

Identification and qualification of point sources of surface water contamination in fruit growing

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Surface water contamination

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

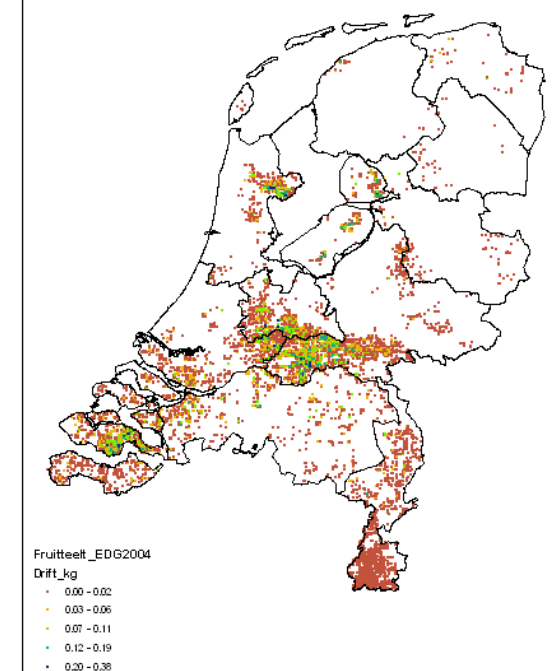
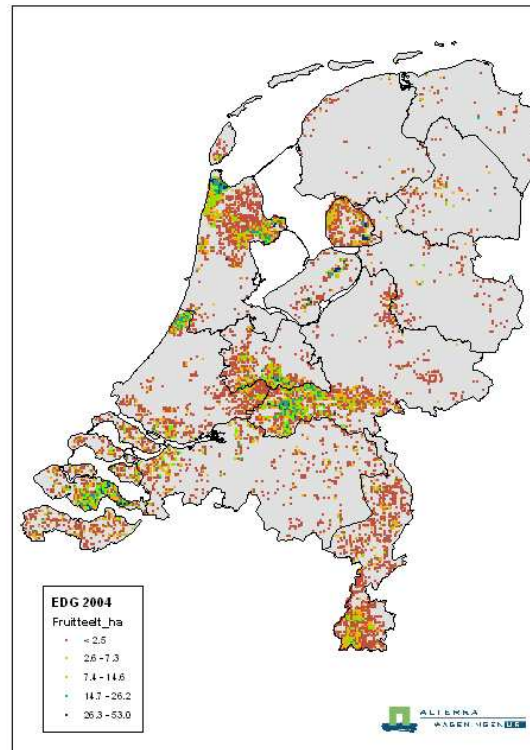
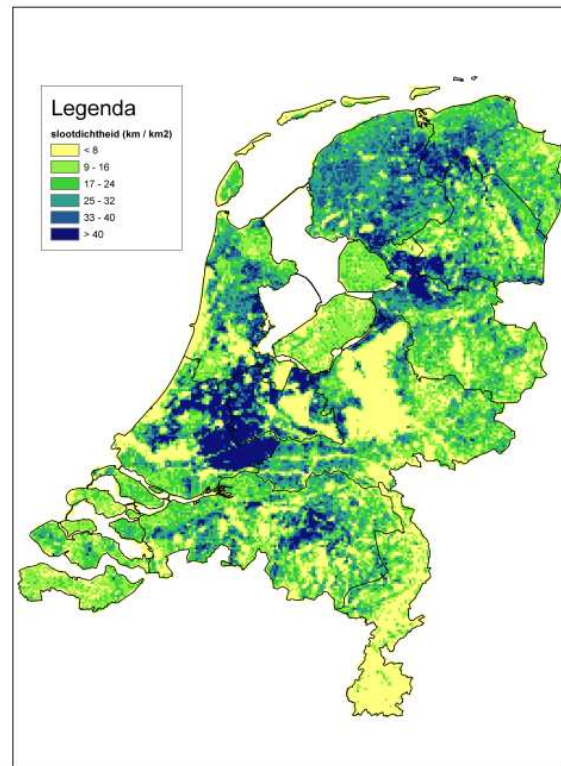


