



**BASF** Group



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# COMPARISON OF LABORATORY AND SEMI-FIELD TESTS FOR THE ESTIMATION OF LEACHING RATES FROM TREATED WOOD – PART 1: ABOVE GROUND

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# Background

BPD: PEC/PNEC ratio is an important criterion

leaching rate etc. → PEC value

tox / ecotox data → PNEC value

What is the relationship between leaching rates based on laboratory methods vs. semi-field methods according to BPD?

- The days of the laboratory test shall be regarded as equivalent to “real days” and..
- Data from these short time period may be extrapolated for longer exposure times based on a polynomial fitting procedure of second order.





# Principle of the research:

Actives involved:

Boric acid (4% or 5%)

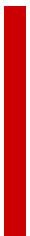
Copper (8% or 10%)

Three types of testing:

Semi-field – Vertical (DTI)

Semi-field – Horizontal (WOLMAN)

Laboratory – CEN TR 15519





## Semi-field test 1 – vertical exposure

- Exposure start : November 2002
  - Duration of exposure 7 years  
(last data processed 12/2009)
- Three replicate racks NT BUILD 509 – 7 panels  $0.76 \times 0.1 \times 0.025 \text{ m}^3$
- Leachates collected after each major rain event
- Bulked samples analyzed for content of Cu and B a total of 19 times

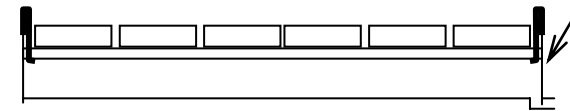


*Example of type of raw data which is feasible to convert to double log*



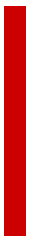
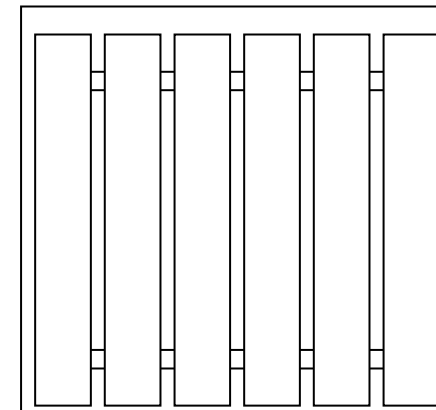
## Semi-field test 2 - horizontal exposure

- Exposure start : November 2002
  - Duration of exposure 5 years (last data processed 11/2007)
- One replicate rack – 6 panels  
 $1.080 \times 0.14 \times 0.038 \text{ m}^3$
- Leachates collected after each major rain event
- Bulk samples analyzed for content of Cu and B



container wall

6 SYP decking boards





## Laboratory leaching study

According to the CEN TR 15119-1 guideline

Test specimens with a size of 150 mm x 50 mm x 10 mm were prepared from sapwood of *Pinus sylvestris*.

The specimens were vacuum pressure treated with a wood preservative formulation containing 10 % Cu and 5 % Boric acid.

Leaching procedure:

