min max (g/hl)	Water l/ha min max	kg a.i./ha a) max. rate per appl. b) max. total rate per crop/season		
Grape	C/S	Nordox 75 WG	F	*Bacterial necrosis Elsinoë ampelina*	WG	750	Airblast sprayer	BBCH 91 - 11	a) 3 b) 3	21 days	n.a.	400-1000	a) 1.25 b) 3.75	90	
Grape	C/S	Nordox 75 WG	F	*Plasmopara viticola, Elsinoë ampelina*	WG	750	Airblast sprayer Knapsack Sprayer	BBCH 12 - 89	a) 8 b) 8	7 days	n.a.	100-1200	a) 1.25 b) 6.0	21	Annual application must not exceed 5 kg/ha during the bird breeding season
Tomato	C/S	Nordox 75 WG	F	*Phytophthora spp Alternaria, Colletotrichum, Pseudomonas, Xanthomonas*	WG	750	Foliar spray	BBCH 12 - 89	a) 8 b) 8	7 days	n.a.	200-1000	a) 0.85 b) 6.0	3	Annual application must not exceed 5 kg/ha during the bird breeding season RMS remarks: No Northern trials were available.
Tomato	C/S	Nordox 75 WG	G	*Phytophthora spp Alternaria, Colletotrichum, Pseudomonas, Xanthomonas*	WG	750	Foliar spray	BBCH 12 - 89	a) 8 b) 8	7 days	n.a.	200–1000	a) 1.25 b) 6.0	3	Annual application must not exceed 5 kg/ha during the bird breeding season
Cucurbits	C/S	Nordox 75 WG	F	*Peronospora cubensis; Alternaria spp Colletotrichum spp Bacterial diseases*	WG	750	Foliar spray	BBCH 10 - 89	a) 8 b) 8	7 days	n.a.	200–1500	a) 0.85 b) 6.0	See Column Remarks	Annual application must not exceed 5 kg/ha during the bird breeding season PHI: 3 d (Cucumber, zucchini), 7 d (Melon, watermelon
Cucurbits	C/S	Nordox 75 WG	G	*Peronospora cubensis; Alternaria spp Colletotrichum spp Bacterial diseases*	WG	750	Foliar spray	BBCH 10 - 89	a) 8 b) 8	7 days	n.a.	200–1500	a) 1.25 b) 6.0	See Column Remarks	Annual application must not exceed 5 kg/ha during the bird breeding season PHI: 3 d (Cucumber, zucchini), 7 d (Melon, watermelon

Crop and/or situation (a)	**Member State**	**Product Name**	**F G I (b)**	**Pests or group of pests controlled (c)**	**Formulation**		**Application**				**Application rate per treatment**			**PHI (days) (l)**	**Remarks (m)**
					Type (d-f)	Conc of a.i. g/kg (i)	Method kind (f-h)	Growth stage and season (j)	Number min max (k) a) per use b) per crop/ season	Interval between applications (min)	Kg a.i./hl min max (g/hl)	Water l/ha min max	kg a.i./ha a) max. rate per appl. b) max. total rate per crop/season		
Grape	C/S	Nordox 75 WG	F	*Plasmopara viticola, Elsinoë ampelina*	WG	750	Airblast sprayer	BBCH 12 - 89	a) 8 b) 8	7 days	n.a.	100–1200	a) 1.25 b) See Column Remarks	21	Flexible dosing regimen Total applied must not exceed 30 kg/ha in any rolling 5 year period and 8 kg/ha/yr in any single

* Use number(s) in accordance with the list of all intended GAPs in Part B, Section 0 should be given in column 1

** F: professional field use, Fn: non-professional field use, Fpn: professional and non-professional field use, G: professional greenhouse use, Gn: non-professional greenhouse use, Gpn: professional and non-professional greenhouse use, I: indoor application

8.2 Metabolites considered in the assessment

As Copper is an elementary atomic particle there are no relevant metabolites for Copper.

8.3 Rate of degradation in soil (KCP 9.1.1)

Studies on degradation in soil with the formulation were not performed, since it is possible to extrapolate from data obtained with the active substance.

8.3.1 Aerobic degradation in soil (KCP 9.1.1.1)

Copper is an elementary atomic particle and therefore cannot be degraded. In the absence of a route and consequently a rate of degradation, the distribution of the different forms of Copper in soil is the important factor influencing the environmental fate of Copper and bio-availability to plants and soil organisms.

The mobile, active and toxicologically significant substance is the free Copper^{2+} ion present in the soil solution. It is a highly reactive species and consequently most of the Copper in the soil is strongly bound to a wide range of soil substances, therefore limiting the amount of free Copper^{2+} ions in the soil solution. The strongest interactions are formed with organic matter and oxides of manganese and iron, whilst clay minerals although adsorbing less strongly also contribute significantly because they are present throughout the soil profile. These strong interactions with soil particles result in the majority of soil Copper (typically > 99% of the total) being present as a bound residue. A small proportion of soil Copper is located in the soil solution as hydrated Copper ($[Cu(H_2O)_6]^{2+}$) and as soluble inorganic or organic complexes. The levels of Copper in the soil solution are small, usually representing < 1% of the total soil Copper, whilst the levels of the free Copper^{2+} ion in the soil solution are very small (usually < 0.1 % of the total soil Copper) due to rapid complexation.

The amount of free Copper^{2+} ion in the soil solution is controlled primarily by pH and the amount of dissolved organic carbon in the soil. In acid soils (pH < 6) the concentration of Copper^{2+} ions in the soil solute`1ion will be greater than at neutral or alkaline pH. This is because the $[Cu(H_2O)_6]^{2+}$ ion can exist at low pH, but as alkalinity increases reactions with inorganic anions result in the formation of sparingly solubility salts and these remove Copper^{2+} ions from solution by precipitation. The stability of Copper-organic matter complexes also increases as pH is raised. These complexes are formed by the interaction of Copper with organic functional groups such as carboxylic acids which are protonated at low pH and consequently have less affinity for Copper^{2+} ions.

Under anaerobic conditions the level of Copper^{2+} ions in solution is controlled by the formation and precipitation of sparingly soluble sulphides and changes in redox potential do not significantly affect the level of Copper^{2+} ions in solution.

Maintaining an alkaline soil pH and abundant supply of organic matter in the soil are therefore important means of regulating the level of bio-available Copper. The addition of lime and low Copper compost materials are methods to achieve these aims and can be conducted routinely as part of normal farming practice.

Soil Copper concentrations are given in terms of total soil Copper, however as previously described the vast majority of Copper in soil is bound to solid components and consequently not available to plant and soil organisms. The concentration of free Copper^{2+} ions (the toxicologically significant form) in the soil

solution, or of poorly adsorbed Copper forms which can easily be released as free $Copper^{2+}$ in the soil solution, is more relevant. Simple measurements of total Copper in the soil should not be used as a means of assessing exposure risk without taking these important facts into account.
In laboratory studies, Copper added to soil became bound primarily to inorganic and organic matter and to oxide fractions within the soil. Measurement of the concentration of Copper in bio-available fractions (exchangeable and soil solution) showed that levels did not change substantially, even in soils containing already elevated levels of Copper. These studies were performed using exaggerated application rates up to 500 mg Copper/kg and 24.3 kg Copper/ha and over a very short time which may not have allowed true equilibrium to be established. Ageing processes are important for Copper because over time residues become increasingly bound and consequently less available. Indeed, care should be taken when considering the results obtained from spiking experiments because the solubility and therefore the bioavailability of added Copper may be overestimated under these artificial conditions. Where field (aged) soil samples are compared to freshly spiked soil samples, it was found that bioavailability was increased for the spiked soils and this was related to a much greater soluble Copper concentration at any given level of total soil Copper. A generic lab-to-field (L/F) factor of 4 is proposed in order to correct for higher toxicity observed in standard tests with laboratory-spiked soils compared to tests in soils affected by long-term use of Cu-based plant protection products. This factor is based on a comprehensive comparison of Cu toxicity in 11 vineyard soils with high Cu concentrations because of the application of Cu fungicides and corresponding reference soils spiked with $CuCl_2$. This correction factor should be performed when comparing toxicity data from freshly spiked soils with total exposure concentrations measured in field-contaminated soils.

The degradation of Copper in soil under aerobic conditions was evaluated during Annex I renewal as published in EFSA Journal 2018; 16(1):5152.

8.3.2 Anaerobic degradation in soil (KCP 9.1.1.1)

The degradation of Copper in soil under anaerobic conditions was evaluated during Annex I renewal as published in EFSA Journal 2018; 16(1):5152.

8.4 Field studies (KCP 9.1.1.2)

The dissipation rate of Copper in soil under field conditions was evaluated during Annex I renewal as published in EFSA Journal 2018; 16(1):5152.

In 2003, the European Copper Task Force (EUCuTF) initiated a 10-year earthworm field monitoring study. After 10 years of treatment with Copper the NOEC of the study was the dose rate T2 (8 kg Copper/ha/year). Soil total Copper concentrations at this treatment rate in the top soil layer (0-5 cm) at Niefern increased from an initial value of around 28 mg/kg up to a maximum value of 130.8 mg/kg dry weight at sampling 32 (Mar 2013). At Heiligenzimmern, concentrations in the top soil layer at the 8 kg Copper/ha/year treatment rate increased from an initial value of around 32 mg/kg dry weight up to a maximum value of 132.9 mg/kg dry weight at sampling 29 (Nov 2011, after 25th application). In the deeper soil layer (5-30 cm) at both sites the total Copper content did not increase significantly.
'Bioavailable' Copper content (as defined by $CaCl_2$ extraction) were very low throughout the ten years of the study at all treatment levels and soil depths. Levels were $\leq$ 2.6 mg/kg dry weight, with the exception of

the highest Copper treatment rate (40 kg Copper/ha/year) in 2009 where a maximum value of 4.8 mg Copper/kg dry weight at sampling 24 (after 18^{th} application) was detected.

In addition, a review of the existing monitoring programs and published literature on Copper levels in European agricultural soils has been conducted, with the aim of identifying a concentration suitable for use in soil exposure assessments for various crops. No convincing evidence for accumulation of Copper in arable fields was found, but elevated Copper levels were observed in a proportion of vineyard soils and to a much lesser extent in some orchard soils.

It can be seen in the following table (Appendix A EFSA Journal 2018; 16(1):5152,119 pp doi:10.2903/j.efsa.2018.5152) that following an extensive review of European monitoring programs a median soil concentration of 11 mg Cu/kg has been found for top soil across Europe and is considerably lower than the very conservative value of 32 considered by EFSA in 2013.

Soil	**Soil concentration (mg Cu/kg soil DM)**	
Background level	**11.5**	
Vineyards[a]	28	Overall median 10^{th} percentile value
	~~66.4~~ 72	Overall median value
	160	Overall median 90^{th} percentile value
	~~73~~ 67	Overall mean value
	29.5	
Vineyards		Overall median 10^{th} percentile value
	26.09	LUCAS data[c]
	128.0	Overall median value LUCAS data
		Overall median 90^{th} percentile value LUCAS
	49.26	data[d]
		Overall mean value LUCAS data
Arable fields[b]	7	Overall median 10^{th} percentile value
	13.2	Overall median value
	26	Overall median 90^{th} percentile value
	15	Overall mean value
Orchards[b]	-	Overall median 10^{th} percentile value
	~~39.8~~ 48.3	Overall median value
	58	Overall median 90^{th} percentile value
	23	Overall mean value
Olive groves	24.7	Overall median value LUCAS data
	74.5	Overall median 90^{th} percentile value LUCAS
		data
	33.5	Overall mean value LUCAS data

[a] Recently published data from the EU LUCAS program [Copper distribution in European Topsoils: An assessment based on LUCUS soil survey, Ballabio et al., Science of the Total Environment 636 (2018) 282-298] confirms the assumption that the data for vineyards in the LOEP values are biased towards the higher end as they are mainly based on published literature, which focusses mainly on contaminated sites.

[b] Includes new data from the EU LUCAS program.

[c] Calculated from the standard deviation of the set of data in the paper described in [a].

[d] Calculated from the standard deviation of the set of data in the paper described in [a].

8.4.1.1 Soil dissipation testing on a range of representative soils (KCP 9.1.1.2.1)

The dissipation rate of Copper in soil under field conditions was evaluated during Annex I renewal as published in EFSA Journal 2018; 16(1):5152.

8.4.2 Soil accumulation testing (KCP 9.1.1.2.2)

The accumulation potential of Copper in soil under field conditions was evaluated during Annex I renewal as published in EFSA Journal 2018; 16(1):5152.
A review of European monitoring programs was used to identify levels of Copper present in soil from natural or anthropogenic sources other than the regulated use for the soil exposure assessments. The values suitable for use in soil exposure assessments are summarised below.

Soil	**Soil concentration (mg Cu/kg soil DM)**	
Background level	**11.5**	
Vineyards[a]	28	Overall median 10th percentile value
	~~66.4~~ 72	Overall median value
	160	Overall median 90th percentile value
	~~73~~ 67	Overall mean value
	29.5	
Vineyards		Overall median 10th percentile value
	26.09	LUCAS data[c]
	128.0	Overall median value LUCAS data
		Overall median 90th percentile value LUCAS
	49.26	data[d]
		Overall mean value LUCAS data
Arable fields[b]	7	Overall median 10th percentile value
	13.2	Overall median value
	26	Overall median 90th percentile value
	15	Overall mean value
Orchards[b]	-	Overall median 10th percentile value
	~~39.8~~ 48.3	Overall median value
	58	Overall median 90th percentile value
	23	Overall mean value
Olive groves	24.7	Overall median value LUCAS data
	74.5	Overall median 90th percentile value LUCAS data
	33.5	Overall mean value LUCAS data

[a] Recently published data from the EU LUCAS program [Copper distribution in European Topsoils: An assessment based on LUCUS soil survey, Ballabio et al., Science of the Total Environment 636 (2018) 282-298] confirms the assumption that the data for vineyards in the LOEP values are biased towards the higher end as they are mainly based on published literature, which focusses mainly on contaminated sites.
[b] Includes new data from the EU LUCAS program.
[c] Calculated from the standard deviation of the set of data in the paper described in [a].
[d] Calculated from the standard deviation of the set of data in the paper described in [a].

Remaining values taken from Appendix A EFSA Journal 2018; 16(1):5152,119 pp doi:10.2903/j.efsa.2018.5152.

It can be seen following an extensive review of European monitoring programs a median soil

concentration of 13.4 mg Cu/kg has been found for arable soil across Europe and is considerably lower than the very conservative value of 32 considered by EFSA in 2013.

