Inverse modelling
Review of earlier discussions

Jülich, May 9, 2000

Outline

- Pesticide registration
- Interpretation field and lysimeter experiments
- Experience with inverse modelling
- Perspective

Registration of pesticides

Tiered approach

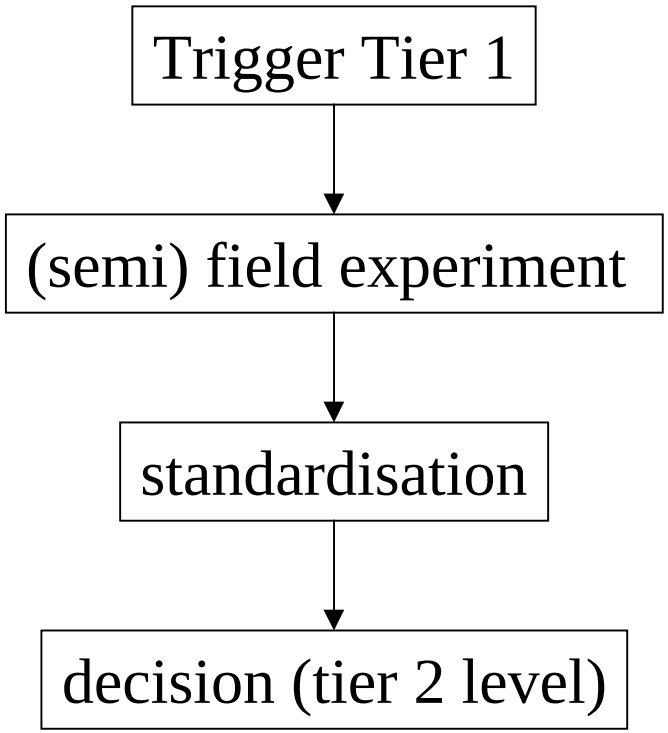
1 Laboratory experiments

2 Field or semi field experiments

3 Saturated zone experiments

(monitoring)

Tier 2


Trigger Tier 1
(semi) field experiment
standardisation
decision (tier 2 level)

Period 1990 - 1995

- more (semi) field experiments will be required because substances fail first tier
- guidelines for (semi) field experiments
- first development of evaluation methods
- initiation of standardisation / interpretation

Lysimeter guidelines

Germany: strict on input side (protocol)

- vulnerability of soil prescribed
- minimum amount of precipitation, otherwise irrigation

Netherlands: strict on output side

- > 300 mm precipitation excess
- parallel experiments sorption and transformation
- interpretation in view of standard scenario

Standardisation (1996)

$C_i = (M_e/C_e) * C_s$ or $C_i = (C_s/C_e) * M_e$

Problems:

- C_e zero
- M_e zero

So at least parallel experiments required

(a lot of suggestions, but no funding until 1999: review decision tree leaching)

Experience

- Parallel experiments almost always lacking
- many ad hoc decisions and variability depending on expert
- many uncertainty on application of formula
  - irregular leaching pattern
  - experiment ‘not triggered’
- result accepted as reported when conditions more vulnerable than standard scenario

Conclusions from evaluations

- Evaluation protocol necessary (standardisation of experts)
- Further discussion on evaluation
- Interpretation method required for ‘old’ experiments
- Dissemination of problems and possible solutions

Field versus lab

- In the registration procedure field derived parameters have more weight
- Beulke (1999): lab experiments tend to over-estimate persistence in the field. An adequate method to compare lab and field studies is required. Inverse modelling has a potential, but should be investigated further.

Inverse modelling

- High quality data set required (large data set on soil, environmental conditions as well as substance)
- Calibrate water movement (tracer) [inverse modelling]
- Calibrate substance parameters [inverse modelling, restricted to most sensitive parameters]

Inverse modelling requirements

- Adequate (leaching) model
- Shell model (PEST, SUSE, ???) for running the model and estimating selected parameters
- Agreement on parameters that are included in the optimisation procedure

Inverse modelling experience on a dataset

- Full data set was lacking
- Simulation with lab (literature) data generally failed
- Inverse modelling improved match between model results and experimental data, but in some cases the fit was not very good
- Variability in parameters decreased

Inverse modelling experience on a data set

- Data set was not very diverse
- Expert user required
- Potential of inverse modelling demonstrated
- Further investigation necessary

General conclusions

- High quality data set required, with parallel experiments on same soil (even if inverse modelling is used)
- Adequate model required
- Opinions: doubtful - promising
- Whenever possible: independent data set for ‘ validation’
- Further investigation warranted