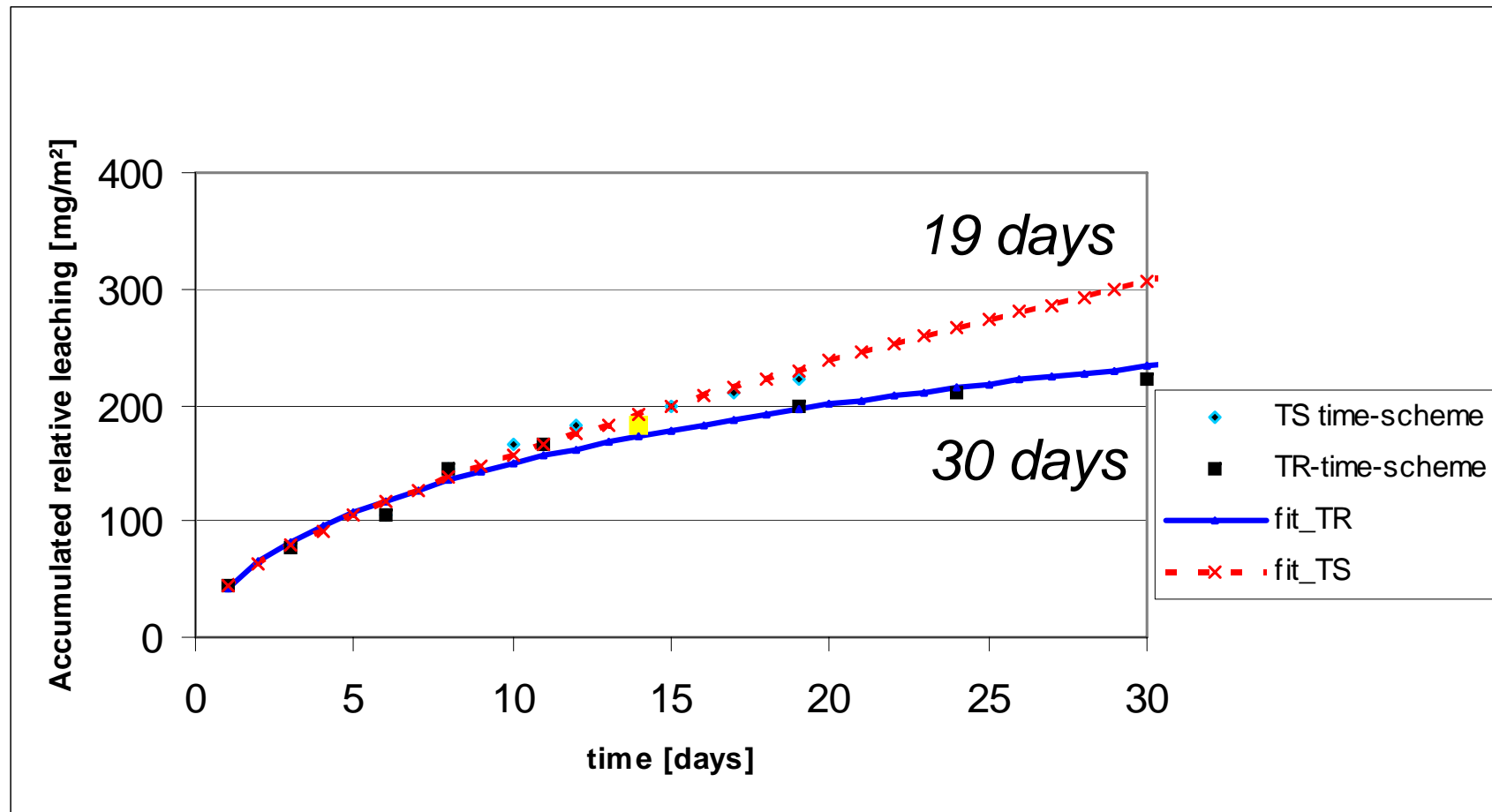
Dipped for 3 x 1 min.

Seven dipping events after 1, 4, 8, 11, 15, 18 and 22 days.