A review of monitoring programs for copper in soil was carried out in 2018 and was used to identify 'background levels' of copper present in soil from natural or anthropogenic sources other than the regulated use for use in soil exposure assessments. The results taken from the LoEP (Appendix A EFSA Journal 2018; 16(1):5152,119 pp doi:10.2903/j.efsa.2018.5152) are summarised in the table above. The EUCuTF stated in their monitoring report that these values are most likely biased towards the higher end as they are mainly based on published literature, which focusses mainly on contaminated sites.

Recently published data from the EU LUCAS program [Coper distribution in European Topsoils: An assessment based on LUCUS soil survey, Ballabio et al., Science of the Total Environment 636 (2018) 282-298] confirms the assumption for this bias and provides lower average values for vineyards, and also shows there is no measurable accumulation for field crops. The EUCuTF have used the LUCAS data set to the extend the data set and to refine the values presented in the LoEP for their PEC soil calculations.

8.5 Mobility in soil (KCP 9.1.2)

Studies on mobility in soil with the formulation were not performed, since it is possible to extrapolate from data obtained with the active substance.

The adsorption/desorption of Copper was evaluated during Annex I renewal as published in EFSA Journal 2018; 16(1):5152. A survey of adsorption K_d in European arable and grazing land soils was selected as the key study for assessing Copper distribution between the aqueous phase and soil. The soils were representative for the variability in physico-chemical properties of soils in Europe and K_d values were measured at relevant doses and realistic conditions. It was concluded that Copper exhibited medium mobility to immobility in soil and that the adsorption of Copper was pH dependent. The geometric K_{doc} value for soil at pH 4-5 of 19509.9 L/kg was selected as a generic K_{doc} value for soil for a first tier exposure assessment.

Parent							
Soil Type	**OC %**	**Soil pH**[a)]	**K_d [mL/g]**	**K_{doc} [mL/g]**	**K_F [mL/g]**	**K_{Foc} [mL/g]**	**1/n**
494 topsoil samples from arable land and grass land across Europe	0.5-48.0	3.28-4.00	-	2300.0-35202.4	-	-	-
	0.6-49.0	4.01-4.99	-	908.7-337000	-	-	-
	0.7-36.0	5.08-5.48	-	1727.8-505444.4	-	-	-
	0.5-42.0	5.53-6.50		350.0-430400.0	-	-	-
	0.5-22.0	6.51-7.98	-	5163.3-1062833.3	-	-	-
Median value (if not pH dependent)			-		-	-	

Geometric mean (if not pH dependent)	-	pH 4-5: 19509.9 pH 5.5-6.5: 33918.3	-	-	
Arithmetic mean (if not pH dependent)	-	-			-
pH dependence, *Yes or No*	Yes				

[a)] Measured in $CaCl_2$

8.5.1 Column leaching (KCP 9.1.2.1)

Discussion of the soil mobility of Copper (soil adsorption/desorption and aged soil column leaching) can be found in the EFSA Journal 2018; 16(1):5152. A summary of the information provided is included below:
Mobility of Copper in soil is influenced significantly by all components of the soil and by different physical, chemical and biological parameters whose relative importance are not well known. For these reasons, standard laboratory sorption tests have not been performed. If these tests had been conducted the resulting K_{oc} values obtained would considerably underestimate adsorption and overestimate the movement of Copper because K_{oc} is a function of the soil organic carbon content only.
Tests performed to determine the extent of Copper adsorption showed that humic acids, manganese and iron oxides and clay particles all contribute significantly to adsorption, with humic acids and manganese oxides showing the highest propensity for binding. Adsorption to these materials is in agreement with the Langmuir adsorption equation and is pH dependent, with increased adsorption observed as soil pH is increased. Although adsorption to iron oxides and clays was less strong compared to organic matter and manganese oxides their abundance throughout the soil profile will mean that their overall adsorption will be at least as great as organic matter and manganese oxides and will not be restricted to surface layers as is the case for organic matter interactions.
Investigations into Copper mobility were performed using column leaching experiments conducted under laboratory conditions with standard Speyer soils (2.1, 2.2 and 2.3) at application rates up to 18 kg/ha (2.25 times the maximum annual rate according to the EU GAP). After leaching with 370 to 393 mL of water over a period of 48 hours, the levels of Copper detected in the leachate did not differ from those observed in control leachate. Movement through the leaching column was minimal, with applied Copper located almost exclusively in the upper most soil segment (0-6 cm).
In these studies, column leaching was performed without ageing, which could have led to an overestimation of the leaching potential as the degree of Copper binding increases with time. Despite these worst-case conditions, the results of the test showed that Copper applied to the column did not leach.

8.5.2 Lysimeter studies (KCP 9.1.2.2)

A review of the existing monitoring programs and published literature on Copper levels in groundwater has been conducted which confirms the limit of 2 mg/L for Copper will not be exceeded following the regulated use of Copper as a fungicide as published in EFSA Journal 2018; 16(1):5152.
Generally natural levels of Copper in groundwater were low, with background concentrations ranging from <0.63 to 25 µg/L, with the exception of volcanic aquifers. In the upper soil layers, typical Copper concentrations in soil water and leachate from field leaching and lysimeter studies ranged from 1 to 90

µg/L, with a peak concentration of 164.2 µg/L detected at a depth of 25 cm. A review of Copper levels in groundwater aquifers with possible anthropogenic inputs detected a range of concentrations from <LOD to 39 µg/L, with a peak concentration of 90 µg/L. Typical concentrations in ranged from < 0.1 to 18 µg/L which is within the range of natural background levels Copper concentrations never approach the legal limit of 2 mg/L set by the European Drinking Water Directive (98/83/EC7) for groundwater.

8.5.3 Field leaching studies (KCP 9.1.2.3)

Not used in exposure/risk assessment.

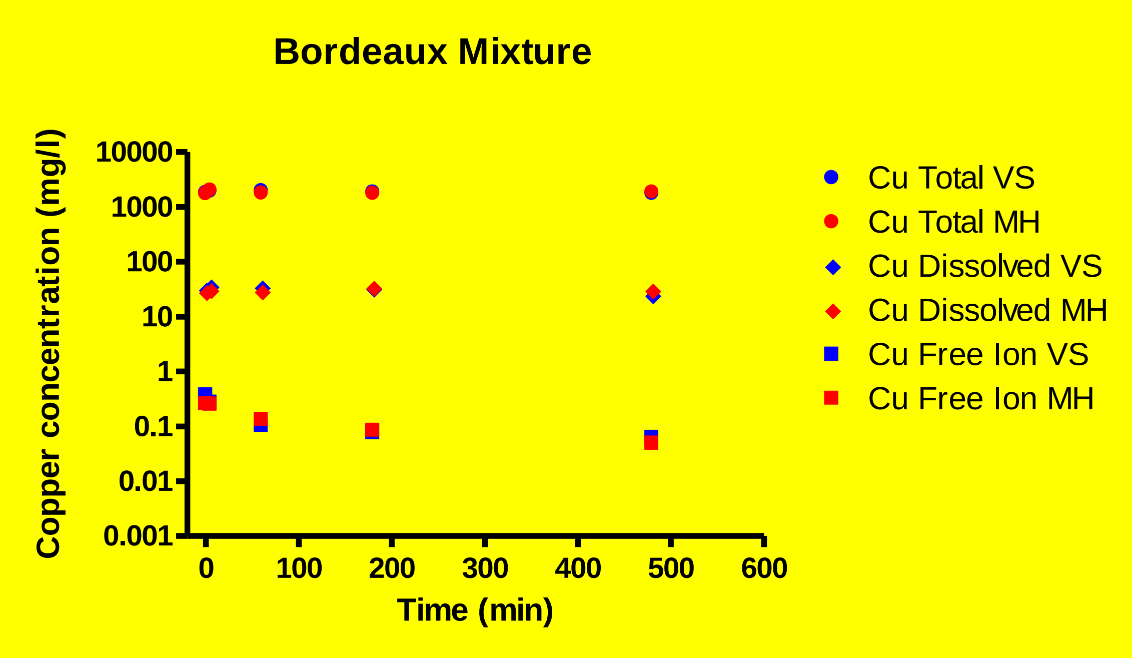
8.6 Degradation in the water/sediment systems (KCP 9.2, KCP 9.2.1, KCP 9.2.2, KCP 9.2.3)

Studies on degradation in water/sediment systems with the formulation were not performed, since it is possible to extrapolate from data obtained with the active substance.

Data on the behaviour of Copper in water sediment systems was evaluated during Annex I renewal inclusion as published in EFSA Journal 2018; 16(1):5152.

No regulatory study was conducted to assess the behaviour of the formulated product or Copper compounds in water/sediment system. However, a laboratory microcosm study was conducted and the results used for determination of the relevant parameters to be used for risk assessment purposes. Dissipation times based on total Copper concentrations in the microcosm study varied between 4 and 30.5 days (mean 9 days, n =18). Also, representative literature studies are provided as complementary data to illustrate the dissipation of Copper from surface water under field and laboratory conditions.

Under the spray drift scenario, the particulate, barely water-soluble Copper compound that hits the surface water will start dissolving while complexation to DOC and sedimentation remove copper from the dissolved fraction. The results from the Blust and Joosen 2016 study (CP-9.2.3/01) have demonstrated that in a realistic water/sediment scenario the total Copper declines very rapidly in the water phase while dissolved Copper was at least a factor of 10 lower.



This study describes best the speciation and kinetic behaviour of Copper in an aquatic environment following a spray drift event. Despite this, the EUCuTF has proposed a more conservative total/dissolved value of 3 for use in the risk assessment, based on the measurements in the mesocosm study.

Based on a very large body of literature, the order of toxic potential is Me^{2+} > inorganic complexes > organic complexes. Copper toxicity to aquatic biota is primarily due to dissolved cupric ion (Cu^{2+}). Assessment of the dissipation time based on the toxic Copper species, i.e. free cupric ion Cu^{2+}, revealed much lower dissipation times. At the highest concentrations in the microcosm study (120 and 240 µg Cu/L) DT_{50} values were ±1 day while at lower concentrations (24, 12 and 2.5 µg Cu/L) no changes in free cupric ion concentrations are observed, therefore indicating DT_{50} << 1 day.

As described above, the spray drift scenario starts with a non-equilibrium phase during which total Copper dissipates with a DT_{50} of < 1 day (Blust and Joosen 2016). Any free Copper ions also dissipate with < 1 day (Ma 2008). The system will reach an equilibrium stage within ca. 24 hours, and the resulting dissolved Copper concentration will be a function of the water chemistry (pH, DOC, hardness, etc.).

Therefore, a DT_{50} of < 1 day is appropriate and the single application scenario shall be presented as the worst-case scenario.

8.7 Predicted Environmental Concentrations in soil (PEC_{soil}) (KCP 9.1.3)

zRMS Comments:	The PECs assessment was accepted. The risk envelope approach was accepted. The worst case scenario of 0% interception and all relevant crops (arable field) were used in PECs assessment (active substance and formulation). The 6 years' period was considered. The natural copper background in vineyards, arable crops, orchards and olive groves, (median and 90th percentile values) assessed by EU LUCAS program was taken into consideration. As the used soil concentration of Cu proposed by the Applicant is based on

	copper distribution in the soils of 25 European Union Member States (over 21 k soil samples), the approach could be accepted at the Member State level. The PECs accum of active substance and formulation with agreed background level was recalculated by evaluator and corrected values are presented in the Table 8.7-4. The relevant PECs values will be used in further risk assessment.

8.7.1 Justification for new endpoints

Endpoints were taken from EFSA Journal 2018;16(1):5152 and EFSA Supporting publication 2018:EN-1486 (confirmatory data).

8.7.2 Active substance(s) and relevant metabolite(s)

Calculations were based on a simple first tier approach (Excel sheet) assuming even distribution of the compound in upper 0-5 cm soil layer following a single season's application. The long-term potential accumulation for Copper was estimated following repeated annual applications for a 20 cm depth of soil. A standard soil density of 1.5 g/cm^3 was assumed for all calculations.

In addition to the levels of Copper arising from the regulated use, a need to include natural background levels of Copper originating from geogenic Copper and previous anthropogenic Copper inputs from a variety of sources in the soil exposure assessment. This requirement to include sources other than the regulated use is specific to Copper and so a standard soil exposure assessment is not possible. European monitoring programs provided a comprehensive overview of Copper levels in agricultural soils. No convincing evidence for accumulation of Copper in arable fields was found, but elevated Copper levels were observed in a proportion of vineyard soils. Concentrations suitable for use in soil exposure assessments, including sources other than the regulated use, were identified.

Crop interception data, which correspond to the intended growth stages, are taken from the FOCUS groundwater guidance paper (FOCUS 2002). Crop interception will reduce the amount of a compound reaching the soil and therefore this would normally be taken into account depending on the growth stage at application. For Copper, the estimation of PEC_{soil} has assumed that there is no crop interception. Although foliar application to crops will involve, at later growth stages, high levels of interception, the assumption has been made that since Copper is a contact fungicide with no systemic activity, all the Copper applied will eventually be deposited to the soil either by mechanical action (as a consequence of prevailing wind) or be washed off by rain.

Table 8.7-1: Input parameters related to application for PEC_{soil} calculations

Individual Crop	**Single Total Amount Reaching the Soil per Season [g a.s./ha]**
Strawberry	3000
Tomato, eggplant	3000
Lettuce, scarole	3000
Cucumber	3000

Risk envelope used for the PEC_{soil} calculations

The risk envelope use patterns are summarised in the table below.

Table 8.7-2: Input parameters related to application for PEC_{soil} calculations

Use No.	4-8
Crop	Arable field
Application rate [g a.s/ha]	3000*
Number of applications/interval	1
Crop interception [%]	0
Depth of soil layer (relevant for plateau concentration) [cm]	5 cm (no tillage)

* Single total amount reaching the soil per season

An accumulated PEC_{soil} value was calculated for repeated annual applications. For Copper, which is not degraded, this value comprised the predicted accumulated concentration in the soil after repeated applications for nine years in 20 cm depth of soil, plus the concentration arising from the final years' application in 5 cm depth of soil, plus the concentration arising from Copper already present in the soil.
A comprehensive review of European monitoring programs was used to identify levels of Copper present in soil from natural or anthropogenic sources other than the regulated use for the soil exposure assessments. The values suitable for use in soil exposure assessments are summarised below and are taken from Appendix A EFSA Journal 2018; 16(1):5152,119 pp doi:10.2903/j.efsa.2018.5152 of the revised list of endpoints of the updated RAR August 2018.

