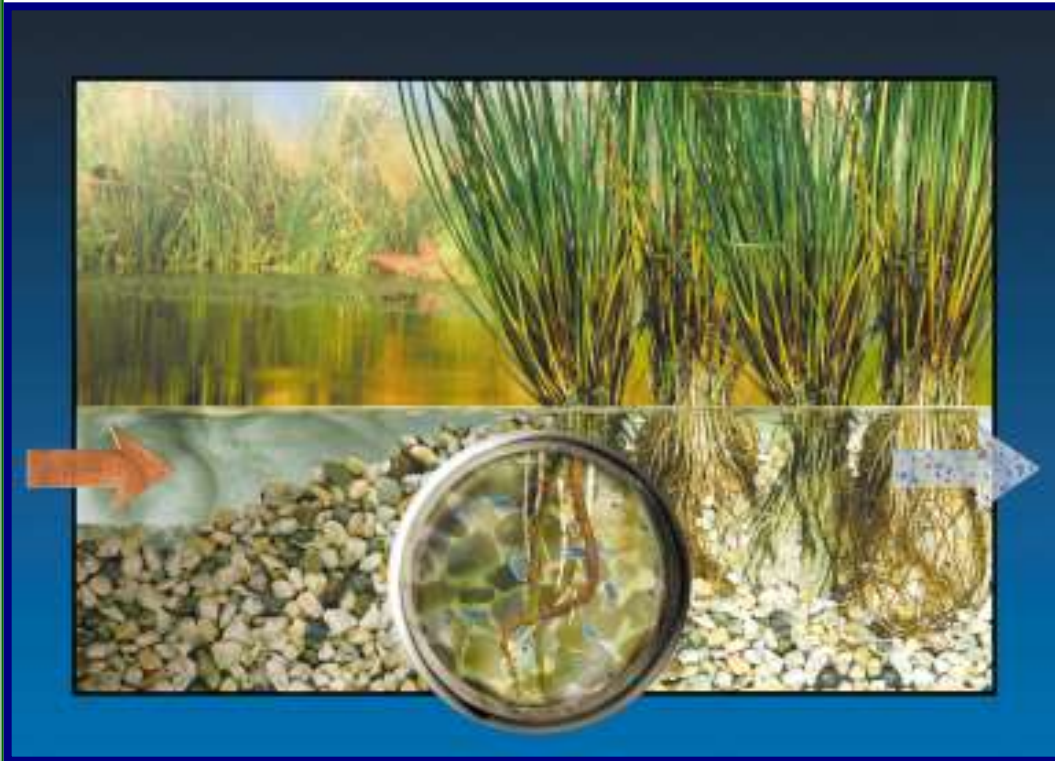


Baeder-Bederski, O.; Kusch, P.; Müller, R. A.

Reducing Faecal Germs in Municipal Waste Water Using Planted Soil Filters



Project partners

- ▶ UFZ-Umweltforschungszentrum Leipzig-Halle GmbH
- ▶ Martin-Luther-Universität Halle-Wittenberg
- ▶ Umweltschutz Nord GmbH & Co.
- ▶ Ökotec GmbH

Duration:

Nov. 2000 - Nov. 2003



SNP - CONACYT

Centro Nacional de Ciencia e Innovación

M E X I C O



Waste water for irrigation: Standards

Guideline/Standard	Tolerance limit Faecal coliforms/100 mL
WHO (1996) Irrigation water	Cat. A (raw veg.): < 1000 Cat. B (cereal crops): < no standard
DIN standard 19650 (1999) Irrigation water	E. coli: Class 2 (raw veg.) < 200 Class 3 (others) < 2000
Norma Oficial Mexicana NOM-003-ECOL-1997 (1997) Reuse of treated waste water in the public domain	permanent exposure: < 240 casual exposure: < 1000

Comparison of different technologies

<i>Source</i>	Faecal coliforms per 100 mL	Germ reduction Lg-stages
Municipal raw waste water	10^6 - 10^8	
Effluent disinfection	< 200	6-8
Effluent planted soil filter	10^3 - 10^6	2-3
Effluent activated sludge unit	10^4 - 10^6	2
Effluent sewage pond	10^5 - 10^7	1

- Effluent quality not always corresponds to the recommended microbiological guideline for treated wastewater for crop irrigation
- No basic approach for dimensioning the germ reduction process in planted soil filters



Experimental Sites



**Full scale plant
Belzig
Ökotec GmbH**

- Site: Small town Belzig, Federal state Brandenburg
- Waste water: Domestic, from a housing estate with conference centre
- Design: Two serial vertical beds with willows and recirculation (300 p.e.)
- Plant age: 10 years



Experimental Sites



Pilot plant
Xochitla-Park
Umweltschutz Nord GmbH&Co KG

- Site: Park of the ,Fundación Xochitla A.C.‘ , Federal state Mexico
- Waste water: domestic, from restaurants and sanitary facilities (36 p.e.)
- Design: Container plant with 6 vertical-and, 6 horizontal beds
- Plant age: 1 year



Experimental Sites



Pilot plant
Langenreichenbach
Center for Environmental Research
Leipzig-Halle GmbH

Site: Village Langenreichenbach, Saxonia

Waste water: Domestic, from an influent of a conventional sewage plant (60 p.e.)

