

MACRO-DB: A risk assessment tool for management of pesticide use in water protection areas in Sweden

CONCLUSIONS

- MACRO-DB is a user-friendly risk assessment tool for pesticide leaching
- The results are given as a simulated concentration of the pesticide in the water reaching the groundwater and surface water.
- The tool is used by environmental inspectors, farmers and agricultural advisers in many water protection areas for abstraction of drinking water in Sweden.
- The use of MACRO-DB has helped to prevent unnecessary conflicts between farmers and local authorities.



INTRODUCTION

- Farmers are not allowed to use plant protection products on agricultural fields located in water protection areas, without permission from the municipality.
- There are 290 municipalities in Sweden and the risk assessments are performed in many different ways.
- This results in differences in the level of protection of the drinking water in Sweden
- There are conflicts between farmers and the local authorities in many municipalities.



MATERIALS & METHODS

- MACRO-DB is a tool based on the model MACRO 5.2. which is an one-dimensional, process oriented, dual-permeability model for water flow and pesticide transport in agricultural soils (Larsbo et al., 2005).
- Transport by wind drift and surface runoff is not included in MACRO-DB.
- Predefined sets of parameters are provided in the tool for each:
 - regional climate
 - soil class
 - crop type
 - pesticide
- Soil hydraulic properties are automatically generated by pedotransfer functions.
- Pre-running of 4400 scenarios representing a wide range of pesticide properties and worst case soils, climate and application time, resulted in Step 1.

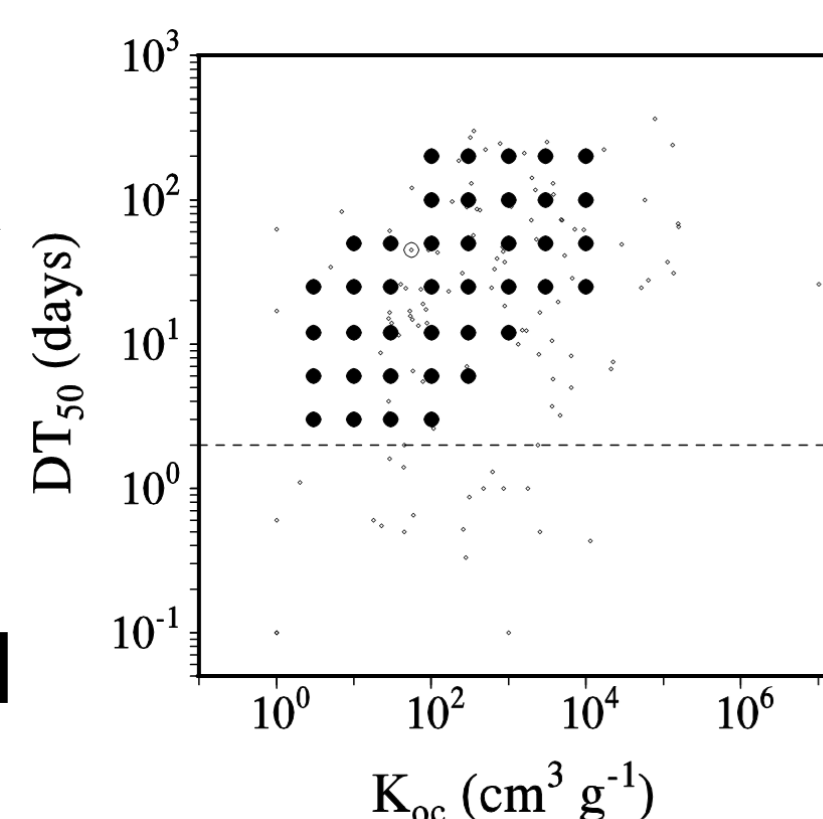


Figure 1: Pesticide properties in Step 1.

Reference:

Larsbo, M., Roulier, S., Stenemo, F., Kasteel, R. and Jarvis, N. An improved dual-permeability model of water flow and solute transport in the vadose zone. *Vadose Zone Journal* 4, no. 2 (2005): 398-406.

RESULTS

MACRO-DB is provided by the Centre for Chemical Pesticides at the Swedish University of Agricultural Sciences and recommended to be used for decisions on pesticide use in water protection areas by the Swedish Environmental Protection Agency and the Swedish Agency for Marine and Water Management.