Soil	Soil concentration (mg Cu/kg soil DM)	
Background level	**11.5**	
Vineyards[a]	28 66.4 160 73	Overall median 10th percentile value Overall median value Overall median 90th percentile value Overall mean value
Vineyards	29.5 26.09 128.0 49.26	Overall median 10th percentile value LUCAS data[c] Overall median value LUCAS data Overall median 90th percentile value LUCAS data[d] Overall mean value LUCAS data
Arable fields[b]	7 13.2 26 15	Overall median 10th percentile value Overall median value Overall median 90th percentile value Overall mean value
Orchards[b]	- ~~39.8~~ 48.3 58 23	Overall median 10th percentile value Overall median value Overall median 90th percentile value Overall mean value
Olive groves	24.7 74.5 33.5	Overall median value LUCAS data Overall median 90th percentile value LUCAS data Overall mean value LUCAS data

[a] Recently published data from the EU LUCAS program [Copper distribution in European Topsoils: An assessment based on LUCUS soil survey, Ballabio et al., Science of the Total Environment 636 (2018) 282-298] confirms the assumption that the data for vineyards in the LOEP values are biased towards the higher end as they are mainly based on published literature, which focusses mainly on contaminated sites.
[b] Includes new data from the EU LUCAS program.
[c] Calculated from the standard deviation of the set of data in the paper described in [a].
[d] Calculated from the standard deviation of the set of data in the paper described in [a].

A review of monitoring programs for Copper in soil was carried out in 2018 and was used to identify 'background levels' of Copper present in soil from natural or anthropogenic sources other than the regulated use for use in soil exposure assessments. The results taken from the LoEP (Appendix A EFSA Journal 2018; 16(1):5152,119 pp doi:10.2903/j.efsa.2018.5152) are summarised in the table above. The EUCuTF stated in their monitoring report that these values are most likely biased towards the higher end as they are mainly based on published literature, which focusses mainly on contaminated sites.
Recently published data from the EU LUCAS program confirms the assumption for this bias and provides lower average values for vineyards, and also shows there is no measurable accumulation for field crops. **The EUCuTF have used the LUCAS data set to extend the data set and to refine the values presented in the LoEP for their PEC soil calculations.**

Findings: The $PEC_{soil\ initial}$ values for total Copper in soil following a single season's application are summarised below in Table 8.7-3. As Copper does not degrade PEC_{soil} values with time are not relevant.

Table 8.7-3: $PEC_{soil\ initial}$ for total Copper

Individual Crop	Rate per Season [g a.s./ha]	Soil depth [cm]	$PEC_{soil,\ initial}$ [mg/kg]
Arable fields	1 x 3000	5	4.00

PEC_{soil} accumulation values which consider different values of the soil background level (e.g. 90[th] percentile value, median value, 10[th] percentile value) are provided below. The calculations are based on a worst-case assumption that the maximum dose is applied for each year of the period authorization is requested for (7 years) and PEC_{soil} values for Copper do not consider any dissipation routes, with no degradation or other losses considered for this time period.

Table 8.7-4: $PEC_{soil\ accumulation}$ for total Copper over seven-year registration

Individual Crop	Rate per Season [g a.s. /ha]	DT_{50} [A]	$PEC_{soil\ accumulation}$ calculation			Background Monitoring Value [B] [mg/kg]	Overall $PEC_{soil,\ accumulation}$ [C] [mg/kg]
			Soil depth [cm]	No. of years	C_{low} [mg/kg]		
Arable fields	1 x 3000	Not relevant	20	6	8	7	19.0
						13.2	25.2
						26	38.0

[A] Copper is an element so DT_{50} value is not relevant
[B] 10[th] percentile value, median value and 90[th] percentile value in European arable and vineyard soils
[C] Overall $PEC_{soil,\ accumulation}$ = Background monitoring value + C_{low} + $PEC_{soil,\ initial}$ over 7 years

8.8 Predicted Environmental Concentrations in groundwater (PEC_{gw}) (KCP 9.2.4)

ZRMS Comments:	The submitted justification and PECgw calculation were accepted. It should be noted, that the FOCUS models are not designed /validated to predict the concentration of minerals and metals in groundwater. ZRMS recommends to Member States to consider the monitoring data, if available, at the national level. Based on statement and agreed PECgw assessment in EFSA Journal 2018;16(1):5152 for much higher application rate of copper (6000 g Cu/ha) – the PECgw values for all scenarios for every crop included in proposed uses, are below the trigger value of 0.1 µg Cu/L. The assessed PECgw value is below trigger value of 0.1 µg/L and also below 2.0 mg/L (legal limit set by the European Drinking Water Directive (98/83/EC) for groundwater). In accordance with groundwater monitoring results (2021, available in Polish language) the average concentration of copper in groundwater in Poland was 1.228 µg Cu/L. In accordance with national law – Regulation of Minister of Health, 20[th] April, 2010 amending the regulation on the quality of water intended for human consumption (Journal of Laws 2010 No. 72, item. 466) – the highest acceptable copper concentration in drinking water is 2.0 mg/l.

In FOCUS groundwater models substance sorption to soil is described solely by interaction with organic material. The adsorption properties of the Cu^{2+} ion are not limited to organic carbon binding and other significant processes occur, many of which are effectively irreversible. Many of the Copper species formed are only sparingly soluble and are therefore less likely to be affected by any downward movement of water in the soil. Furthermore, important binding processes for the Cu^{2+} ion, such as adsorption to clay and mineral oxides can occur at all depths in the soil column and not just at the surface layer as is the case for organic matter interactions.

It should be noted that the FOCUS models are not designed or validated to predict the behaviour of metals in the environment. Nevertheless, an assessment of the potential for Copper to reach groundwater according to standard FOCUS modelling has be conducted.

A review of the existing monitoring programs and published literature on Copper levels in groundwater has been conducted (EFSA Journal 2018; 16(1):5152.). Generally natural levels of Copper in groundwater were low, with background concentrations ranging from < 0.63 to 25 µg/L, with the exception of volcanic aquifers. In the upper soil layers, typical Copper concentrations in soil water and leachate from field leaching and lysimeter studies ranged from 1 to 90 µg/L, with a peak concentration of 164.2 µg/L detected at a depth of 25 cm.

A review of Copper levels in groundwater aquifers with possible anthropogenic inputs detected a range of concentrations from <LOD to 39 µg/L, with a peak concentration of 90 µg/L. Typical concentrations in ranged from < 0.1 to 18 µg/L which is within the range of natural background levels. Copper concentrations never approach the legal limit of 2 mg/L set by the European Drinking Water Directive (98/83/EC7) for groundwater. Furthermore the Copper concentrations are generally below the threshold values established for Copper in European Member States as reported by the commission in the following report Brussels, 5.3.2010 C(2010) 1096 final; and sec (2010) 166 final except for Finland and partly the UK see table below. It should be noted that in this context 29 out of the 33 groundwater bodies considered by member states to be at risk with regard to Copper have no (Finland) or only very limited (UK, grapes only) uses of Copper as a plant protection product. Overall concentrations of Copper in groundwater are not of concern and are the result of natural background or sources other than Copper fungicides.

Member state	**Threshold value**	**Unit**	**GWB at risk**	**GWB at poor status**
Austria	2	mg/L	no	no
Belgium	100	µg/L	1	no
Bulgaria	2	mg/L	1	no
Cyprus	No threshold value			
Czech Republic	No threshold value			
Denmark	No threshold value			
Estonia	No threshold value			
Finland	20	µg/L	3	2
France	No threshold value			
Germany	No threshold value			
Greece	No threshold value			
Hungary	No threshold value			
Ireland	1500	µg/L	no	no
Italy	No threshold value			
Latvia	No threshold value			
Lithuania	No threshold value			
Luxembourg	No threshold value			
Malta	1	mg/L	no	no

Member state	**Threshold value**	**Unit**	**GWB at risk**	**GWB at poor status**
The Netherlands	No threshold value			
Poland	~~0.2~~ 2	mgCu/L	1	no
Portugal	No threshold value			
Romania	No threshold value			
Slovak Republic	500.2 - 504.5	µg/L	no	no
Slovenia	No threshold value			
Spain	2	mg/L	1	-
Sweden	No threshold value			
United Kingdom	10.1 - 1500	µg/L	26	14

GWB = ground water bodies

An additional study has looked at the levels of Copper in bottled drinking water across Europe as being representative of ground water across Europe and has been summarised below.

Reference:	**CP 9.2.4/01, Demetriades, A. et al., 2012**
Title:	European Ground Water Geochemistry Using Bottled Water as a Sampling Medium
Report No.:	Clean Soil and Safe Water
Guidelines:	Not Applicable
Deviations:	No
GLP:	No
Published:	Literature
Comment:	-

In a further study a total of 1785 bottled waters were purchased from supermarkets in 40 European countries that represented 1247 wells/drill holes/springs at 884 locations and were representative of groundwater across Europe. Each of the bottled waters were analysed for 72 parameters which included the concentration of copper at the laboratories of the Federal Institute for Geosciences and Natural Resources (BGR) in Germany.

	Minimum	Median	Maximum
Copper at µg/L	< 0.1	0.27	100

The levels of Copper in the bottled water purchased from across Europe and deemed to be representative of the ground water from where they had been sampled was found to be between < 0.1 and 100 µg/L.

zRMS Comments	The submitted publication has been evaluated in 2020. The submitted publication considers “groundwater” samples as a bottled mineral water bought from supermarkets throughout Europe. The analytical data for copper content in bottled water can be used as an additional data giving only general information of copper content differentiation in consumed mineral/table water. The submitted information/data will be used at the national level.

8.8.1 Justification for new endpoints

Endpoints were taken from EFSA Journal 2018;16(1):5152.

Parameter	**Unit**	**Total Copper**	**Comment**
Molar mass	[g/mol]	63.54	-
Water solubility	[mg/L]	500	at 20°C, pH 5.6 LoEP EFSA Journal 2018; 16(1):5152
Vapour Pressure	[Pa]	0	Not applicable inorganic solid with negligible volatility.
K_d	[mL/g]	19509.9	Geometric mean calculated from soils pH range 4-5 LoEP EFSA Journal 2018; 16(1):5152
Freundlich Exponent	[-]	1	Default value
DT_{50}	[days]	1,000,000	Appropriate value to simulate no degradation LoEP EFSA Journal 2018; 16(1):5152
Plant uptake factor	[-]	0	Default value

8.8.2 Active substance(s) and relevant metabolite(s) (KCP 9.2.4.1)

The PEC_{gw} calculations are performed for the one FOCUS crop scenario (tomatoes) with an application amount of 3000 g a.s./ha. Since the FOCUS modelling is not designed or validated to predict the behaviour of metals in the environment, and thus is not suitable for Copper predictions and was only carried out for completeness, the choice of the suitable FOCUS crop scenario is not relevant. Therefore, the presented calculations for tomatoes cover all other intended uses presented in the GAP table.

Table 8.8-1: Input parameters related to application for PEC_{gw} calculations

Crop	**Tomato**
Application rate (g as/ha)	3000
Number of applications/interval (d)	1
Relative application date	Please refer to the table below
Crop interception (%)	0
Frequency of application	Annual
Models used for calculation	FOCUS PEARL v5.5.5, FOCUS PELMO v6.6.4, FOCUS MACRO v5.5.3

Table 8.8-2: Application dates used for groundwater risk assessment

	Scenario	**Application dates (absolute)***
Crop		Tomato
	Châteaudun	23rd August (Julian Day: 234#)
	Hamburg	--

	Scenario	**Application dates (absolute)***
	Jokioinen	--
	Kremsmünster	--
	Okehampton	--
	Piacenza	23rd August
	Porto	28th August
	Sevilla	30th June
	Thiva	7th September

*Based on AppDate version 3.06
relevant for FOCUS Macro

Table 8.8-3: Input parameters related to active substance total Copper for PEC_{gw} calculations

Compound	**Total Copper**	**Value in accordance with EU endpoint y/n/ Reference***
Molecular weight (g/mol)	63.54	-
Water solubility (g/mol):	500	at 20°C, pH 5.6 LoEP EFSA Journal 2018; 16(1):5152
Saturated vapour pressure (Pa):	0	Not applicable inorganic solid with negligible volatility.
DT_{50} in soil (d)	1,000,000	Appropriate value to simulate no degradation LoEP EFSA Journal 2018; 16(1):5152
Transformation rate	-	-
K_{foc} (mL/g)/K_{fom}	19509.9	Geometric mean calculated from soils pH range 4-5 LoEP EFSA Journal 2018; 16(1):5152
1/n	1	Conservative default value
Plant uptake factor	0	Assumed non systemic
Formation fraction	-	-

Table 8.8-4: PEC$_{gw}$ for total Copper on tomatoes

Crop	Scenario	80th Percentile PEC$_{gw}$ at 1 m Soil Depth [µg/L]		
		FOCUS PEARL	FOCUS PELMO	FOCUS MACRO
Tomatoes	Châteaudun	0.000000	0.000	<0.00001
	Piacenza	0.000000	0.000	-
	Porto	0.000000	0.000	-
	Sevilla	0.000000	0.000	-
	Thiva	0.000000	0.000	-

- The scenario is not parameterized

8.9 Predicted Environmental Concentrations in surface water (PEC$_{sw}$) (KCP 9.2.5)

zRMS Comments	The submitted PECsw and PECsed calculations were accepted. The approach considering emission of 0.1% drift is accepted. The max PECsw = 0.33 µg a.s./L.

8.9.1 Justification for new endpoints

Endpoints were taken from EFSA Journal 2018;16(1):5152.

8.9.2 Active substance(s), relevant metabolite(s) and the formulation (KCP 9.2.5)

PEC$_{SW}$ calculations – Greenhouse use

According to the List of Endpoints of Copper, the “Dutch Model” was used for the PEC$_{SW}$ greenhouse calculations.

For the surface water risk assessment for greenhouse use, some drift from the greenhouse towards a static water body has to be taken into account. Following the “Dutch Model”, the maximum instantaneous PEC$_{SW}$ value was calculated from entry through spray drift that occurred immediately after the last application, considering a drift of 0.1 % of the application rate from the glasshouse. The PEC$_{SW}$ was calculated using the following equation:

$$PEC_{SW} = \frac{0.1\ \%\ Drift\ x\ Application\ rate\ [\mu g\ a.i./ha]}{Water\ depth\ [cm] x\ 10}$$

With the depth of the static water body assumed as 30 cm and the single application rates of Nordox 75 WG of 1.0 kg a.s./ha. The resulting maximum instantaneous **PEC_{SW}** values is **0.33 µg a.s./L** for Nordox 75 WG in greenhouses.

PECsw/sed of formulation
Not necessary for a formulation containing one active substance. Covered from the risk assessment based on the active substance Copper.

8.10 Fate and behaviour in air (KCP 9.3, KCP 9.3.1)

zRMS Comments	The submitted justification was accepted.