Design: 7 vertical-, 6 horizontal beds and 2 ponds

Plant age: 2 years



Pilot Plant Langenreichenbach/Xochitla

Legend



Planted system



Sewage pond

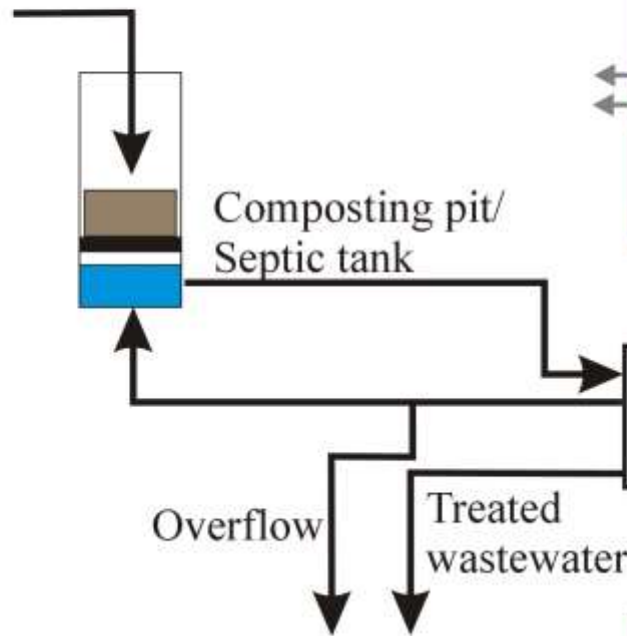


Soil filter
Substrate: expanded clay/sand

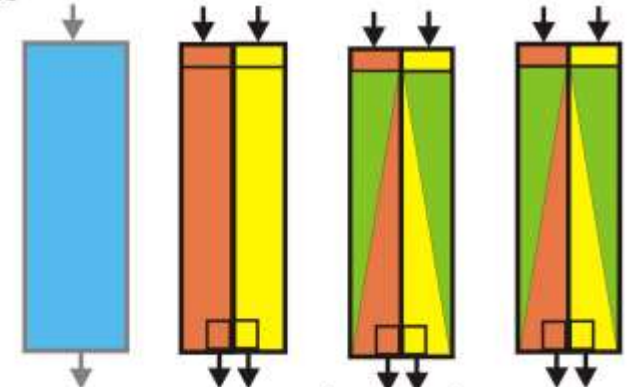
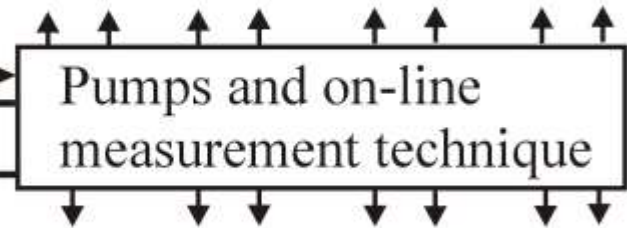
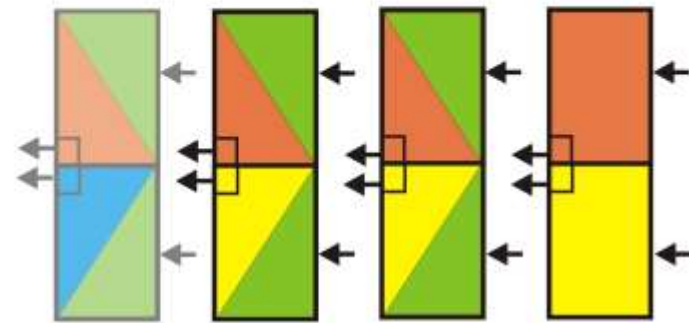