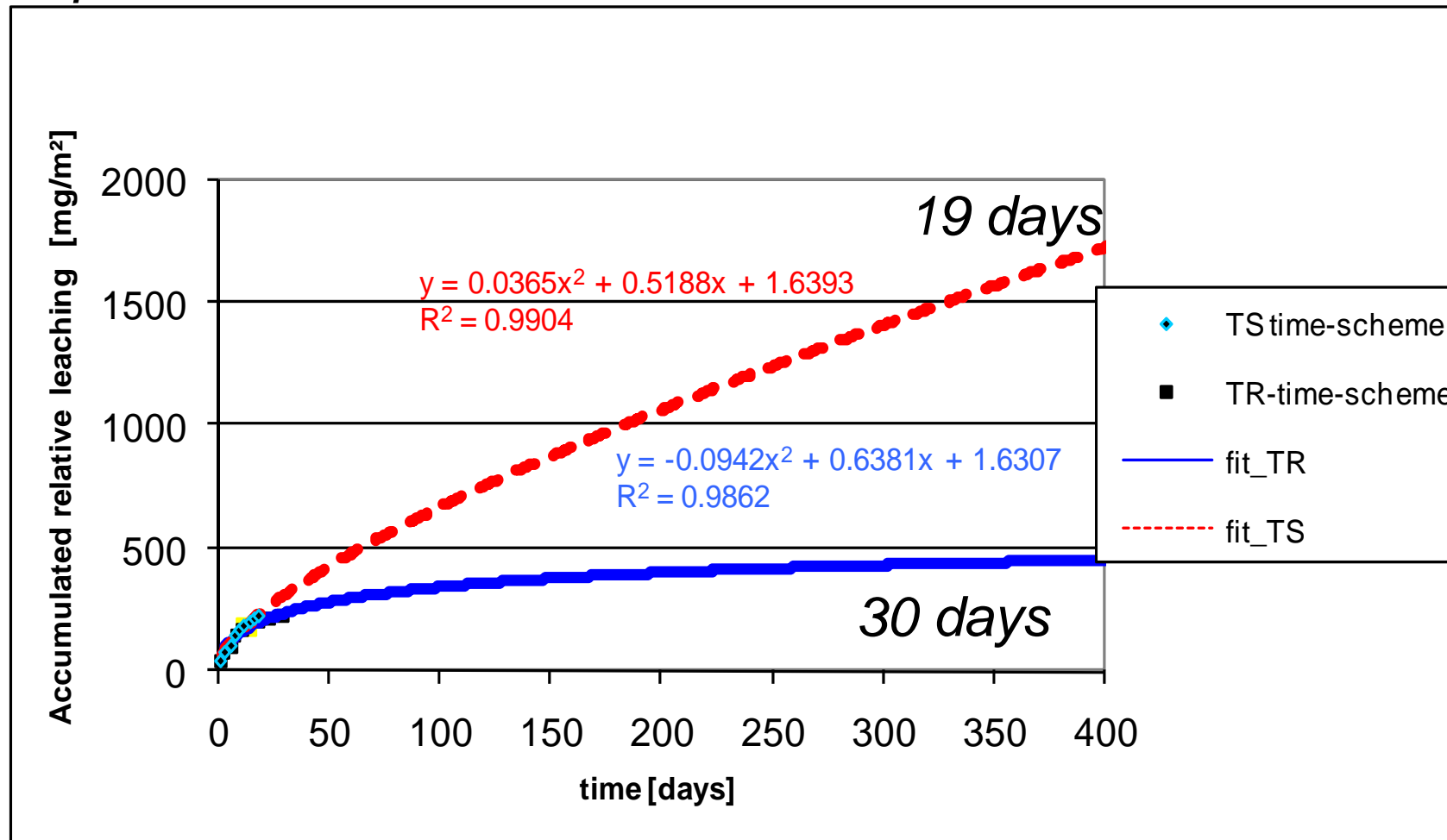


*Laboratory leaching of active A from treated wood according to different time schemes (9 dipping events in 19 or 30 days)*