Copper is not volatile at environmentally relevant temperatures and will therefore not be present in air. Furthermore, Copper cannot be transformed into related metabolites or degradation products and degradation processes likely to occur in air will have no action on Copper.

Appendix 1 Lists of data considered in support of the evaluation

Tables considered not relevant can be deleted as appropriate.

MS to blacken authors of vertebrate studies in the version made available to third parties/public.

List of data submitted by the applicant and relied on

Data point	Author(s)	Year	Title Company Report No. Source (where different from company) GLP or GEP status Published or not	Vertebrate study Y/N	Owner
KCP 9.2.4/01	Demetriades, A. et al	2012	Title European Ground Water Geochemistry Using Bottled Water as a Sampling Medium Company Report No Source Clean Soil and Safe Water Non GLP Published	N	Literature Paper

List of data submitted or referred to by the applicant and relied on, but already evaluated at EU peer review

Data point	Author(s)	Year	Title Company Report No. Source (where different from company) GLP or GEP status Published or not	Vertebrate study Y/N	Owner

The following tables are to be completed by MS

List of data submitted by the applicant and not relied on

Data point	Author(s)	Year	Title Company Report No. Source (where different from company) GLP or GEP status Published or not	Vertebrate study Y/N	Owner
KCP XX	Author	YYYY	Title Company Report N Source GLP/non GLP/GEP/non GEP Published/Unpublished	Y/N	Owner

List of data relied on not submitted by the applicant but necessary for evaluation

Data point	Author(s)	Year	Title Company Report No. Source (where different from company) GLP or GEP status Published or not	Vertebrate study Y/N	Owner
KCP XX	Author	YYYY	Title Company Report N Source GLP/non GLP/GEP/non GEP Published/Unpublished	Y/N	Owner

Appendix 2 Detailed evaluation of the new Annex II studies

Not relevant.

Appendix 3 PEC_{gw} raw data

PEC_{gw} calculations were conducted with FOCUS PEARL v5.5.5, FOCUS PELMO v6.6.4, FOCUS MACRO v5.5.3. Raw data can be submitted in electronic form. In the following example files for each program are included.

A 3.1 FOCUS PEARL v5.5.5

Crop	**File name**
Tomato	77-81

Example file: 77

```
*-------------------------------------------------------------------------------
* INPUT FILE for PEARL
* Generated by user interface version FOCUSPEARL 5.5.5 (build : 5.5.5) (October 2020) on 16/12/2021 12:20:54
*-------------------------------------------------------------------------------
* This file is intended to be used by expert users.
*
* Contact addresses:
* -----------------
* Aaldrik Tiktak                    Erik van den Berg
* Environmental Assessment Agency (PBL) Wageningen Environmental Research (WENR)
* PO BOX 30314                      PO BOX 47
* 2500 GH The Hague                 6700 AA Wageningen
* The Netherlands                   The Netherlands
* e-mail: aaldrik.tiktak@pbl.nl     erik.vandenberg@wur.nl
*
* (c) 2020 RIVM, PBL, WENR

*-------------------------------------------------------------------------------
* Section 1: Control section
*-------------------------------------------------------------------------------

FOCUSPEARL       CallingProgram
5.5.5            CallingProgramVersion
Groundwater      ExposureType
6                InitYears (y)
0                NumRep (-)
01-Jan-1901      TimStart
31-Dec-1926      TimEnd
0.001            ThetaTol (m3.m-3)
Month            OptDelTimPrn
30               DelTimPrn  (d)
OnLine           OptHyd
```

1E-5 DelTimSwaMin (d)
0.2 DelTimSwaMax (d)
Yes PrintCumulatives
1.0 GWLTol (m)
30 MaxItSwa
No OptHysteresis
0.2 PreHeaWetDryMin (cm)
All OptSys
Yes OptScreen
No OptPaddy
No OptMacropore
None OptAux

*---
* Section 2: Soil section
*---

CHAT-S_Soil SoilTypeID
CHATEAUDUN Location
table SoilProfile

ThiHor (m)	NumLay
0.01	5
0.24	24
0.05	5
0.2	16
0.1	4
0.4	16
0.2	4
0.3	6
0.4	4
2.6	26

end_table
table horizon SoilProperties

Nr	FraSand (kg.kg-1)	FraSilt (kg.kg-1)	FraClay (kg.kg-1)	CntOm (kg.kg-1)	pH (-)
1	0.03	0.67	0.3	0.024	8
2	0.03	0.67	0.3	0.024	8
3	0.02	0.67	0.31	0.016	8.1
4	0.02	0.67	0.31	0.016	8.1
5	0.08	0.67	0.25	0.012	8.2
6	0.3	0.44	0.26	0.005	8.5
7	0.3	0.44	0.26	0.005	8.5
8	0.38	0.38	0.24	0.0046	8.5
9	0.38	0.38	0.24	0.0046	8.5
10	0.08	0.61	0.31	0.0036	8.3

end_table
table horizon VanGenuchtenPar

Nr	ThetaSat (m3.m-3)	ThetaRes (m3.m-3)	AlphaDry (cm-1)	AlphaWet (cm-1)	n (-)	KSat (m.d-1)	l (-)
1	0.43	0	0.05	0.1	1.08	1.728	0.5
2	0.43	0	0.05	0.1	1.08	1.728	0.5
3	0.44	0	0.05	0.1	1.095	2.592	0.5

4 0.44 0 0.05 0.1 1.095 2.592 0.5
5 0.44 0 0.05 0.1 1.095 4.32 2.5
6 0.44 0 0.015 0.03 1.16 1.0368 -2
7 0.44 0 0.015 0.03 1.16 1.0368 -2
8 0.49 0 0.0107 0.0214 1.28 0.7828 -1.5
9 0.49 0 0.0107 0.0214 1.28 0.7828 -1.5
10 0.42 0 0.0191 0.0382 1.152 1.2796 -1.18
end_table
Input OptRho
table horizon Rho (kg.m-3)
1 1300.0
2 1300.0
3 1410.0
4 1410.0
5 1410.0
6 1370.0
7 1370.0
8 1410.0
9 1410.0
10 1490.0
end_table

0.002 ZPndMax (m)

* Soil evaporation parameters
Boesten OptSolEvp
1 FacEvpSol (-)
0.79 CofRedEvp (cm1/2)
0.01 PrcMinEvp (m.d-1)

Table horizon LenDisLiq (m)
1 0.05
2 0.05
3 0.05
4 0.05
5 0.05
6 0.05
7 0.05
8 0.05
9 0.05
10 0.05
end_table
MillingtonQuirk OptCofDifRel
2 ExpDifLiqMilNom (-)
0.6667 ExpDifLiqMilDen (-)
2 ExpDifGasMilNom (-)
0.6667 ExpDifGasMilDen (-)
Constant OptPnd

*---
* Section 3: Weather and irrigation section
*---

```
chat-m          MeteoStation
Input           OptEvp
2.35            TemLboSta      (C)
Sprinkler_Weekly  OptIrr
SPRINKLER_WEEKLY  IrrigationScheme
1.0             FacPrc (-)
1.0             FacEvp (-)
0.0             DifTem (C)
Laminar         OptTraRes
Daily           OptMetInp
No              OptRainfallEvents
No              OptSnow

*-----------------------------------------------------------------------------
* Section 4a: Lower boundary flux
*-----------------------------------------------------------------------------

-1200           ZGrwLevSta (cm)

FreeDrain       OptLbo
*-----------------------------------------------------------------------------
* Section 4b: Drainage/infiltration section
*-----------------------------------------------------------------------------

No              OptDra
No              OptSurDra
0               NumDraLev

*-----------------------------------------------------------------------------
* Section 5: Compound section
*-----------------------------------------------------------------------------

Cu SubstanceName
table compounds
Cu
end_table
EqlDom_Input       OptDT50_Cu
63.54              MolMas_Cu (g.mol-1)
table FraPrtDau (mol.mol-1)
end_table
OptimumConditions   OptCntLiqTraRef_Cu
1000000.           DT50Ref_Cu (d)
20.                TemRefTra_Cu (C)
0.7                ExpLiqTra_Cu (-)
65.4               MolEntTra_Cu (kJ.mol-1)
table horizon FacZTra (-)
hor Cu
1 1
2 1
3 0.5
4 0.5
5 0.5
6 0.3
```

```
7 0
8 0
9 0
10 0
end_table
table horizon FacZSor (-)
hor Cu
1 -99
2 -99
3 -99
4 -99
5 -99
6 -99
7 -99
8 -99
9 -99
10 -99
end_table
0.                MolEntSor_Cu (kJ.mol-1)
20.               TemRefSor_Cu (C)
pH-independent    OptCofFre_Cu
11315.7           KomEql_Cu (L.kg-1)
1131570.          KomEqlMax_Cu (L.kg-1)
1.                ConLiqRef_Cu (mg.L-1)
1.                ExpFre_Cu (-)
0.                PreVapRef_Cu (Pa)
20.               TemRefVap_Cu (C)
500.              SlbWatRef_Cu (mg.L-1)
20.               TemRefSlb_Cu (C)
27.               MolEntSlb_Cu (kJ.mol-1)
95.               MolEntVap_Cu (kJ.mol-1)
0.                CofDesRat_Cu (d-1)
0.                FacSorNeqEql_Cu (-)
0.                FacUpt_Cu (-)
0.01              ThiAirBouLay (m)
Lumped            OptDspCrp_Cu
10.               DT50DspCrp_Cu (d)
0.0001            FacWasCrp_Cu (m-1)
20.               TemRefDif_Cu (C)
4.3E-5            CofDifWatRef_Cu (m2.d-1)
0.43              CofDifAirRef_Cu (m2.d-1)
*-----------------------------------------------------------------------------
* Section 6: Management section
*-----------------------------------------------------------------------------

Cu_tom_Chat ApplicationScheme
1.0             ZTgt (m)
0.0             ZEADTop (m)
0.2             ZEADBot (m)
1               DelTimEvt (a)
table Applications
23-Aug-2000  AppSolSur 3.0
end_table
```

```
table TillageDates
end_table
table interpolate CntSysEql (mg.kg-1)
0.0      0.0
50.0     0.0
end_table
table interpolate CntSysNeq (mg.kg-1)
0.0      0.0
50.0     0.0
end_table
No DepositionScheme
table    FlmDep   (kg.ha-1.d-1)
end_table
*-----------------------------------------------------------------------------
* Section 7: Crop section
*-----------------------------------------------------------------------------

CHAT-TOMATOES CropCalendar
Yes              RepeatCrops
Fixed            OptLenCrp
LAI    OptCov

table  Crops
10-May          25-Aug       tomatoes1
end_table
table  IrrigationPeriods
10-May          26-Jul       tomatoes1
end_table
table  CrpPar_tomatoes1
0.0    0.0    1.05   0.0    0.0
0.472  6.0    1.05   0.8    0.0
0.481  6.0    1.1    0.8    0.0
0.717  6.0    1.1    0.8    0.0
0.726  6.0    0.85   0.8    0.0
1.0    6.0    0.85   0.8    0.0
end_table
table  RootDensity_tomatoes1
0.0    1.0
1.0    1.0
end_table
-10.0            HLim1_tomatoes1 (cm)
-25.0            HLim2_tomatoes1 (cm)
-800.0           HLim3U_tomatoes1 (cm)
-1500.0          HLim3L_tomatoes1 (cm)
-16000.0         HLim4_tomatoes1 (cm)
70.0             RstEvpCrp_tomatoes1 (s.m-1)
0.39             CofExtDif_tomatoes1 (-)
1.0              CofExtDir_tomatoes1 (-)
0.0001           CofIntCrp_tomatoes1 (cm)
0.0              TemSumSta_tomatoes1 (C)
0.0              TemSumEmgAnt_tomatoes1 (C)
0.0              TemSumAntMat_tomatoes1 (C)
0.2              ZTensiometer_tomatoes1 (m)
```

0.0 FraCovStm_tomatoes1 (-)
-100.0 PreHeaIrrSta_tomatoes1 (cm)
15.0 IrgThreshold_tomatoes1 (mm)
*---
* Section 8: Output control
*---

DaysFromSta DateFormat
Yes OptDelOutFiles
Yes PrintCumulatives
Yes LeachingReport
80.0 TargetPercentile (%)
No DrainageReport
No AirReport
No SoilReport
0.2 ThiLayPer (m)
table VerticalProfiles
end_table
G12.4 RealFormat
table OutputDepths (m)
0.05
0.1
0.2
0.3
0.4
0.5
0.75
1.0
2.0
end_table
No print_AmaAppCrp
Yes print_AmaAppSol
No print_AmaCrp
No print_AmaDra_1
No print_AmaDra_2
No print_AmaDra_3
No print_AmaDra_4
No print_AmaDra_5
Yes print_AmaEqlTgt
Yes print_AmaEqlPro
No print_AmaEqlTil
Yes print_AmaErrMic
Yes print_AmaForPro
No print_AmaHarCrp
Yes print_AmaNeqTgt
Yes print_AmaNeqPro
No print_AmaNeqTil
Yes print_AmaSysTgt
Yes print_AmaSysPro
No print_AmaSysTil
Yes print_AmaTraPro
Yes print_AmaUptPro
No print_AmaDspCrp