Environment and use of pesticides

- 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



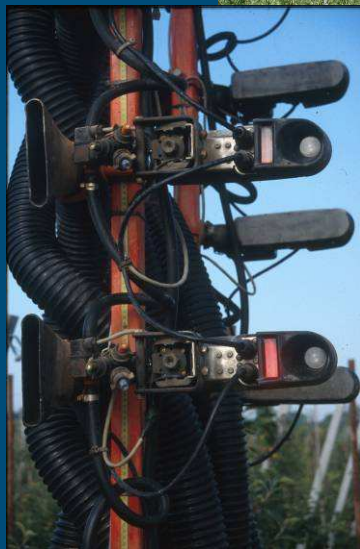
Ditches, fruit growing and drift in the Netherlands



Spray drift - situations



Drift reduction in fruit growing

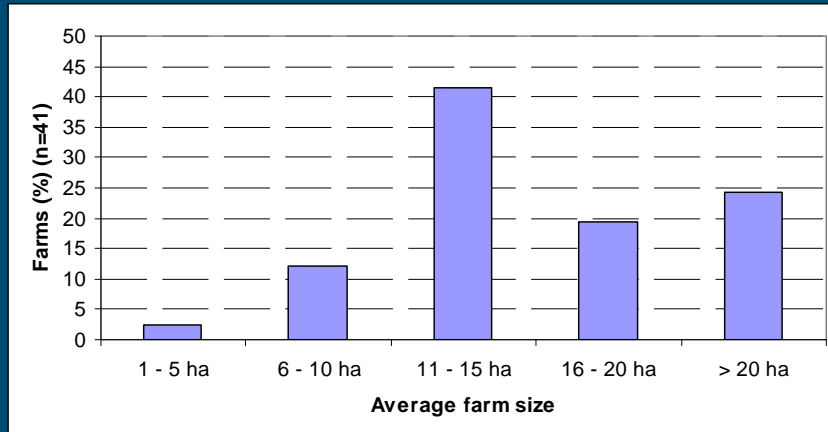


Point sources in fruit growing

- Measurements show less decrease of pesticide concentrations in surface water than expected from model based calculations
 - Implementation of spray drift reducing techniques is overestimated.
 - Impact of point sources is underestimated (model does not take point sources into account).
- Inquiry amongst 41 fruit growers (apples & pears) in four fruit growing areas
 - Filling and cleaning practices; handling of waste water *et cetera*



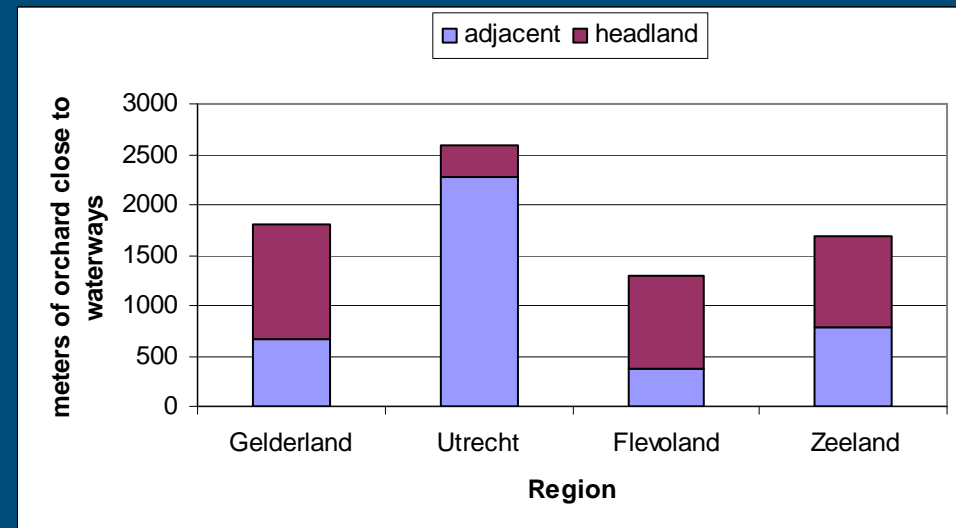
Farm sizes in inquiry



98% of fruit growers had at least 1 orchard bordering a watercourse.