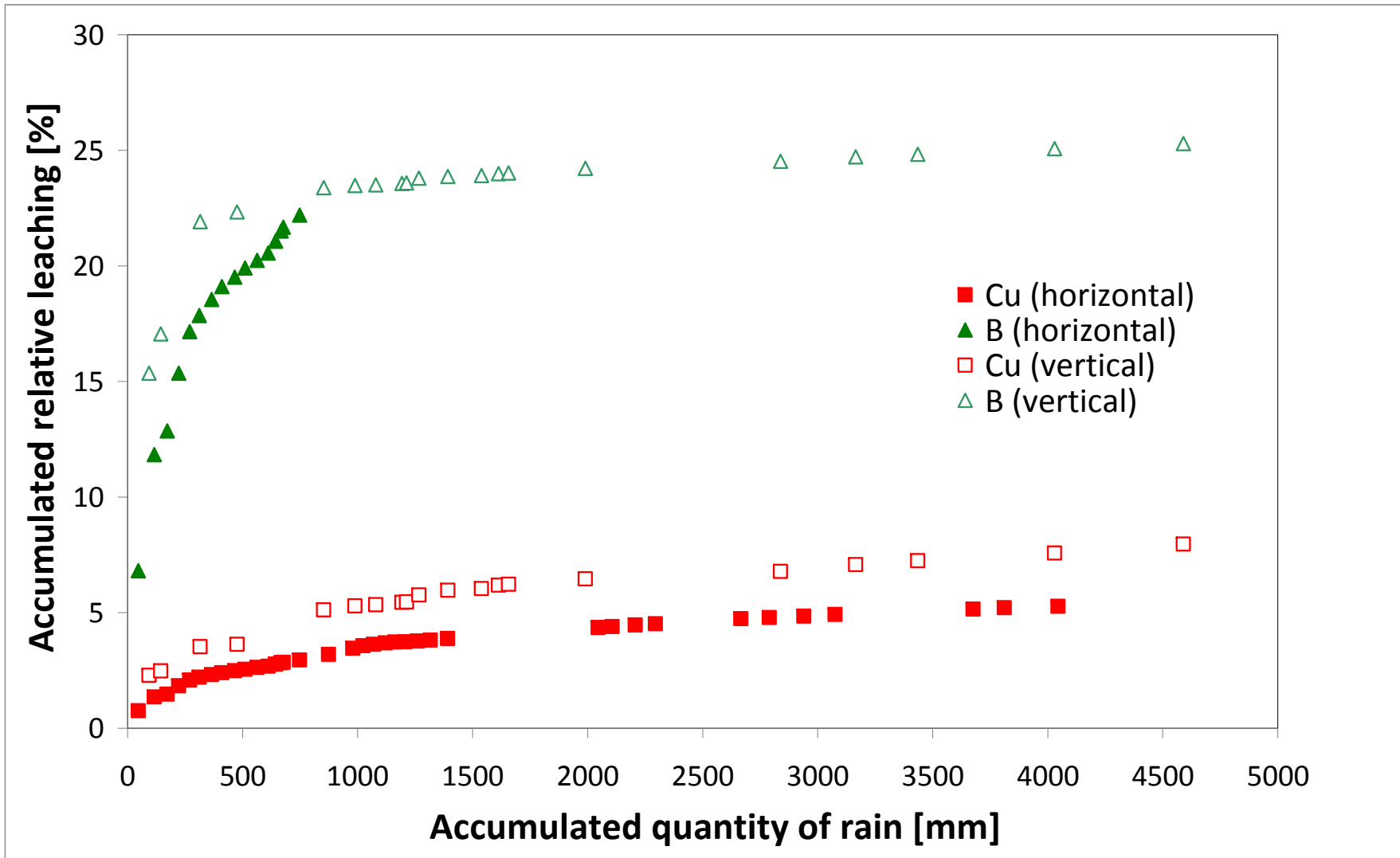




Polynomial regression employed on two sets of lab. data *and extrapolating to one year of exposure*