No	print_AmaWasCrp
No	print_ConGas
Yes	print_ConLiq
Yes	print_ConLiqLbo
Yes	print_ConLiqSatAvg
Yes	print_ConSys
No	print_ConSysEql
No	print_ConSysNeq
No	print_DelTimPrl
Yes	print_Eps
Yes	print_FacCrpEvp
No	print_FlmDepCrp
No	print_FlmGas
Yes	print_FlmGasVol
No	print_FlmLiq
Yes	print_FlmLiqInfSys
Yes	print_FlmLiqLbo
No	print_FlmSys
No	print_FlvLiq
No	print_FlvLiqDra_3
No	print_FlvLiqDra_4
No	print_FlvLiqDra_5
Yes	print_FlvLiqEvpIntIrr
Yes	print_FlvLiqEvpIntPrc
Yes	print_FlvLiqEvpSol
Yes	print_FlvLiqEvpSolPot
Yes	print_FlvLiqIrr
Yes	print_FlvLiqLbo
No	print_FlvLiqGrw
Yes	print_FlvLiqTrp
Yes	print_FlvLiqTrpPot
No	print_FraCovCrp
Yes	print_GrwLev
No	print_LAI
No	print_PreHea
Yes	print_Theta
No	print_StoCap
No	print_FlvLiqGrwSur
No	print_VvrLiqDra
No	print_VvrLiqUpt
No	print_ZRoot
No	print_FlvLiqDra_1
No	print_FlvLiqDra_2
Yes	print_FlvLiqPrc
Yes	print_Tem
No	print_ConLiqDra_1
No	print_ConLiqDra_2
No	print_ConLiqDra_3
No	print_ConLiqDra_4
No	print_ConLiqDra_5
No	print_ConLiqDra
No	print_ZPnd
No	print_AvoLiqSol

```
No          print_ConGas_VPrf
No          print_ConLiq_VPrf
No          print_ConSys_VPrf
No          print_ConSysEql_VPrf
No          print_ConSysNeq_VPrf
No          print_PreHea_VPrf
No          print_Tem_VPrf
No          print_Theta_VPrf
No          print_AvoLiqErr
No          print_FlvLiqInf
No          print_RstAirLam
No          print_AmaRunOff
No          print_AmaSolSur
No          print_VelWnd
No          print_TemAir
No          print_FlvLiqCanDrp
No          print_ConLiqPer
No          print_CntSysPer
No          print_ConLiqTWA2D
No          print_ConLiqTWA3D
No          print_ConLiqTWA4D
No          print_CntSysTWA2D
No          print_CntSysTWA3D
No          print_CntSysTWA4D
No          print_ConLiqTWA1D
No          print_CntSysTWA1D
Yes         print_ConLiqPer
Yes         print_CntSysPer
*-----------------------------------------------------------------------------
* End of FOCUSPEARL 5.5.5 input file
*-----------------------------------------------------------------------------

* ----------------------------------------------------------------------------
* PEARL REPORT: Header
* Results from the PEARL model  (c) WENR, PBL and RIVM
* PEARL kernel version      : 3.2.20
* SWAP kernel version       : swap3237
* PEARL created on          : 14-Sep-2020
*
* PEARL was called from     : FOCUSPEARL,version 5.5.5
* Working directory         : C:\Pearl\PesticideModels\FOCUSPEARL_5.5.5\FOCUSPEARL\77
* Run ID                    : 77
* Input file generated on   : 16-12-2021
* ----------------------------------------------------------------------------
*
* ExposureType          : Groundwater
* Scenario data subset  : FOCUS Groundwater version 5
* Location              : CHATEAUDUN
* Meteo station         : chat-m
* Soil type             : CHAT-S_Soil
* Crop calendar         : CHAT-TOMATOES
* Substance             : Cu
* Application scheme    : Cu_tom_Chat
```

```
* Deposition scheme     : No
* Irrigation scheme     : SPRINKLER_WEEKLY
*
* End of PEARL REPORT: Header
* -----------------------------------------------------------------------------

* Key to the annual water balances in the soil system
* -----------------------------------------------------------------------------
* DelLiq       Net storage change of water in profile       (m.a-1)
* Prc          Precipitation                                (m.a-1)
* Irr          Irrigation                                   (m.a-1)
* LeaLbo       Seepage at the lower boundary                (m.a-1)
* LeaGrw       Groundwater recharge                         (m.a-1)
* LeaTgt       Flux at lower boundary of the target layer   (m.a-1)
* EvpInt       Evaporation of intercepted water             (m.a-1)
* SolAct       Actual soil evaporation                      (m.a-1)
* TrpAct       Actual transpiration                         (m.a-1)
* Dra          Total discharge to drains and channels       (m.a-1)
* Dra_1        Lateral discharge to primary system          (m.a-1)
* Dra_2        Lateral discharge to secondary system        (m.a-1)
* Dra_3        Lateral discharge to tertiary system         (m.a-1)
* Dra_4        Lateral discharge to tile drains             (m.a-1)
* Dra_5        Lateral discharge to surface drainage system (m.a-1)
* RunOff       Run-off                                      (m.a-1)
* EvpPnd       Evaporation of ponded water                  (m.a-1)
* CanDrp       Canopy drip                                  (m.a-1)
* SolPot       Potential soil evaporation                   (m.a-1)
* TrpPot       Potential transpiration                      (m.a-1)

* Key to the annual mass balance of substance at the crop
* -----------------------------------------------------------------------------
* AmaAppCrp    Areic mass applied to the crop canopy         (kg.ha-1.a-1)
* DelAmaCrp    Change of areic mass at the crop canopy       (kg.ha-1.a-1)
* AmaVol       Areic mass volatilised from the crop canopy   (kg.ha-1.a-1)
* AmaPen       Areic mass penetrated into the plant tissue   (kg.ha-1.a-1)
* AmaTra       Areic mass transformed at the crop canopy     (kg.ha-1.a-1)
* AmaDep       Areic mass deposited at the crop canopy       (kg.ha-1.a-1)
* AmaDsp       Areic mass dissipated at the crop canopy      (kg.ha-1.a-1)
* AmaWas       Areic mass washed from the cropy canopy       (kg.ha-1.a-1)
* AmaHar       Areic mass removed by harvesting              (kg.ha-1.a-1)

* Key to the annual mass balance of substance in the soil system
* -----------------------------------------------------------------------------
* AmaAppSol    Areic mass applied to the soil system         (kg.ha-1.a-1)
* DelAma       Change of mass in the soil system             (kg.ha-1.a-1)
* DelAmaEql    Change of mass in the equilibrium domain      (kg.ha-1.a-1)
* DelAmaNeq    Change of mass in the non-equilibrium domain  (kg.ha-1.a-1)
* AmaTra       Areic mass transformed in the soil system     (kg.ha-1.a-1)
* AmaFor       Areic mass formed in the soil system          (kg.ha-1.a-1)
* AmaUpt       Areic mass taken-up from the soil system      (kg.ha-1.a-1)
* AmaDra       Areic mass drained from the soil system       (kg.ha-1.a-1)
* AmaDra_1     Areic mass drained to the primary system      (kg.ha-1.a-1)
* AmaDra_2     Areic mass drained to the secunary system     (kg.ha-1.a-1)
```

* AmaDra_3 Areic mass drained to the tertiary system (kg.ha-1.a-1)
* AmaDra_4 Areic mass drained to tube drains (kg.ha-1.a-1)
* AmaDra_5 Areic mass drained to surface drain system (kg.ha-1.a-1)
* AmaDep Areic mass deposited at the soil surface (kg.ha-1.a-1)
* AmaVol Areic mass volatized from the soil surface (kg.ha-1.a-1)
* AmaLea Areic mass leached from the soil system (kg.ha-1.a-1)
* AmaLeaAqf Areic mass leached to the deep acquifer (kg.ha-1.a-1)

* Key to the output per summary period
* --
* AmaLeaTgt Areic mass leached from the target layer (kg.ha-1)
* FlvLeaTgt Volume of water leached from the target layer (m3.m-2)
* ConLeaTgt Concentration in water leached from the target layer (ug.L-1)
* --

* Annual water balance of the target layer
* --

* yr	Identifier	DelLiq	Prc	Irr	LeaLbo	LeaTgt	EvpInt	SolAct	TrpAct	Dra	Dra_1	Dra_2	Dra_3	Dra_4	Dra_5	Run	EvpPnd	CanDrp	SolPot	TrpPot
1901	BalWatTgt	0.0481	0.5227	0.2434	0.0247	0.0905	0.0000	0.2762	0.3512	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3142	0.5089	0.3738
1902	BalWatTgt	0.0075	0.4133	0.2032	0.0458	0.0545	0.0000	0.2299	0.3246	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2569	0.5078	0.3486
1903	BalWatTgt	-0.0188	0.5070	0.1732	0.0765	0.1398	0.0000	0.2689	0.2904	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2654	0.4339	0.3031
1904	BalWatTgt	0.0097	0.5926	0.1574	0.1022	0.1690	0.0000	0.2826	0.2888	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2688	0.4496	0.3188
1905	BalWatTgt	0.0198	0.5541	0.1869	0.1662	0.1227	0.0000	0.2989	0.2996	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2356	0.4356	0.3152
1906	BalWatTgt	-0.0088	0.6045	0.1965	0.1630	0.1465	0.0000	0.3240	0.3393	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2835	0.4536	0.3549
1907	BalWatTgt	-0.0058	0.7325	0.1372	0.1714	0.2736	0.0000	0.2957	0.3062	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2572	0.4184	0.3269
1908	BalWatTgt	0.0085	0.4733	0.2766	0.1816	0.0883	0.0000	0.2684	0.3846	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3010	0.4915	0.4379
1909	BalWatTgt	0.0025	0.7586	0.0932	0.2104	0.2650	0.0000	0.3256	0.2588	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2739	0.4475	0.2695
1910	BalWatTgt	0.0260	0.7063	0.1491	0.3126	0.2788	0.0000	0.2855	0.2652	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2527	0.4411	0.2774
1911	BalWatTgt	-0.0205	0.7866	0.1596	0.2848	0.3579	0.0000	0.3193	0.2894	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2739	0.4292	0.3009
1912	BalWatTgt	-0.0006	0.6903	0.0978	0.3011	0.2479	0.0000	0.2763	0.2645	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2458	0.4467	0.2792
1913	BalWatTgt	0.0236	0.8047	0.1307	0.2644	0.3003	0.0000	0.3455	0.2660	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2667	0.4571	0.2752
1914	BalWatTgt	-0.0274	0.7277	0.2090	0.2653	0.3385	0.0000	0.3088	0.3168	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3414	0.5010	0.3323
1915	BalWatTgt	-0.0195	0.6683	0.1784	0.3416	0.1900	0.0000	0.3479	0.3284	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3013	0.4544	0.3428
1916	BalWatTgt	0.0189	0.8461	0.1658	0.2278	0.3594	0.0000	0.3162	0.3173	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3056	0.4594	0.3306

1917 BalWatTgt -0.0070 0.5936 0.1445 0.2947 0.1476 0.0000 0.2901 0.3073 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2838 0.4866 0.3197
1918 BalWatTgt 0.0103 0.6340 0.2429 0.1578 0.1952 0.0000 0.3452 0.3261 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2918 0.4384 0.3421
1919 BalWatTgt -0.0039 0.6577 0.1396 0.1843 0.2696 0.0000 0.2697 0.2620 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.3098 0.4417 0.2728
1920 BalWatTgt -0.0171 0.6951 0.1444 0.3785 0.2904 0.0000 0.2891 0.2770 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2897 0.4126 0.2969
1921 BalWatTgt 0.0070 0.5227 0.2228 0.1405 0.1069 0.0000 0.2776 0.3540 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2963 0.5089 0.3738
1922 BalWatTgt 0.0050 0.4133 0.1972 0.0889 0.0493 0.0000 0.2304 0.3257 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2517 0.5078 0.3486
1923 BalWatTgt -0.0204 0.5070 0.1715 0.0934 0.1393 0.0000 0.2691 0.2905 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2640 0.4339 0.3031
1924 BalWatTgt 0.0092 0.5926 0.1570 0.1067 0.1689 0.0000 0.2826 0.2888 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2685 0.4496 0.3188
1925 BalWatTgt 0.0197 0.5541 0.1869 0.1672 0.1227 0.0000 0.2989 0.2996 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2355 0.4356 0.3152
1926 BalWatTgt -0.0088 0.6045 0.1965 0.1631 0.1465 0.0000 0.3240 0.3393 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2835 0.4536 0.3549

* Annual water balance of the soil profile
* --
----
* yr Identifier DelLiq Prc Irr LeaLbo LeaGrw EvpInt SolAct TrpAct Dra Dra_1
Dra_2 Dra_3 Dra_4 Dra_5 Run EvpPnd CanDrp SolPot TrpPot
1901 BalWatSol 0.1139 0.5227 0.2434 0.0247 0.0247 0.0000 0.2762 0.3512 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.3142 0.5089 0.3738
1902 BalWatSol 0.0163 0.4133 0.2032 0.0458 0.0458 0.0000 0.2299 0.3246 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2569 0.5078 0.3486
1903 BalWatSol 0.0444 0.5070 0.1732 0.0765 0.0765 0.0000 0.2689 0.2904 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2654 0.4339 0.3031
1904 BalWatSol 0.0764 0.5926 0.1574 0.1022 0.1022 0.0000 0.2826 0.2888 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2688 0.4496 0.3188
1905 BalWatSol -0.0237 0.5541 0.1869 0.1662 0.1662 0.0000 0.2989 0.2996 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2356 0.4356 0.3152
1906 BalWatSol -0.0252 0.6045 0.1965 0.1630 0.1630 0.0000 0.3240 0.3393 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2835 0.4536 0.3549
1907 BalWatSol 0.0964 0.7325 0.1372 0.1714 0.1714 0.0000 0.2957 0.3062 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2572 0.4184 0.3269
1908 BalWatSol -0.0848 0.4733 0.2766 0.1816 0.1816 0.0000 0.2684 0.3846 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.3010 0.4915 0.4379
1909 BalWatSol 0.0571 0.7586 0.0932 0.2104 0.2104 0.0000 0.3256 0.2588 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2739 0.4475 0.2695
1910 BalWatSol -0.0078 0.7063 0.1491 0.3126 0.3126 0.0000 0.2855 0.2652 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2527 0.4411 0.2774
1911 BalWatSol 0.0526 0.7866 0.1596 0.2848 0.2848 0.0000 0.3193 0.2894 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2739 0.4292 0.3009
1912 BalWatSol -0.0537 0.6903 0.0978 0.3011 0.3011 0.0000 0.2763 0.2645 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2458 0.4467 0.2792
1913 BalWatSol 0.0595 0.8047 0.1307 0.2644 0.2644 0.0000 0.3455 0.2660 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2667 0.4571 0.2752
1914 BalWatSol 0.0458 0.7277 0.2090 0.2653 0.2653 0.0000 0.3088 0.3168 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.3414 0.5010 0.3323
1915 BalWatSol -0.1712 0.6683 0.1784 0.3416 0.3417 0.0000 0.3479 0.3284 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.3013 0.4544 0.3428
1916 BalWatSol 0.1505 0.8461 0.1658 0.2278 0.2278 0.0000 0.3162 0.3173 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.3056 0.4594 0.3306
1917 BalWatSol -0.1541 0.5936 0.1445 0.2947 0.2947 0.0000 0.2901 0.3073 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2838 0.4866 0.3197
1918 BalWatSol 0.0477 0.6340 0.2429 0.1578 0.1578 0.0000 0.3452 0.3261 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2918 0.4384 0.3421
1919 BalWatSol 0.0814 0.6577 0.1396 0.1843 0.1843 0.0000 0.2697 0.2620 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.3098 0.4417 0.2728
1920 BalWatSol -0.1052 0.6951 0.1444 0.3785 0.3785 0.0000 0.2891 0.2770 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2897 0.4126 0.2969
1921 BalWatSol -0.0266 0.5227 0.2228 0.1405 0.1405 0.0000 0.2776 0.3540 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2963 0.5089 0.3738
1922 BalWatSol -0.0346 0.4133 0.1972 0.0889 0.0889 0.0000 0.2304 0.3257 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2517 0.5078 0.3486
1923 BalWatSol 0.0255 0.5070 0.1715 0.0934 0.0934 0.0000 0.2691 0.2905 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2640 0.4339 0.3031
1924 BalWatSol 0.0715 0.5926 0.1570 0.1067 0.1067 0.0000 0.2826 0.2888 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2685 0.4496 0.3188
1925 BalWatSol -0.0247 0.5541 0.1869 0.1672 0.1672 0.0000 0.2989 0.2996 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2355 0.4356 0.3152
1926 BalWatSol -0.0253 0.6045 0.1965 0.1631 0.1631 0.0000 0.3240 0.3393 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.2835 0.4536 0.3549

