

Tool for Estimating Application Dates for FOCUS Surface Water Scenarios Based on Plant Growth Stages

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INTRODUCTION

When using the SWASH FOCUS model shell, application dates are required for the calculation of predicted environmental concentrations (PEC) in surface water. It is necessary to define these application dates for each scenario and crop. However, to-date, no guidance describing a uniform procedure to find adequate application dates based on BBCH codes provided in the GAP table has been implemented. In SWASH, crop parameters describing the scenarios only include specific dates for the growth stages “emergence”, “maturation” (for R-Scenarios) or “max. leaf area development” (for D-Scenarios) and “harvest” [1]. Information on intermediate growth stages is not currently provided. The selection of adequate dates for intermediate growth stages is therefore reliant on the user’s knowledge. Accordingly, selected dates can vary significantly and lead to different PEC values being calculated by SWASH. The **aim of our study** was therefore to develop a tool to provide appropriate application dates for FOCUS surface water scenarios and crops based on BBCH codes.

MATERIAL AND METHODS



Figure 1: Example of groundwater and surface water scenarios with matching main crop growth stages. H: Hamburg; P: Piacenza; T: Thiva; S: Sevilla

CROPS	SURFACE WATER SCENARIOS									
	D1	D2	D3	D4	D5	D6	R1	R2	R3	R4
Spring cereal			H							
Winter cereal						T			P	
Maize						T		P		
Oil seed rape summer										
Oil seed rape winter										
Pome/stone fruits			H				H			S
Potatoes ...			H					P		

■ Same main crop dates in FOCUS groundwater and surface water scenarios

□ No matching dates in between scenarios

■ Crop not relevant in the surface water scenario

Matching dates were adopted from FOCUS GW scenarios. **Missing dates** were calculated by **linear interpolation** between the dates given for main growth stages following Klein’s approach (Fig. 2). BBCH stages which were not defined for certain crops were skipped for the interpolation. Missing planting dates were estimated by calculating the average number of days over the time period between planting and the emergence date of each crop in the GW scenarios.

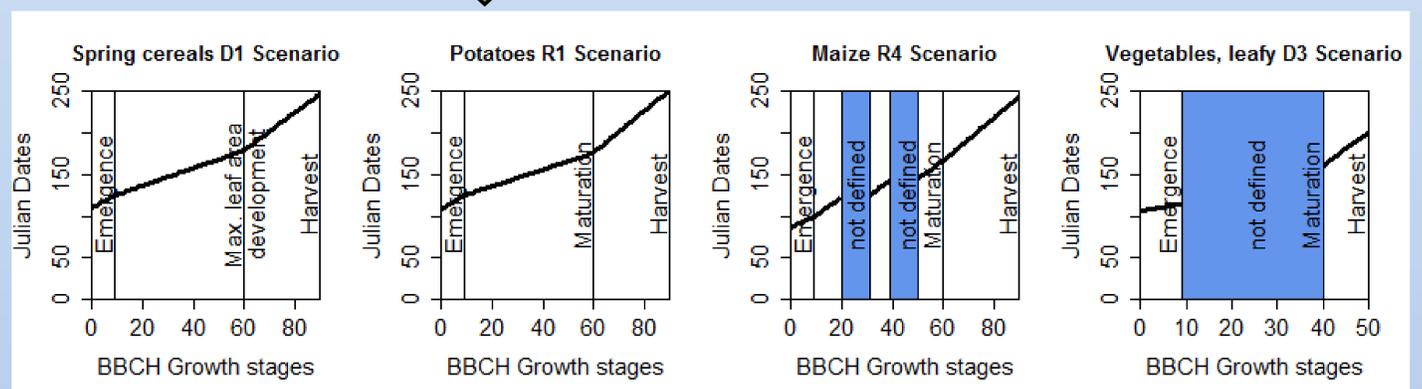


Figure 2: Examples of estimation of crop growth dates for FOCUS surface water scenarios using linear interpolation between main growth stages.

RESULTING TOOL

Based on these estimated dates, an EXCEL-based TOOL was developed to help SWASH users choose adequate application dates for FOCUS surface water scenarios. This tool is available on request.

INPUT:

1. These values have to be entered by the user

BBCH	61
Crop	field beans 1st
Nr. of applications	4
Interval	7
crop 1st or 2nd: first or second growing season of the year	
Min. width of the application window for multiple applications	51
Window width = 30 + (nr. of appl.-1) * interval	
Start of the appl. window	15 days before suggested date

OUTPUT:

Scenario	Suggested appl. date	Respective Julian date
D1	no relevant crop	n.a.
D2	01/07/2002	182
D3	17/07/2001	198
D4	12/07/2001	193
D5	no relevant crop	n.a.
D6	03/05/2001	123
R1	12/07/2001	193
R2	19/05/2001	139
		123
		123

2. Application dates are calculated by the tool and given in the output table

Suggested Application Window for SWASH

Single Application		Multiple Application	
First day	Last day	First day	Last day
n.a.	n.a.	n.a.	n.a.
167	197	167	218
183	213	183	234
178	208	178	229

3. Single and multiple application windows for the SWASH model are proposed. The starting time of the window can be chosen among „start at suggested date“ or „start 15 days before suggested date“.

Note: if the last day of the application window trespasses the harvest date (BBCH 90), the Julian Date will turn red

Reference: Gaviria, C.; Hörold, C. (2014): Tool for estimating application dates for FOCUS Surface Water Scenarios based on plant growth stages. RIFCON GmbH, 69493 Hirschberg

Figure 3: The Excel tool developed to provide absolute application dates according to BBCH codes and suggested application windows for single and multiple applications in SWASH

CONCLUSION

This tool is adjusted primarily for the estimation of application dates needed for the SWASH model shell and is therefore not applicable to other models. However, this tool harmonizes and facilitates the selection of the application dates based on BBCH codes standardizing the PEC calculations.

REFERENCES

- [1] FOCUS (2012a): Generic Guidance for FOCUS Surface Water Scenarios, Version 1.2.
- [2] Klein (2014): AppDate2.0a – Estimation of application dates based on crop development. Fraunhofer-IME, D57392 Schmallenberg
- [3] FOCUS (2012b): Generic Guidance for FOCUS Ground water Scenarios, Version 2.1.