# Semi-field

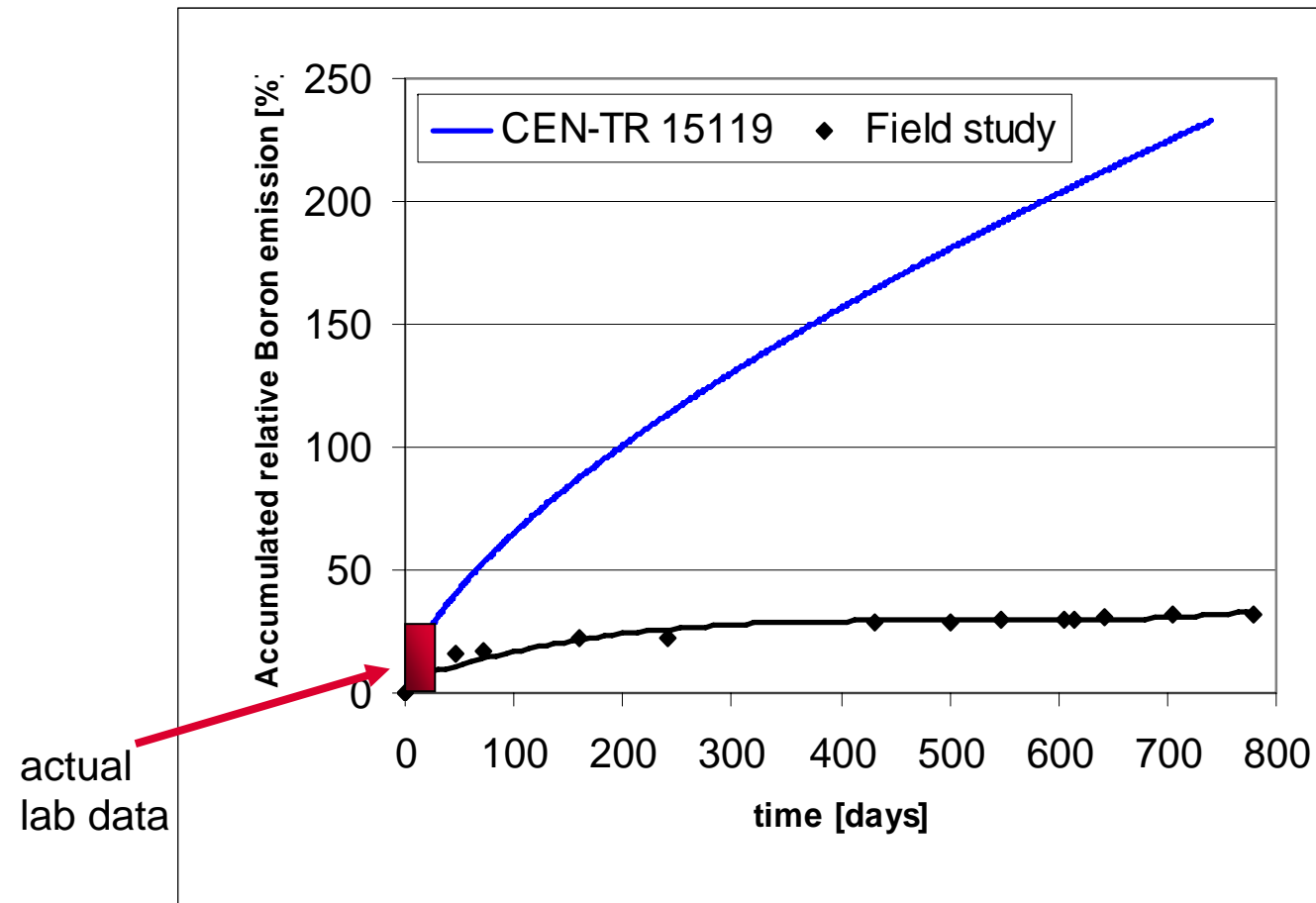


Note: Boron analysis in the semi-field test 2 was stopped after approx. 1 year.