* Annual mass balance of substance at the crop canopy
* ---

* yr Identifier	AmaApp	DelAmaCrp	AmaDep	AmaDsp	AmaWas	AmaHar
1901 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1902 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1903 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1904 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1905 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1906 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1907 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1908 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1909 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1910 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1911 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1912 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1913 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1914 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1915 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1916 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1917 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1918 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1919 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1920 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1921 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1922 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1923 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1924 BalCrp_Cu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

1925 BalCrp_Cu 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
1926 BalCrp_Cu 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

* Annual mass balance (kg.ha-1) of compound Cu in the target layer
* --
* yr Identifier AmaAppSol DelAma DelAmaEql DelAmaNeq AmaTra AmaFor AmaUpt AmaDra AmaDra_1 AmaDra_2 AmaDra_3 AmaDra_4 AmaDra_5 AmaDep AmaVol AmaLea ConLeaTgt
1901 BalTgt_Cu 3.000 3.000 3.000 0.000 0.1162E-03 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1902 BalTgt_Cu 3.000 3.000 3.000 0.000 0.4995E-03 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1903 BalTgt_Cu 3.000 2.999 2.999 0.000 0.8614E-03 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1904 BalTgt_Cu 3.000 2.999 2.999 0.000 0.1184E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1905 BalTgt_Cu 3.000 2.999 2.999 0.000 0.1458E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1906 BalTgt_Cu 3.000 2.998 2.998 0.000 0.2211E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1907 BalTgt_Cu 3.000 2.998 2.998 0.000 0.2274E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1908 BalTgt_Cu 3.000 2.997 2.997 0.000 0.2834E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1909 BalTgt_Cu 3.000 2.997 2.997 0.000 0.2937E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1910 BalTgt_Cu 3.000 2.997 2.997 0.000 0.3093E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1911 BalTgt_Cu 3.000 2.996 2.996 0.000 0.3655E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1912 BalTgt_Cu 3.000 2.996 2.996 0.000 0.3792E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1913 BalTgt_Cu 3.000 2.995 2.995 0.000 0.4613E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1914 BalTgt_Cu 3.000 2.995 2.995 0.000 0.5221E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1915 BalTgt_Cu 3.000 2.994 2.994 0.000 0.5630E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1916 BalTgt_Cu 3.000 2.994 2.994 0.000 0.5543E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1917 BalTgt_Cu 3.000 2.994 2.994 0.000 0.5597E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1918 BalTgt_Cu 3.000 2.994 2.994 0.000 0.6070E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1919 BalTgt_Cu 3.000 2.994 2.994 0.000 0.6478E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1920 BalTgt_Cu 3.000 2.993 2.993 0.000 0.7100E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1921 BalTgt_Cu 3.000 2.992 2.992 0.000 0.8180E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1922 BalTgt_Cu 3.000 2.992 2.992 0.000 0.8384E-02 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

1923 BalTgt_Cu 3.000 2.992 2.992 0.000 0.8300E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1924 BalTgt_Cu 3.000 2.992 2.992 0.000 0.8400E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1925 BalTgt_Cu 3.000 2.992 2.992 0.000 0.8270E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1926 BalTgt_Cu 3.000 2.989 2.989 0.000 0.1053E-01 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

* Annual mass balance (kg.ha-1) of compound Cu in the soil profile
* --
----
* yr Identifier AmaAppSol DelAma DelAmaEql DelAmaNeq AmaTra AmaFor AmaUpt
AmaDra AmaDra_1 AmaDra_2 AmaDra_3 AmaDra_4 AmaDra_5 AmaDep AmaVol AmaLea
AmaLeaAqf
1901 BalSol_Cu 3.000 3.000 3.000 0.000 0.1162E-03 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1902 BalSol_Cu 3.000 3.000 3.000 0.000 0.4995E-03 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1903 BalSol_Cu 3.000 2.999 2.999 0.000 0.8614E-03 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1904 BalSol_Cu 3.000 2.999 2.999 0.000 0.1184E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1905 BalSol_Cu 3.000 2.999 2.999 0.000 0.1458E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1906 BalSol_Cu 3.000 2.998 2.998 0.000 0.2211E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1907 BalSol_Cu 3.000 2.998 2.998 0.000 0.2274E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1908 BalSol_Cu 3.000 2.997 2.997 0.000 0.2834E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1909 BalSol_Cu 3.000 2.997 2.997 0.000 0.2937E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1910 BalSol_Cu 3.000 2.997 2.997 0.000 0.3093E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1911 BalSol_Cu 3.000 2.996 2.996 0.000 0.3655E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1912 BalSol_Cu 3.000 2.996 2.996 0.000 0.3792E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1913 BalSol_Cu 3.000 2.995 2.995 0.000 0.4613E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1914 BalSol_Cu 3.000 2.995 2.995 0.000 0.5221E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1915 BalSol_Cu 3.000 2.994 2.994 0.000 0.5630E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1916 BalSol_Cu 3.000 2.994 2.994 0.000 0.5543E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1917 BalSol_Cu 3.000 2.994 2.994 0.000 0.5597E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1918 BalSol_Cu 3.000 2.994 2.994 0.000 0.6070E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1919 BalSol_Cu 3.000 2.994 2.994 0.000 0.6478E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

1920 BalSol_Cu 3.000 2.993 2.993 0.000 0.7100E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1921 BalSol_Cu 3.000 2.992 2.992 0.000 0.8180E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1922 BalSol_Cu 3.000 2.992 2.992 0.000 0.8384E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1923 BalSol_Cu 3.000 2.992 2.992 0.000 0.8300E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1924 BalSol_Cu 3.000 2.992 2.992 0.000 0.8400E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1925 BalSol_Cu 3.000 2.992 2.992 0.000 0.8270E-02 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1926 BalSol_Cu 3.000 2.989 2.989 0.000 0.1053E-01 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

* Intermediate target output for compound Cu
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* yr Identifier AmaLea FlvLea ConLea
* (kg/ha) (m) (ug/L)
1907 Target_Cu 0.0000 0.27358 0.0000
1908 Target_Cu 0.0000 0.08835 0.0000
1909 Target_Cu 0.0000 0.26498 0.0000
1910 Target_Cu 0.0000 0.27876 0.0000
1911 Target_Cu 0.0000 0.35787 0.0000
1912 Target_Cu 0.0000 0.24793 0.0000
1913 Target_Cu 0.0000 0.30028 0.0000
1914 Target_Cu 0.0000 0.33855 0.0000
1915 Target_Cu 0.0000 0.18997 0.0000
1916 Target_Cu 0.0000 0.35942 0.0000
1917 Target_Cu 0.0000 0.14758 0.0000
1918 Target_Cu 0.0000 0.19515 0.0000
1919 Target_Cu 0.0000 0.26957 0.0000
1920 Target_Cu 0.0000 0.29038 0.0000
1921 Target_Cu 0.0000 0.10693 0.0000
1922 Target_Cu 0.0000 0.04932 0.0000
1923 Target_Cu 0.0000 0.13933 0.0000
1924 Target_Cu 0.0000 0.16893 0.0000
1925 Target_Cu 0.0000 0.12272 0.0000
1926 Target_Cu 0.0000 0.14650 0.0000

* Leaching summary per summary period:
* --
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* Rank Identifier Percent DateSta DateEnd ConLeaTgt Year
* (-) (%) (ug/L) (a)
1 ConLea_Cu 2.50 01-Jan-1907 31-Dec-1907 0.00 1907
2 ConLea_Cu 7.50 01-Jan-1908 31-Dec-1908 0.00 1908
3 ConLea_Cu 12.50 01-Jan-1909 31-Dec-1909 0.00 1909
4 ConLea_Cu 17.50 01-Jan-1910 31-Dec-1910 0.00 1910
5 ConLea_Cu 22.50 01-Jan-1911 31-Dec-1911 0.00 1911
6 ConLea_Cu 27.50 01-Jan-1912 31-Dec-1912 0.00 1912

7	ConLea_Cu	32.50	01-Jan-1913	31-Dec-1913	0.00	1913
8	ConLea_Cu	37.50	01-Jan-1914	31-Dec-1914	0.00	1914
9	ConLea_Cu	42.50	01-Jan-1915	31-Dec-1915	0.00	1915
10	ConLea_Cu	47.50	01-Jan-1916	31-Dec-1916	0.00	1916
11	ConLea_Cu	52.50	01-Jan-1917	31-Dec-1917	0.00	1917
12	ConLea_Cu	57.50	01-Jan-1918	31-Dec-1918	0.00	1918
13	ConLea_Cu	62.50	01-Jan-1919	31-Dec-1919	0.00	1919
14	ConLea_Cu	67.50	01-Jan-1920	31-Dec-1920	0.00	1920
15	ConLea_Cu	72.50	01-Jan-1921	31-Dec-1921	0.00	1921
16	ConLea_Cu	77.50	01-Jan-1922	31-Dec-1922	0.00	1922
17	ConLea_Cu	82.50	01-Jan-1923	31-Dec-1923	0.00	1923
18	ConLea_Cu	87.50	01-Jan-1924	31-Dec-1924	0.00	1924
19	ConLea_Cu	92.50	01-Jan-1925	31-Dec-1925	0.00	1925
20	ConLea_Cu	97.50	01-Jan-1926	31-Dec-1926	0.00	1926

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* PEARL REPORT: Leaching
* Start date : 01-Jan-1901
* End date : 31-Dec-1926
* Target depth : 1.00 m
* Annual application to the soil surface at 23-Aug; dosage = 3.0000 kg.ha-1

* Leaching summary for compound Cu
* Molar mass (g.mol-1) : 63.5
* Saturated vapour pressure (Pa) : 0.00 ; measured at (C) 20.0
* Solubility in water (mg.L-1) : 500. ; measured at (C) 20.0
* Half-life (d) in soil : ********; measured at (C) 20.0
* Kom (coef. for sorption on soil organic matter) (L.kg-1) : 11315.7
* KF (overall sorption coefficient of the soil target layer) (L.kg-1) : 149.
* Freundlich exponent (-) : 1.00
* Plant uptake factor (-) : 0.00
* --
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* Period * number	From	To	Water percolated below target depth (mm)	Substance leached below target depth (kg/ha)	Average substance concentration in water at target depth (ug/L)
1	01-Jan-1907	31-Dec-1907	273.578	0.0000000	0.000
2	01-Jan-1908	31-Dec-1908	88.347	0.0000000	0.000
3	01-Jan-1909	31-Dec-1909	264.983	0.0000000	0.000
4	01-Jan-1910	31-Dec-1910	278.757	0.0000000	0.000
5	01-Jan-1911	31-Dec-1911	357.866	0.0000000	0.000
6	01-Jan-1912	31-Dec-1912	247.925	0.0000000	0.000
7	01-Jan-1913	31-Dec-1913	300.280	0.0000000	0.000
8	01-Jan-1914	31-Dec-1914	338.548	0.0000000	0.000
9	01-Jan-1915	31-Dec-1915	189.969	0.0000000	0.000
10	01-Jan-1916	31-Dec-1916	359.416	0.0000000	0.000
11	01-Jan-1917	31-Dec-1917	147.580	0.0000000	0.000
12	01-Jan-1918	31-Dec-1918	195.152	0.0000000	0.000
13	01-Jan-1919	31-Dec-1919	269.569	0.0000000	0.000

14	01-Jan-1920 31-Dec-1920	290.381	0.0000000	0.000
15	01-Jan-1921 31-Dec-1921	106.930	0.0000000	0.000
16	01-Jan-1922 31-Dec-1922	49.322	0.0000000	0.000
17	01-Jan-1923 31-Dec-1923	139.327	0.0000000	0.000
18	01-Jan-1924 31-Dec-1924	168.933	0.0000000	0.000
19	01-Jan-1925 31-Dec-1925	122.720	0.0000000	0.000
20	01-Jan-1926 31-Dec-1926	146.500	0.0000000	0.000

* The average concentration of Cu closest to the 80th percentile is 0.000000 ug/L

* End of PEARL REPORT: Leaching
* ---
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* ---
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* PEARL REPORT: Project_Summary
* Report_type Leaching
* Result_text Concentration closest to the 80th percentile (ug/L)
* Run_Id 77
* ExposureType Groundwater
* Scenario data subset FOCUS Groundwater version 5
* Location CHATEAUDUN
* Meteo_station chat-m
* Soil_type CHAT-S_Soil
* Crop_calendar CHAT-TOMATOES
* Substance Cu
* Application_scheme Cu_tom_Chat
* Irrigation_scheme SPRINKLER_WEEKLY
* Deposition_scheme No
* Result_Cu 0.000000

* End of PEARL REPORT: Project_Summary
* ---
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*
* The run time was 1 minutes and 53 seconds

A 3.2 FOCUS PELMO v6.6.4

Crop	**File name**
Tomato	Copper_Tom

Example file: Copper_Tom (Châteaudun)