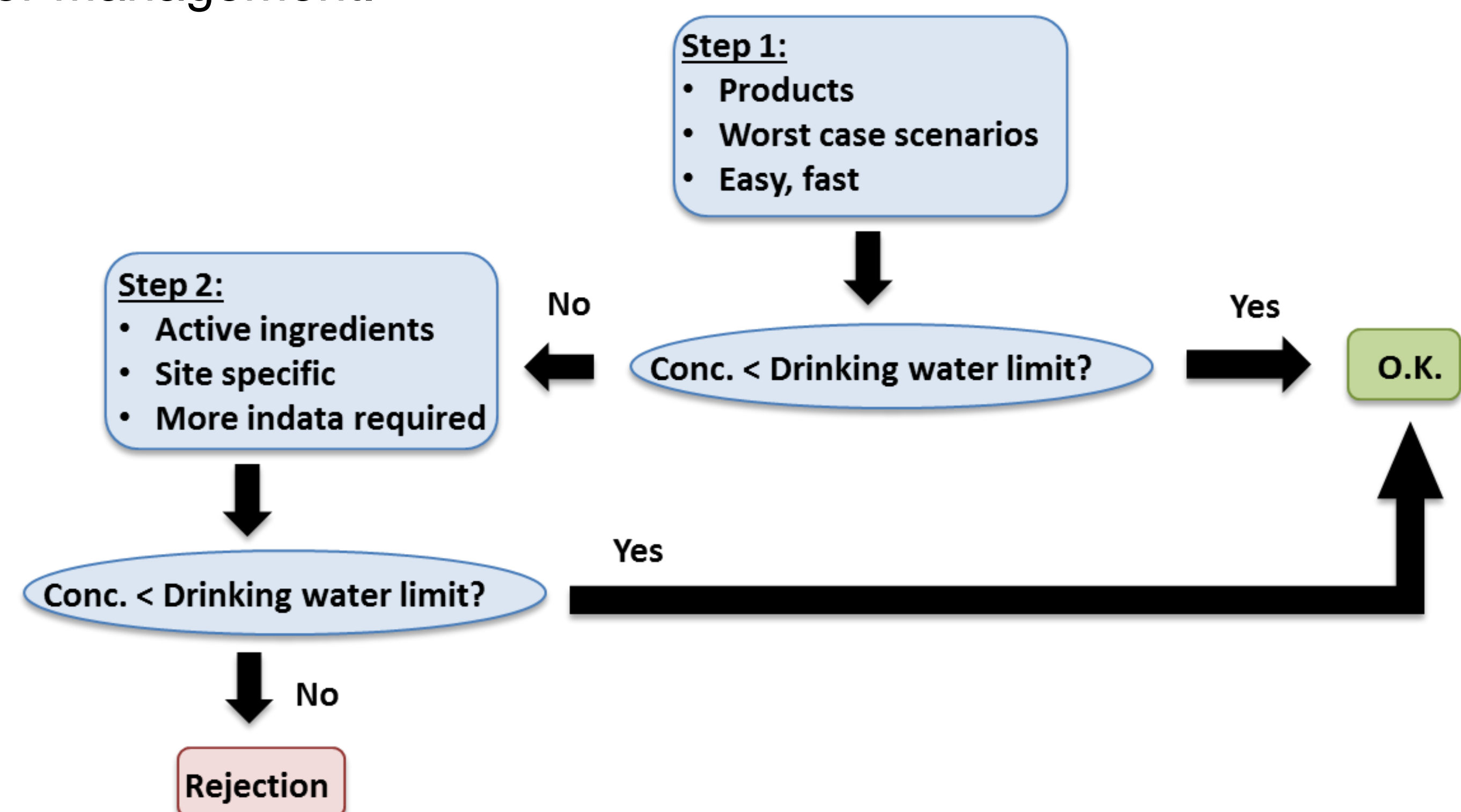


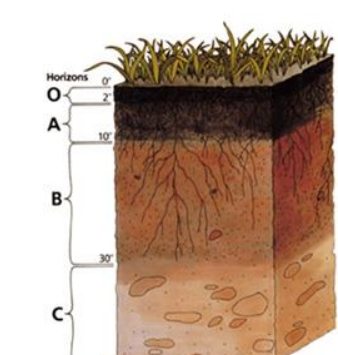
Figure 2: MACRO-DB is a tool in two steps for decisions on pesticide use in water protection areas in Sweden.

Step 1: Web application. Very worst case. Only information on product, dose and time for application is needed. www.slu.se/macro-db-steg1

Step 2: Program to download for free. www.slu.se/macro-db

Site specific information is needed on:

- texture in topsoil and subsoil and organic content
- the underlying material
- tile-drains or edge of the field ditches
- crop
- active ingredient, dose and time for application



Results are given as a simulated concentration of the pesticide in the water:

- at 2 m soil depth, which will reach the groundwater
- in the water leaving the drainage system, which will reach the surface water.

It is possible to take account for:

- dilution from non-arable land in the catchment area
- if the pesticide is not applied every year due to crop rotation