# Semi-field vs. lab

## b) Boron – 2 years



# Comparison – semi-field test vs. lab data



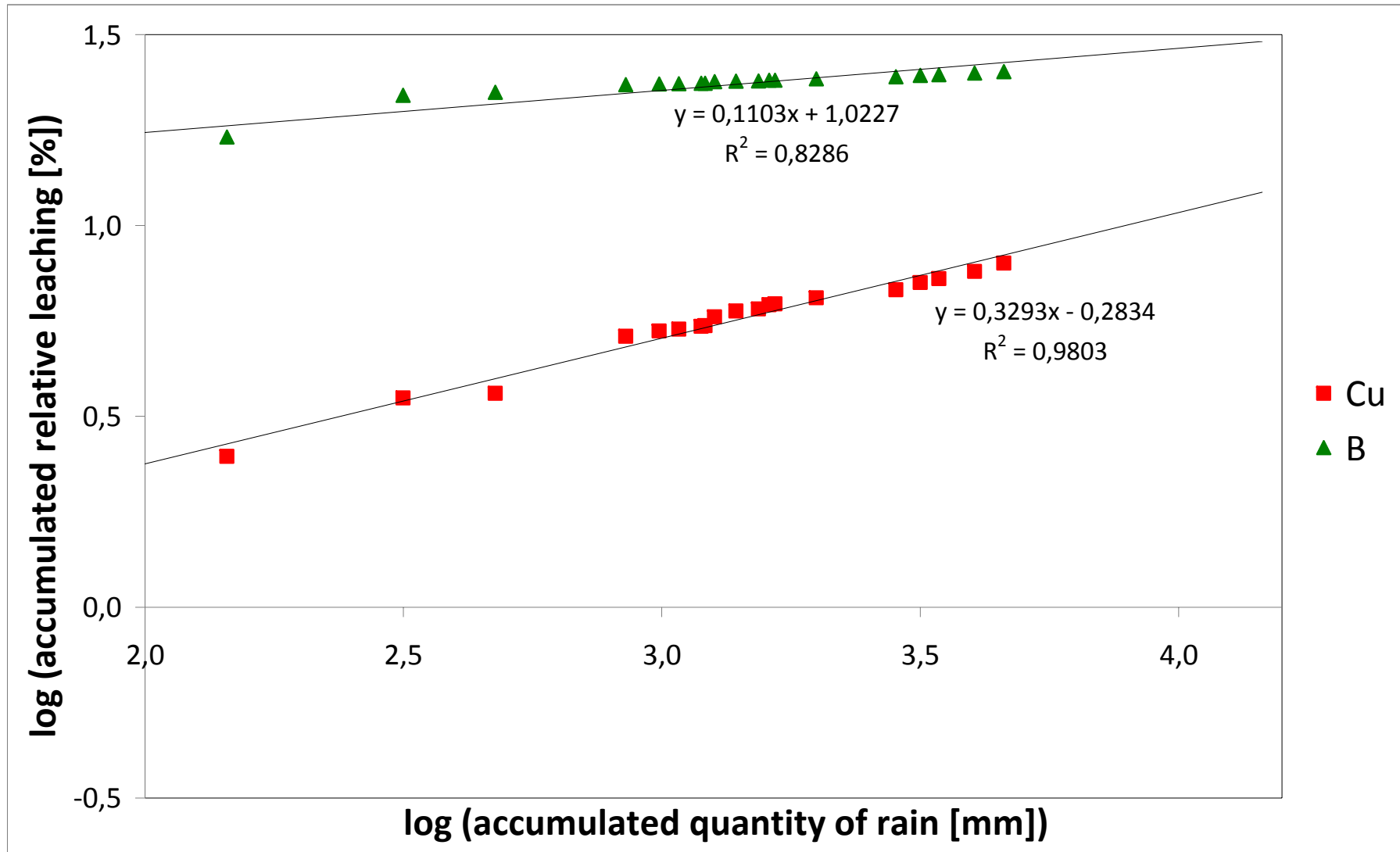
	<b>Rel. Leaching rate Copper (after 22 days)</b>	<b>Rel. Leaching rate Copper (after 2 years)</b>	<b>Rel. Leaching rate Boron (after 22 days)</b>	<b>Rel. Leaching rate Boron (after 2 years)</b>
<b>CEN TR 15119</b>	<b>4.3 %</b>	<b>15.1 %</b>	<b>25.7 %</b>	<b>230 %</b>
<b>Semi-field study I</b>	<b>1.0 %</b>	<b>6.0 %</b>	<b>7.2 %</b>	<b>23.9 %</b>
<b>Adjustment factor laboratory / semi field study</b>	<b>0.23</b>	<b>0.40</b>	<b>0.28</b>	<b>0.10</b>

- Lab data largely overestimate leaching rates of both actives for short and medium term

Prediction of 20 years leaching ( $10^{4.16}$  mm rainfall) using double logarithm function. Data from 93 mm to 4590 mm accumulated rainfall for the vertical set-up



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# Prediction of 20 years leaching

(% relative to initial retention)



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Derived functions extrapolated to 20 years (14400= $10^{4.16}$   
mm rainfall)

<b>20 years leaching</b>	<b>B (%)</b>	<b>Cu (%)</b>
Double log (using all data)	30	12
Double log (data > 1 yr)	27	11
Linear (data > 1 yr)	30	15





# Conclusions

- The CEN TR 15119 (3 x 1 min dipping scheme) will overestimate the realistic emission of active ingredients (Cu and B) in UC 3 as function of time.
- Adjustment factors for Cu and B are in the range of 0.1 and 0.4 during the first two years of service time.
- Extrapolation of lab studies to a time period of several years should be considered carefully and will overestimate the exposure drastically (e.g. boron leaching > 100 % after 200 days of exposure).
- Long term leaching can be predicted using both double logarithmic and linear functions on field leaching data when excluding data. The double logarithmic function seems to predict a somewhat lower long term leaching compared to simple linear regression