Echo of Input data

1
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* *
* PESTICIDE LEACHING MODEL *
* PELMO 5.0, DEC 2020 *

```
*   FOCUSPELMO 6.6.4            *
*                          *
*                          *
***********************************


DEVELOPED BY:
      U.S. ENVIRONMENTAL PROTECTION AGENCY
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 AND
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      DEPARTMENT ECOLOGY
      D-67435 NEUSTADT/WSTR.
      Tel ++ 49-6321-671-422


 PELMO 5.0,       DEC 2020


**************HYDROLOGY DATAS**************

         FOCUS GW Simulation: 6 warming-up years


         YEAR   1: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:01
         YEAR   2: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:02
         YEAR   3: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:03
         YEAR   4: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:04
         YEAR   5: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:05
         YEAR   6: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:06
         YEAR   7: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:07
         YEAR   8: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:08
         YEAR   9: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:09
         YEAR  10: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:10
         YEAR  11: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:11
         YEAR  12: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:12
         YEAR  13: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:13
         YEAR  14: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:14
         YEAR  15: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:15
         YEAR  16: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:16
         YEAR  17: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:17
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        YEAR  18: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:18
        YEAR  19: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:19
        YEAR  20: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:20
        YEAR  21: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:21
        YEAR  22: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:22
        YEAR  23: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:23
        YEAR  24: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:24
        YEAR  25: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:25
        YEAR  26: Ver 4 Châteaudun scenario (48.05 N, 1.38 E))     Year:26


 HYDROLOGY AND SEDIMENT RELATED PARAMETERS
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Variable time step

Pan Evaporation data are used.


  LATTITUDE OF THE LOCATION:  48.00

 CROPNAME                                    GENERAL      Tomatoes

 PAN COEFFICIENT FOR EVAPORATION (NO CROP)          1.000        1.000
 PAN COEFFICIENT FOR EVAPORATION (MID  SEASON)       1.000        1.100
 PAN COEFFICIENT FOR EVAPORATION (LATE SEASON)       1.000        0.6000
 FLAG FOR ET (0=EVAP,1=TEMP,2=EVAP/TEMP)              0
 DEPTH TO WHICH ET IS COMPUTED YEAR-ROUND [CM]        20.00
 SNOW MELT COEFFICIENT [CM/DEG-C-DAY]              0.4600
 INITIAL CROP NUMBER                              1
 INITIAL CROP CONDITION                             1



NO CALCULATION OF RUNOFF EVENTS
 CROP INFORMATION
 ----------------

      MAXIMUM                              IRRIGATION PERENNIAL         SURFACE
      INTERCEPT.MAXIMUM        MINIMUM      MAXIMUM                     FLG(0=NO)    CROP
CONDITION                      USLE COVER MANAGEMENT
 CROP  POTENTIAL ROOT DEPTH  LAI       LAI      WEIGHT    (1=CANOPY) (0=NO)            AFTER
AMC       RUNOFF CURVE NUMBERS      "C" FACTOR
 NUMBER    [CM]        [CM]        [-]        [-]       [KG/M**2]  2=DRIP)  (1=YES)               HARVEST
FALLOW     CROP  RESIDUE   FALLOW  CROP    RESIDUE   EXT. COEFF.  SPRING POINT

                                                                      I        80       64       80
  18     0.0000     80.00    0.0000     6.000    0.0000       1        0              3        II         91       81       91
1.0000  1.0000  1.0000     0.39000
                                                                     III        96       91       96
```

CROP ROTATION INFORMATION

CROP NUMBER	EMERGENCE DATE	MATURATION DATE	SENESCENCE DATE	HARVEST DATE
Tomatoes	10 MAY , 1	30 JUNE, 1	26 JULY, 1	25 AUG., 1
Tomatoes	10 MAY , 2	30 JUNE, 2	26 JULY, 2	25 AUG., 2
Tomatoes	10 MAY , 3	30 JUNE, 3	26 JULY, 3	25 AUG., 3
Tomatoes	10 MAY , 4	30 JUNE, 4	26 JULY, 4	25 AUG., 4
Tomatoes	10 MAY , 5	30 JUNE, 5	26 JULY, 5	25 AUG., 5
Tomatoes	10 MAY , 6	30 JUNE, 6	26 JULY, 6	25 AUG., 6
Tomatoes	10 MAY , 7	30 JUNE, 7	26 JULY, 7	25 AUG., 7
Tomatoes	10 MAY , 8	30 JUNE, 8	26 JULY, 8	25 AUG., 8
Tomatoes	10 MAY , 9	30 JUNE, 9	26 JULY, 9	25 AUG., 9
Tomatoes	10 MAY , 10	30 JUNE, 10	26 JULY, 10	25 AUG., 10
Tomatoes	10 MAY , 11	30 JUNE, 11	26 JULY, 11	25 AUG., 11
Tomatoes	10 MAY , 12	30 JUNE, 12	26 JULY, 12	25 AUG., 12
Tomatoes	10 MAY , 13	30 JUNE, 13	26 JULY, 13	25 AUG., 13
Tomatoes	10 MAY , 14	30 JUNE, 14	26 JULY, 14	25 AUG., 14
Tomatoes	10 MAY , 15	30 JUNE, 15	26 JULY, 15	25 AUG., 15
Tomatoes	10 MAY , 16	30 JUNE, 16	26 JULY, 16	25 AUG., 16
Tomatoes	10 MAY , 17	30 JUNE, 17	26 JULY, 17	25 AUG., 17
Tomatoes	10 MAY , 18	30 JUNE, 18	26 JULY, 18	25 AUG., 18
Tomatoes	10 MAY , 19	30 JUNE, 19	26 JULY, 19	25 AUG., 19
Tomatoes	10 MAY , 20	30 JUNE, 20	26 JULY, 20	25 AUG., 20
Tomatoes	10 MAY , 21	30 JUNE, 21	26 JULY, 21	25 AUG., 21
Tomatoes	10 MAY , 22	30 JUNE, 22	26 JULY, 22	25 AUG., 22
Tomatoes	10 MAY , 23	30 JUNE, 23	26 JULY, 23	25 AUG., 23
Tomatoes	10 MAY , 24	30 JUNE, 24	26 JULY, 24	25 AUG., 24
Tomatoes	10 MAY , 25	30 JUNE, 25	26 JULY, 25	25 AUG., 25
Tomatoes	10 MAY , 26	30 JUNE, 26	26 JULY, 26	25 AUG., 26
Tomatoes	10 MAY , 27	30 JUNE, 27	26 JULY, 27	25 AUG., 27
Tomatoes	10 MAY , 28	30 JUNE, 28	26 JULY, 28	25 AUG., 28
Tomatoes	10 MAY , 29	30 JUNE, 29	26 JULY, 29	25 AUG., 29
Tomatoes	10 MAY , 30	30 JUNE, 30	26 JULY, 30	25 AUG., 30
Tomatoes	10 MAY , 31	30 JUNE, 31	26 JULY, 31	25 AUG., 31
Tomatoes	10 MAY , 32	30 JUNE, 32	26 JULY, 32	25 AUG., 32
Tomatoes	10 MAY , 33	30 JUNE, 33	26 JULY, 33	25 AUG., 33
Tomatoes	10 MAY , 34	30 JUNE, 34	26 JULY, 34	25 AUG., 34
Tomatoes	10 MAY , 35	30 JUNE, 35	26 JULY, 35	25 AUG., 35
Tomatoes	10 MAY , 36	30 JUNE, 36	26 JULY, 36	25 AUG., 36
Tomatoes	10 MAY , 37	30 JUNE, 37	26 JULY, 37	25 AUG., 37
Tomatoes	10 MAY , 38	30 JUNE, 38	26 JULY, 38	25 AUG., 38
Tomatoes	10 MAY , 39	30 JUNE, 39	26 JULY, 39	25 AUG., 39
Tomatoes	10 MAY , 40	30 JUNE, 40	26 JULY, 40	25 AUG., 40
Tomatoes	10 MAY , 41	30 JUNE, 41	26 JULY, 41	25 AUG., 41
Tomatoes	10 MAY , 42	30 JUNE, 42	26 JULY, 42	25 AUG., 42
Tomatoes	10 MAY , 43	30 JUNE, 43	26 JULY, 43	25 AUG., 43
Tomatoes	10 MAY , 44	30 JUNE, 44	26 JULY, 44	25 AUG., 44

Tomatoes	10 MAY , 45	30 JUNE, 45	26 JULY, 45	25 AUG., 45
Tomatoes	10 MAY , 46	30 JUNE, 46	26 JULY, 46	25 AUG., 46
Tomatoes	10 MAY , 47	30 JUNE, 47	26 JULY, 47	25 AUG., 47
Tomatoes	10 MAY , 48	30 JUNE, 48	26 JULY, 48	25 AUG., 48
Tomatoes	10 MAY , 49	30 JUNE, 49	26 JULY, 49	25 AUG., 49
Tomatoes	10 MAY , 50	30 JUNE, 50	26 JULY, 50	25 AUG., 50
Tomatoes	10 MAY , 51	30 JUNE, 51	26 JULY, 51	25 AUG., 51
Tomatoes	10 MAY , 52	30 JUNE, 52	26 JULY, 52	25 AUG., 52
Tomatoes	10 MAY , 53	30 JUNE, 53	26 JULY, 53	25 AUG., 53
Tomatoes	10 MAY , 54	30 JUNE, 54	26 JULY, 54	25 AUG., 54
Tomatoes	10 MAY , 55	30 JUNE, 55	26 JULY, 55	25 AUG., 55
Tomatoes	10 MAY , 56	30 JUNE, 56	26 JULY, 56	25 AUG., 56
Tomatoes	10 MAY , 57	30 JUNE, 57	26 JULY, 57	25 AUG., 57
Tomatoes	10 MAY , 58	30 JUNE, 58	26 JULY, 58	25 AUG., 58
Tomatoes	10 MAY , 59	30 JUNE, 59	26 JULY, 59	25 AUG., 59
Tomatoes	10 MAY , 60	30 JUNE, 60	26 JULY, 60	25 AUG., 60
Tomatoes	10 MAY , 61	30 JUNE, 61	26 JULY, 61	25 AUG., 61
Tomatoes	10 MAY , 62	30 JUNE, 62	26 JULY, 62	25 AUG., 62
Tomatoes	10 MAY , 63	30 JUNE, 63	26 JULY, 63	25 AUG., 63
Tomatoes	10 MAY , 64	30 JUNE, 64	26 JULY, 64	25 AUG., 64
Tomatoes	10 MAY , 65	30 JUNE, 65	26 JULY, 65	25 AUG., 65
Tomatoes	10 MAY , 66	30 JUNE, 66	26 JULY, 66	25 AUG., 66
Tomatoes	10 MAY , 67	30 JUNE, 67	26 JULY, 67	25 AUG., 67
Tomatoes	10 MAY , 68	30 JUNE, 68	26 JULY, 68	25 AUG., 68
Tomatoes	10 MAY , 69	30 JUNE, 69	26 JULY, 69	25 AUG., 69
Tomatoes	10 MAY , 70	30 JUNE, 70	26 JULY, 70	25 AUG., 70
Tomatoes	10 MAY , 71	30 JUNE, 71	26 JULY, 71	25 AUG., 71
Tomatoes	10 MAY , 72	30 JUNE, 72	26 JULY, 72	25 AUG., 72
Tomatoes	10 MAY , 73	30 JUNE, 73	26 JULY, 73	25 AUG., 73
Tomatoes	10 MAY , 74	30 JUNE, 74	26 JULY, 74	25 AUG., 74
Tomatoes	10 MAY , 75	30 JUNE, 75	26 JULY, 75	25 AUG., 75
Tomatoes	10 MAY , 76	30 JUNE, 76	26 JULY, 76	25 AUG., 76
Tomatoes	10 MAY , 77	30 JUNE, 77	26 JULY, 77	25 AUG., 77
Tomatoes	10 MAY , 78	30 JUNE, 78	26 JULY, 78	25 AUG., 78
Tomatoes	10 MAY , 79	30 JUNE, 79	26 JULY, 79	25 AUG., 79
Tomatoes	10 MAY , 80	30 JUNE, 80	26 JULY, 80	25 AUG., 80
Tomatoes	10 MAY , 81	30 JUNE, 81	26 JULY, 81	25 AUG., 81
Tomatoes	10 MAY , 82	30 JUNE, 82	26 JULY, 82	25 AUG., 82
Tomatoes	10 MAY , 83	30 JUNE, 83	26 JULY, 83	25 AUG., 83
Tomatoes	10 MAY , 84	30 JUNE, 84	26 JULY, 84	25 AUG., 84
Tomatoes	10 MAY , 85	30 JUNE, 85	26 JULY, 85	25 AUG., 85
Tomatoes	10 MAY , 86	30 JUNE, 86	26 JULY, 86	25 AUG., 86
Tomatoes	10 MAY , 87	30 JUNE, 87	26 JULY, 87	25 AUG., 87
Tomatoes	10 MAY , 88	30 JUNE, 88	26 JULY, 88	25 AUG., 88
Tomatoes	10 MAY , 89	30 JUNE, 89	26 JULY, 89	25 AUG., 89
Tomatoes	10 MAY , 90	30 JUNE, 90	26 JULY, 90	25 AUG., 90
Tomatoes	10 MAY , 91	30 JUNE, 91	26 JULY, 91	25 AUG., 91
Tomatoes	10 MAY , 92	30 JUNE, 92	26 JULY, 92	25 AUG., 92
Tomatoes	10 MAY , 93	30 JUNE, 93	26 JULY, 93	25 AUG., 93
Tomatoes	10 MAY , 94	30 JUNE, 94	26 JULY, 94	25 AUG., 94
Tomatoes	10 MAY , 95	30 JUNE, 95	26 JULY, 95	25 AUG., 95
Tomatoes	10 MAY , 96	30 JUNE, 96	26 JULY, 96	25 AUG., 96
Tomatoes	10 MAY , 97	30 JUNE, 97	26 JULY, 97	25 AUG., 97

Tomatoes	10 MAY , 98	30 JUNE, 98	26 JULY, 98	25 AUG., 98
Tomatoes	10 MAY , 99	30 JUNE, 99	26 JULY, 99	25 AUG., 99
Tomatoes	10 MAY , 100	30 JUNE, 100	26 JULY, 100	25 AUG., 100
Tomatoes	10 MAY , 101	30 JUNE, 101	26 JULY, 101	25 AUG., 101
Tomatoes	10 MAY , 102	30 JUNE, 102	26 JULY, 102	25 AUG., 102
Tomatoes	10 MAY , 103	30 JUNE, 103	26 JULY, 103	25 AUG., 103
Tomatoes	10 MAY , 104	30 JUNE, 104	26 JULY, 104	25 AUG., 104
Tomatoes	10 MAY , 105	30 JUNE, 105	26 JULY, 105	25 AUG., 105
Tomatoes	10 MAY , 106	30 JUNE, 106	26 JULY, 106	25 AUG., 106
Tomatoes	10 MAY , 107	30 JUNE, 107	26 JULY, 107	25 AUG., 107
Tomatoes	10 MAY , 108	30 JUNE, 108	26 JULY, 108	25 AUG., 108
Tomatoes	10 MAY , 109	30 JUNE, 109	26 JULY, 109	25 AUG., 109
Tomatoes	10 MAY , 110	30 JUNE, 110	26 JULY, 110	25 AUG., 110
Tomatoes	10 MAY , 111	30 JUNE, 111	26 JULY, 111	25 AUG., 111
Tomatoes	10 MAY , 112	30 JUNE, 112	26 JULY, 112	25 AUG., 112
Tomatoes	10 MAY , 113	30 JUNE, 113	26 JULY, 113	25 AUG., 113
Tomatoes	10 MAY , 114	30 JUNE, 114	26 JULY, 114	25 AUG., 114
Tomatoes	10 MAY , 115	30 JUNE, 115	26 JULY, 115	25 AUG., 115
Tomatoes	10 MAY , 116	30 JUNE, 116	26 JULY, 116	25 AUG., 116
Tomatoes	10 MAY , 117	30 JUNE, 117	26 JULY, 117	25 AUG., 117
Tomatoes	10 MAY , 118	30 JUNE, 118	26 JULY, 118	25 AUG., 118
Tomatoes	10 MAY , 119	30 JUNE, 119	26 JULY, 119	25 AUG., 119
Tomatoes	10 MAY , 120	30 JUNE, 120	26 JULY, 120	25 AUG., 120