Drift reducing measures:

- 100% windbreaks
- 78% drift reducing nozzles
- 2.5% tunnel sprayer



Filling and cleaning stations

- All fruit growers have their own spraying equipment; no contractors.
- All sprayers are filled at the farmyard
 - 80% of the filling and cleaning location consists of (semi-) impervious material.
 - 66% of the locations did not possess mandatory equipment; impervious floor for filling and cleaning with a collection unit.
 - 20% of the farmyards had surface water within 10 m distance.



Cleaning of sprayers

■ Internal cleaning

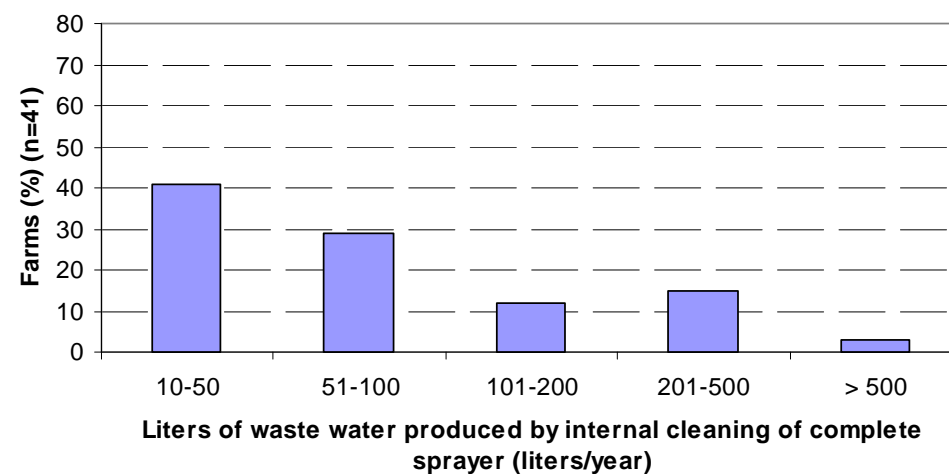
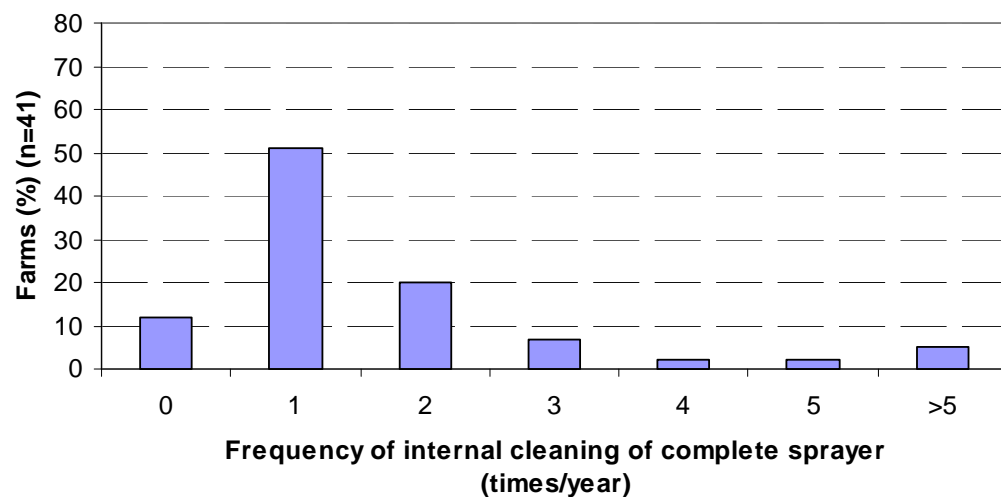
- Complete internal cleaning: 1-2 times per season.
- Cleaning of pumps, hoses and nozzles is common practice (95% of growers). Performed in the orchard.
- No discharge of spray remnants at the farmyard.

