Point sources and biofilters in the Netherlands

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Surface water contamination

- Non point sources
  - Subsurface drains
  - Runoff
  - Spray drift
- Point sources – on farm activities
  - Spillage during filling
  - Leakages of spray equipment
  - Poor control of left over of spray liquid
  - Internal and external contamination of sprayers

Surface waters

total 300 000 km: 7 × perimeter of earth

Environment and use of pesticides

- Government => aim
  - 95% reduction environmental pollution by pesticides in 2010 (reference year 1998)
- Legislation
  - Drift mitigation measures => 90% spray drift reduction (reference year 1998)
  - Restrictions for application of pesticides (label) => board for the authorisation of pesticides
- Mandatory sprayer inspections
- Recycling of empty containers
- Licensing of sprayer operators
- Mandatory equipment for filling and washing stations

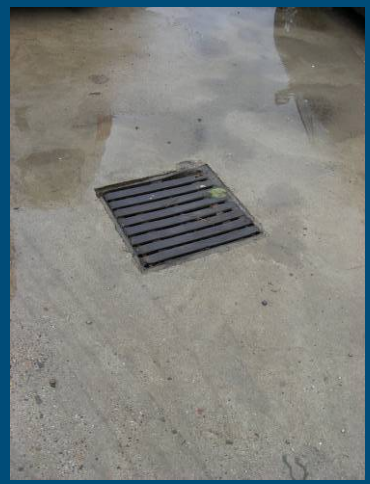
What about point sources???

- Emphasis on non point sources
  - authorisation of pesticides
  - drift reduction
- Risk assessment of point sources
  - Assessing sources → inquiries
  - Assessing transport routes → inquiries and modelling
  - Reducing farmyard spillages → promotion bioremediation
  - Creating awareness among growers and contractors

Inquiry point sources – fruit growing

- Filling of sprayers at the farm yard (100%)
  - 20 – 30 spray applications annually
  - 60 – 90 filling events annually (= occasions that could create point source pollution)
- Cleaning of sprayers
  - Internal cleaning including tank – 1 or 2 times per year.
  - Cleaning of pumps, hoses and nozzles is common practice at the end of spraying day – carried out in the orchard.
  - External cleaning – 78% of growers cleans more than once a year; mainly at the farm yard.
- Minority of the farm yards is equipped with storage facilities for waste water
- 500 – 1000 liters of waste water annually (filling and cleaning)

Fruit growing Filling and cleaning stations



Inquiry point sources Arable farming

- Potential risks of emissions to surface waters
  - Filling and mixing on farmyard → high risks when spills occur
  - Internal cleaning → low risks (waste water sprayed on the field)
  - External cleaning → high risks (mainly on farmyard)
  - Risks involved in today's farm practice
  - Codes of practice are not always followed
  - Farmers and contractors are not always familiar with codes of practice
- Water use
  - Per wash down 50 – 5000 L (most common 50 – 300 L)
  - Annually, farmers 50 – 6000 L (average 975 L)
  - Annually, contractors ± 11000 L

Residues in external washings

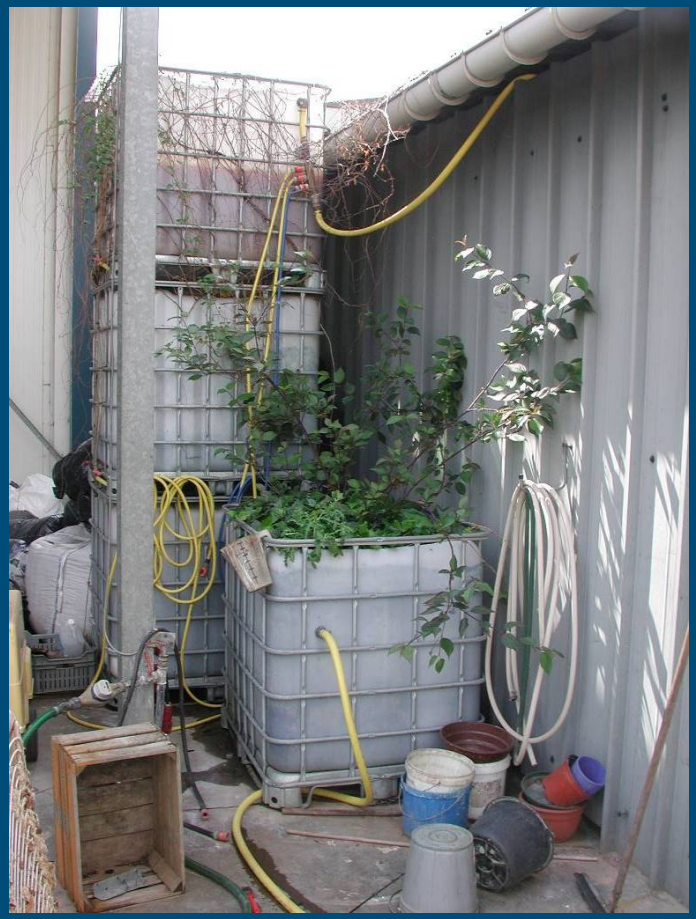
- Sampling of washings
  - Research 2007
  - 5 sprayers

Residues

- Sampling of washings
  - In theory, 0.1 to 0.5 % of a.s. on sprayer
  - 40 80% is washed down
  - 0.04 to 0.4% of a.s. in waste water (but, 2007 high rainfall prior to sampling)

- Washings consist of more than 300 times the maximum permissible concentration of Terbutylazin and Dicamba in surface waters

Biofilter fruit growing: Belgian system (Debaer & Jaeken)



Biofilter – arable farming I

- Design considerations
  - Annual hydraulic load ± 1000 mm = 1000 L/m^2
  - Depth biobed > 1 m
  - Lined biobed
  - Drainage pipe in sand layer, biomix covered with turf and seeded with grass
  - High ground water tables aboveground bed

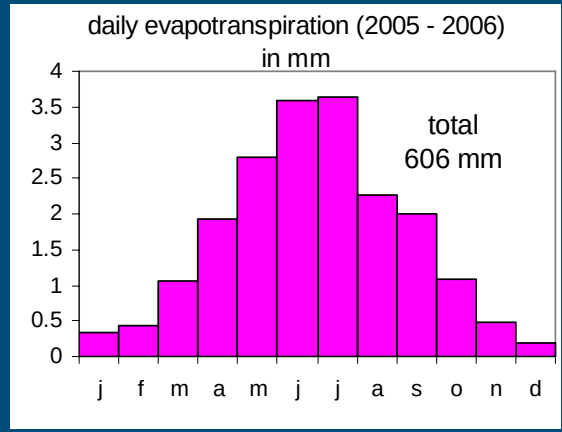
Biofilter – arable farming II

- How to increase performance?
  - No precipitation in filter
    - roof to exclude rainfall
  - No peak hydraulic loading
    - Combination with storage tank
    - Temperature dependent daily loading
  - Protection grass
    - Subsurface drip irrigation system

Biobed: In progress

Biobed research

- Pesticide mixture
  - Mixture of most commonly used pesticides
  - Known concentrations
  - Daily application rate = 2x mean monthly daily evapotranspiration rate



- Measurements
  - In– and effluent loading
  - In and effluent concentrations
  - Soil moisture content at different depths

gypsum blocks

Thank you for your attention

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