MECHANICAL TREATMENTS

NO	DATE	DEPTH[CM]

*** PARAMETERS OF ACTIVE SUBSTANCE (Copper)***
****

APPLICATION DATE	PESTICIDE APPLIED [KG/HA]	UPPER INCORP. DEPTH [CM]	LOWER INCORP. DEPTH [CM]	FFIELD [-]
23 AUG., 1	3.000	0.0000	0.0000	0.0000
23 AUG., 2	3.000	0.0000	0.0000	0.0000
23 AUG., 3	3.000	0.0000	0.0000	0.0000
23 AUG., 4	3.000	0.0000	0.0000	0.0000
23 AUG., 5	3.000	0.0000	0.0000	0.0000
23 AUG., 6	3.000	0.0000	0.0000	0.0000
23 AUG., 7	3.000	0.0000	0.0000	0.0000
23 AUG., 8	3.000	0.0000	0.0000	0.0000
23 AUG., 9	3.000	0.0000	0.0000	0.0000
23 AUG., 10	3.000	0.0000	0.0000	0.0000
23 AUG., 11	3.000	0.0000	0.0000	0.0000
23 AUG., 12	3.000	0.0000	0.0000	0.0000

23 AUG., 13	3.000	0.0000	0.0000	0.0000
23 AUG., 14	3.000	0.0000	0.0000	0.0000
23 AUG., 15	3.000	0.0000	0.0000	0.0000
23 AUG., 16	3.000	0.0000	0.0000	0.0000
23 AUG., 17	3.000	0.0000	0.0000	0.0000
23 AUG., 18	3.000	0.0000	0.0000	0.0000
23 AUG., 19	3.000	0.0000	0.0000	0.0000
23 AUG., 20	3.000	0.0000	0.0000	0.0000
23 AUG., 21	3.000	0.0000	0.0000	0.0000
23 AUG., 22	3.000	0.0000	0.0000	0.0000
23 AUG., 23	3.000	0.0000	0.0000	0.0000
23 AUG., 24	3.000	0.0000	0.0000	0.0000
23 AUG., 25	3.000	0.0000	0.0000	0.0000
23 AUG., 26	3.000	0.0000	0.0000	0.0000

PLANT PESTICIDE PARAMETERS

CROP INTERCEPTION: 1
(1=SOIL(NO), 2=LINEAR, 3=EXPONENTIAL, 4=MANUAL)

VOLATILIZATION PARAMETERS ACTIVE SUBSTANCE

TEMPERATURE [deg C] 20.00
HENRY-CONSTANT [Pa*m3/mole] or [J/mole] 0.0000
CALCULATED USING
VAPOUR PRESSURE [Pa] 0.0000
MOLECULAR MASS [g/mole] 63.54
WATER SOLUBILITY [mg/l] 500.0

TEMPERATURE [deg C] 30.00
HENRY-CONSTANT [Pa*m3/mole] or [J/mole] 0.1412E-03
CALCULATED USING
VAPOUR PRESSURE [Pa] 0.4000E-03
MOLECULAR MASS [g/mole] 63.54
WATER SOLUBILITY [mg/l] 180.0

Q10-Factor for Henry's constant: 1.000

DIFFUSION COEFF.AIR [cm2/d] 4303.
DEPTH OF SURFACE LAYER FOR VOLATILIZATION [CM] 0.1000
HENRY CONSTANT AT 20.0 deg C [-] 0.0000
HENRY CONSTANT AT 30.0 deg C [-] 0.5602E-07

PLANT UPTAKE OF ACTIVE SUBSTANCE

PLANT UPTAKE FACTOR (-) 0.0000

TRANSFORMATION PARAMETERS

DegT50 of the compound (d) at 20 °C at pF 2: 990210.26

TRANSFORM. TRANSFORM. TEMP. Q10 MOISTURE-DURING-STUDY MOISTURE REL. TRANSFORM FORMATION
TO in EQ.Domaine OF STUDY VALUE ABSOLUTE RELATIVE EXPONENT IN NEQ DOMAIN FACTOR
[/DAY] [C] [-] [%] [%] [-] [-] [-]
BR/CO2 0.7000E-06 20.00 2.200 0.0000 100.0 0.7000 0.0000 1.000

SORPTION PARAMETERS

--PARAMETERS TO CALCULATE KD-VALUES WITH KOC--
KOC [CM**3/G] 0.1951E+05
FREUNDLICH-SORPTION EXPONENT 1/n 1.000
[PEARL] FACTOR DESCRIBING NON-EQ-SITES EQ-SITES (-): 0.0000
[PEARL] DESORPTION RATE [1/D]: 0.0000

MIN. CONC FOR FREUNDLICH-SORPTION [æG/L] 0.1000E-19

DEPTH DEPENDEND SORPTION AND TRANSFORMATION PARAMETERS

HORIZON	KOC	KD	FR-EXP	TRANSFORMATION RATE TO BR/CO2
	[CM**3/G]	[CM**3/G]	[-]	[/DAY]
1	0.1951E+05	271.2	1.000	0.7000E-06
2	0.1951E+05	181.4	1.000	0.3500E-06
3	0.1951E+05	136.6	1.000	0.3500E-06
4	0.1951E+05	58.53	1.000	0.2100E-06
5	0.1951E+05	58.53	1.000	0.0000
6	0.1951E+05	52.68	1.000	0.0000
7	0.1951E+05	40.97	1.000	0.0000

(C
Ver 4 Châteaudun

Ver 4 Châteaudun, tomatoes

GENERAL SOIL INFORMATION

CORE DEPTH [CM] 260.0
TOTAL HORIZONS IN CORE 7
TOTAL COMPARTMENTS IN CORE 52
DPFLAG FLAG (0=DISP.COEFF.1=DISP.LENGTH) 1
THETA FLAG (0=INPUT,1=PRZM 2=PELMO) 0
PARTITION COEFFICIENT FLAG (0=INPUT,1=CALCULATED) 1

BULK DENSITY FLAG (0=INPUT,1=CALCULATED) 0
SOIL HYDRAULICS MODULE free drainage
COMPARTMENT DEPTH FLAG (0=const,1=depth dep.) 0

SOIL HORIZON INFORMATION

HORIZON	THICKNESS [CM]	BULK DENSITY [G/CM**3]	INITIAL SOIL WATER CONTENT [CM/CM]	DRAINAGE PARAMETER [/DAY]	FIELD CAPACITY WATER CONTENT [CM/CM]	WILTING POINT WATER CONTENT [CM/CM]	DISPERSION LENGTH [CM]	ORGANIC CARBON [%]	BIODEG. FACTOR [-]	PH [-]
1	25.0000	1.3000	0.3740	0.1970	0.3740	0.2530	5.0000	1.3900	1.0000	8.0000
2	25.0000	1.4100	0.3720	0.1950	0.3720	0.2350	5.0000	0.9300	0.5000	8.1000
3	10.0000	1.4100	0.3720	0.2130	0.3720	0.2350	5.0000	0.7000	0.5000	8.2000
4	40.0000	1.3700	0.3860	0.2650	0.3860	0.1850	5.0000	0.3000	0.3000	8.5000
5	20.0000	1.3700	0.3860	0.2650	0.3860	0.1850	5.0000	0.3000	0.0000	8.5000
6	70.0000	1.4100	0.4170	0.2960	0.4170	0.1160	5.0000	0.2700	0.0000	8.5000
7	70.0000	1.4900	0.3620	0.2050	0.3620	0.1760	5.0000	0.2100	0.0000	8.3000

OUTPUT FILE PARAMETERS

OUTPUT	TIME STEP	LAYER FREQ
WATR	YEAR	1
PEST	YEAR	1
CONC	YEAR	1

Total number of layers in the top meter: 21

PLOT FILE INFORMATION

NUMBER OF PLOTTING VARIABLES 15

TIMSER NAME	MODE	DEPTH(CM)	ARGUMENT	CONSTANT	SUBSTANCE
PRSN	TSER	0.	1	1.000	PESTIC
TETD	TSER	0.	1	1.000	PESTIC
INFL	TSER	100.	22	1.000	PESTIC
RUNF	TSER	0.	1	1.000	PESTIC

THET	TSER	0.	1	1.000	PESTIC
THET	TSER	30.	7	1.000	PESTIC
TEMP	TSER	0.	1	1.000	PESTIC
TEMP	TSER	30.	7	1.000	PESTIC
TPAP	TSER	0.	1	0.1000E+06	PESTIC
TDKF	TSER	0.	1	0.1000E+06	PESTIC
TUPF	TSER	0.	1	0.1000E+06	PESTIC
TPST	TSER	5.	2	0.1000E+07	PESTIC
PFLX	TSER	100.	21	0.1000E+06	PESTIC
RFLX	TSER	0.	1	0.1000E+06	PESTIC
LEAC	TSER	100.	21	0.1000E+10	PESTIC

FOCUS Summary Output File

Model Version: FOCUSPELMO 6.6.4
Date of this simulation: 16/12/2021 11:27:00
Pesticide input file: Copper_Tom
Simulated crop: Tomatoes

PECgw for ACTIVE SUBSTANCE (Copper)

Location	Selected Period	Flux (g/ha)	Percolate (L/m²)	Conc. (µg/L)
Châteaudun (C)	(17/16)	6.55E-16	124.670	0.000
Piacenza (P)	(17/16)	5.37E-08	429.800	0.000
Porto (O)	(17/16)	1.72E-10	1128.20	0.000
Sevilla (S)	(1/2)	0.00E+00	227.606	0.000
Thiva (T)	(17/16)	1.84E-14	223.280	0.000

A 3.3 FOCUS MACRO v5.5.3

Crop	File name
Tomato	124

Example file: Tomato (124)
MACRO in FOCUS Version 5.5.4
Output File = C:\SWASH\MACRO\macro124.bin
Type of compound = parent
Compound : Cu
Scenario : Chateaudun
Groundwater

Simulation from 19010101 to 19270101, application every year
(6 year warm-up)

Crop : Vegetables, fruiting, irrigated

Number of applications : 1

Application 1 : 3000 g/ha of Cu on day 234

Period	Applied	Degraded	Leached	Runoff	Uptake	Changeofstorage
1	0.01167528	0	0	0	299.9912	
2	0.05003795	0	0	0	299.9615	
3	0.08537304	0	0	0	299.9369	
4	0.1164671	0	0	0	299.9333	
5	0.1406043	0	0	0	299.9181	
6	0.214839	0	0	0	299.8376	
7	0.2217504	0	0	0	299.8615	
8	0.2833006	0	0	0	299.7783	
9	0.2857125	0	0	0	299.8018	

10	0.299541	0	0	0	299.8178
11	0.3506155	0	0	0	299.8219
12	0.3675349	0	0	0	299.9115
13	0.4386926	0	0	0	299.9693
14	0.5123751	0	0	0	299.9123
15	0.5414627	0	0	0	299.8629
16	0.5332603	0	0	0	299.9961
17	0.5384912	0	0	0	299.8223
18	0.584578	0	0	0	299.8007
19	0.625258	0	0	0	299.8048
20	0.6898689	0	0	0	299.7309
21	0.7864714	0	0	0	299.5477
22	0.807766	0	0	0	299.506
23	0.8031893	0	0	0	299.5376
24	0.8106899	0	0	0	299.594
25	0.7885885	0	0	0	299.5422
26	1.010633	0	0	0	299.2682

Period	Precipitation	Evapotranspiration	Percolation	Runoff	Changeofstorage
1	772.4764	594.937	137.3794	0	40.16
2	620.7705	507.1608	113.5538	0	0.0463491
3	687.7767	539.5742	177.1367	0	-28.94613
4	752.8892	526.8566	218.1412	0	7.874573
5	746.5371	555.2051	163.8033	0	27.51603
6	804.8396	622.7021	192.8513	0	-10.72758
7	872.7739	558.0969	330.9741	0	-16.31775
8	755.1182	594.9219	137.027	0	23.15574
9	867.1104	562.9404	305.9475	0	-1.795934
10	871.4019	537.1138	296.1046	0	38.16216
11	951.9185	584.02	395.6382	0	-29.01183
12	791.4619	499.9966	287.8372	0	3.610248
13	937.3467	586.5581	330.3943	0	20.37139
14	942.8926	610.5225	361.2759	0	-28.93098
15	849.7676	642.313	232.0854	0	-24.64636
16	1014.278	617.5176	379.3308	0	17.26251
17	741.8633	575.9971	168.4329	0	-2.580017
18	880.1436	630.3252	235.0337	0	14.76803
19	801.5059	510.2158	300.9395	0	-10.3168
20	842.2588	531.1865	328.4771	0	-17.42725
21	750.8848	593.5801	139.3584	0	17.93341
22	614.4922	505.4834	108.9536	0	0.04592185
23	682.2559	538.5508	172.6392	0	-28.94552
24	752.9883	526.9121	218.1846	0	7.874512
25	746.4609	555.2148	163.7163	0	27.51609
26	804.8379	622.7012	192.8511	0	-10.7274

Period	Percolation_at_reporting_depth
1	149.1437
2	106.4862
3	174.2379
4	221.7549
5	166.045
6	190.0932

7	329.8484
8	142.8027
9	305.068
10	305.8244
11	390.3524
12	288.8419
13	330.9156
14	361.1988
15	220.5009
16	385.301
17	163.4995
18	241.7709
19	299.9548
20	323.1237
21	146.7258
22	101.8792
23	169.7472
24	221.7984
25	165.9508
26	190.0936

Period	Av_FluxConc_at_reporting_depth
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0
13	0
14	0
15	0
16	6.040157E-41
17	3.031133E-39
18	8.746642E-38
19	4.406412E-36
20	2.73277E-34
21	4.401718E-33
22	2.880461E-32
23	1.26195E-31
24	1.255783E-30
25	9.491734E-30
26	6.263441E-29