■ External cleaning

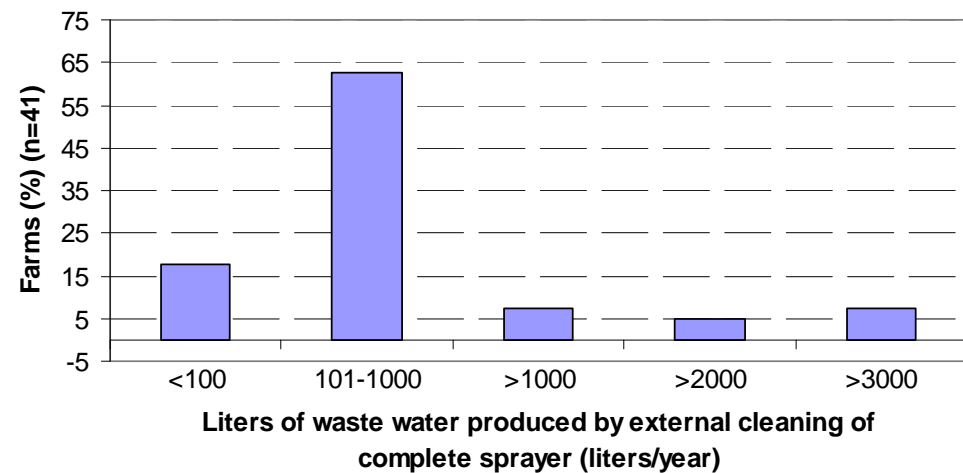
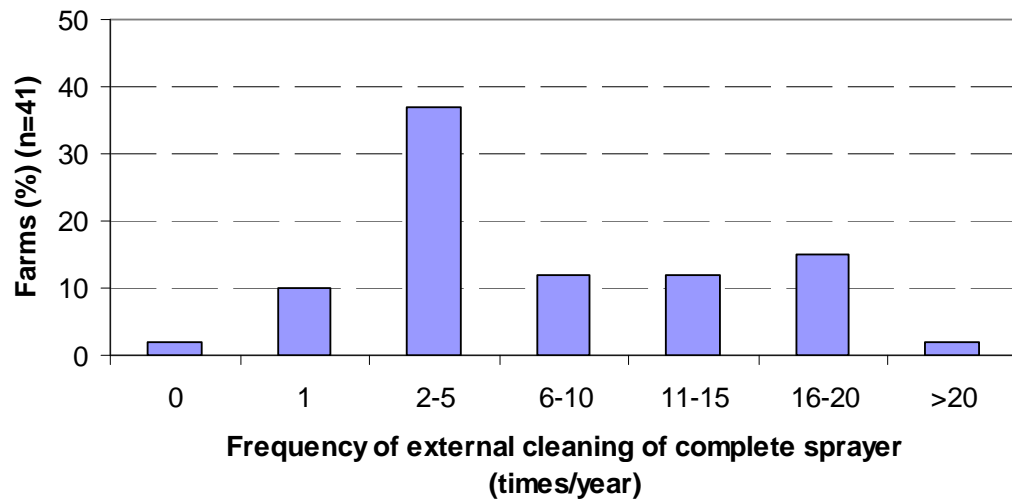
- Majority (78%) cleans the outside of the sprayer.
- Majority (70%) performs cleaning at the farmyard.
- Minority of farmyards (24%) is equipped with storage facilities for waste water.