Soil filter
Substrate: sand

Wastewater inflow



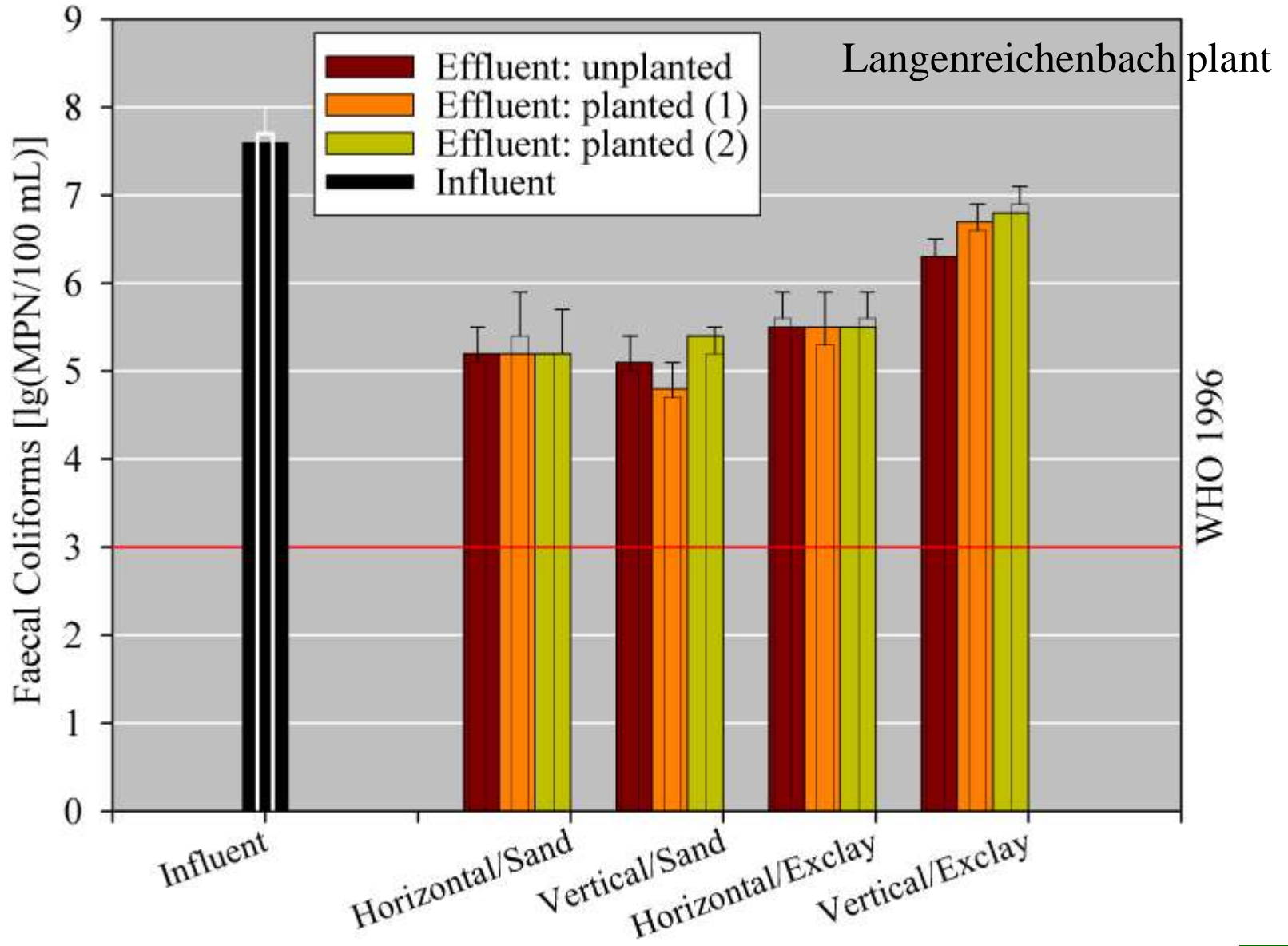
Vertical systems



Horizontal systems

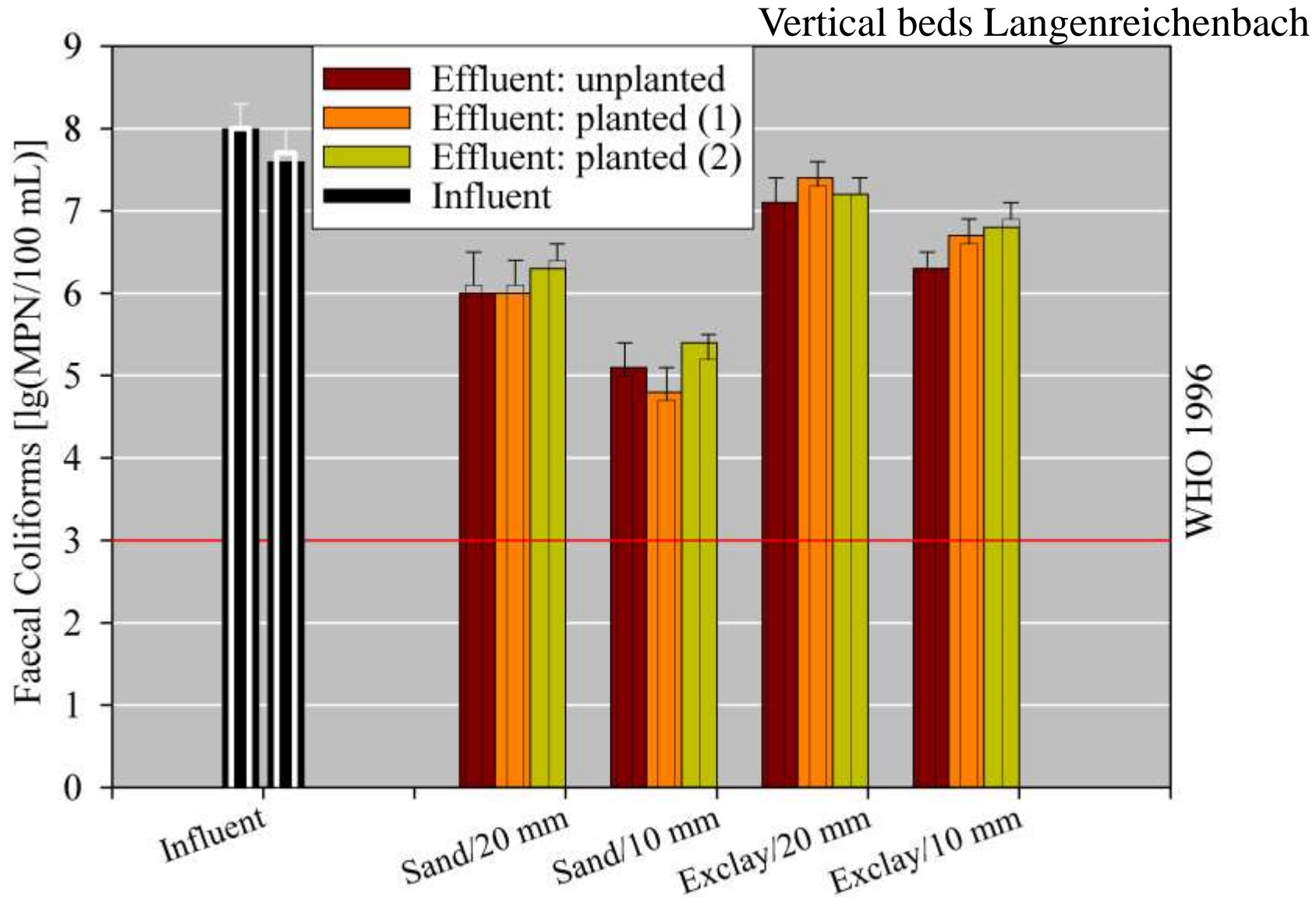


Coliform reduction: Horizontal vs. vertical systems





Influence of operation conditions



Summary: Influences on the germ reduction

Temperature

- Moderate climate: 2,5 lg-stages
- Subtropical climate : max. 4 lg-stages

Design

- Germany: Horizontal and vertical systems reach the same germ reduction.
- Mexico: Vertical systems seems to be better.
- Coupled systems shows the best germ reduction.

Summary: Influences on the germ reduction

Substrates

- Large volume of pore space unfavourable
- Adsorption effects probably, but no differentiation between substrates probably.

Plants

- No significant differentiation between planted/unplanted systems after 2 years of operation in Germany.
- In Mexico possible.

Hydraulics

- Small influence of the hydraulic load between 20 - 60 mm/d
- Short circuits or preferential flow (retention time)
- Frequency of loading (flow conditions)
- Recirculation



Acknowledgements

Xochitla

Technical direction:

Melanie Büschking ¹

Chemical exam., Technical assistens :

Frank Unger ¹

Langenreichenbach

Chemical exam. , Technical assistens:

Peter Mosig ²

Microbiological examinations:

Matthias Dürr ³, Susanne Stüber ³

Belzig

Technical direction:

Herwig Nachtschatt ⁴

Chemical exam. , Technical assistens:

Stefanie Wild ⁴

¹ Umweltschutz-Nord GmbH, Ganderkesee

² Center for Environmental Reserach , Leipzig

³ Martin Luther University Halle-Wittenberg, Institute of Hygiene, Halle

⁴ Ökotec GmbH, Belzig