Internal cleaning of sprayers



External cleaning of sprayers



Summary inquiry – 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)
 - Frequent transportation of filled (and contaminated) sprayer to orchards.
 - Necessity for inspection of sprayers to avoid leaking hoses and nozzles.
- Cleaning of sprayers
 - Internal cleaning including tank – 1 or 2 times per year.
 - Cleaning of pumps, hoses and nozzles is common practice at the 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)

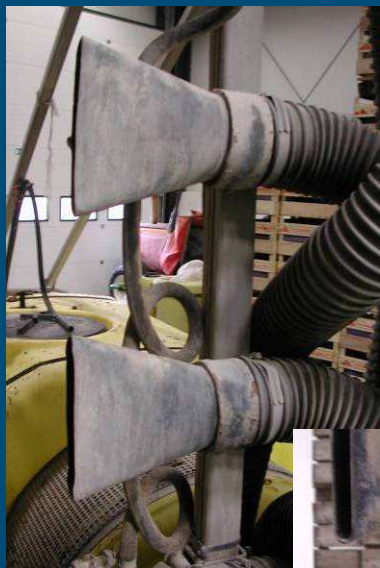


Filling and cleaning stations – fruit growing



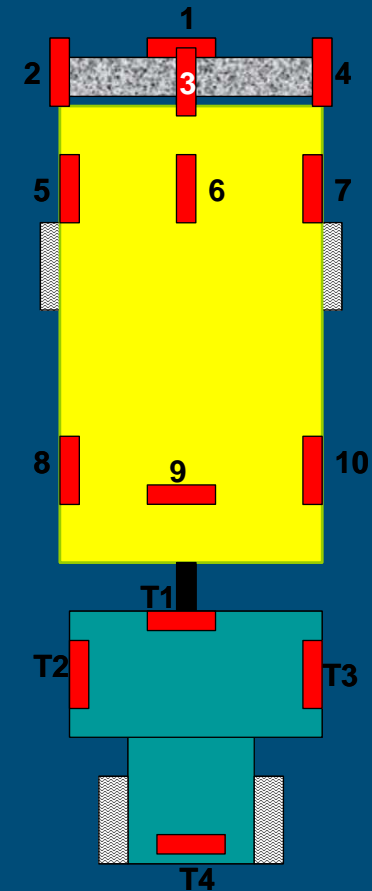
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Contamination and cleaning of sprayers



External cleaning of sprayers

- External cleaning is not carried out frequently.
- The quantity of the external residues on the sprayer is unknown.
- Efficiency of the cleaning is unknown.
- Further research is required to investigate sprayer contamination, the efficiency of cleaning and the environmental impacts of cleaning.



Cheap and simple methods for collecting wastes



Treatment - degradation pesticides in waste water



Bioremediation – Belgian system (Debaer & Jaeken)

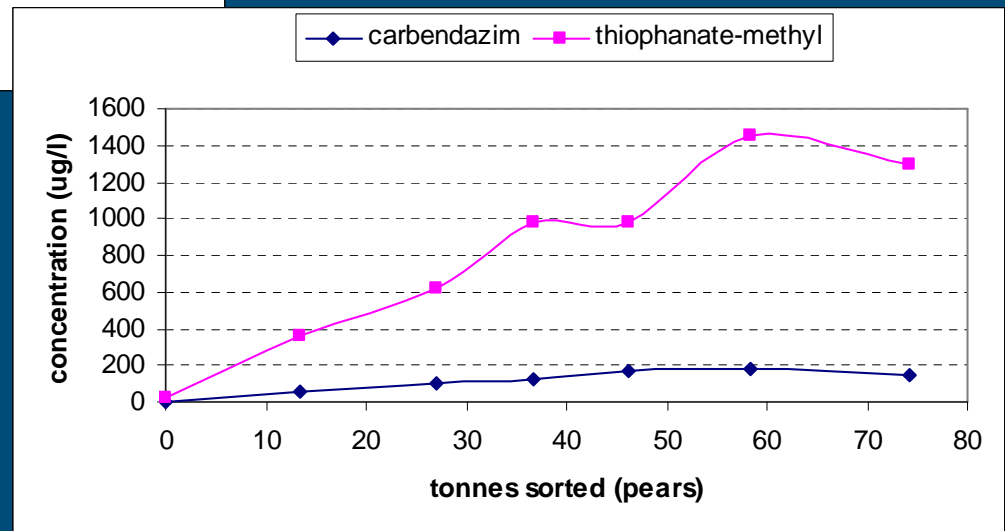
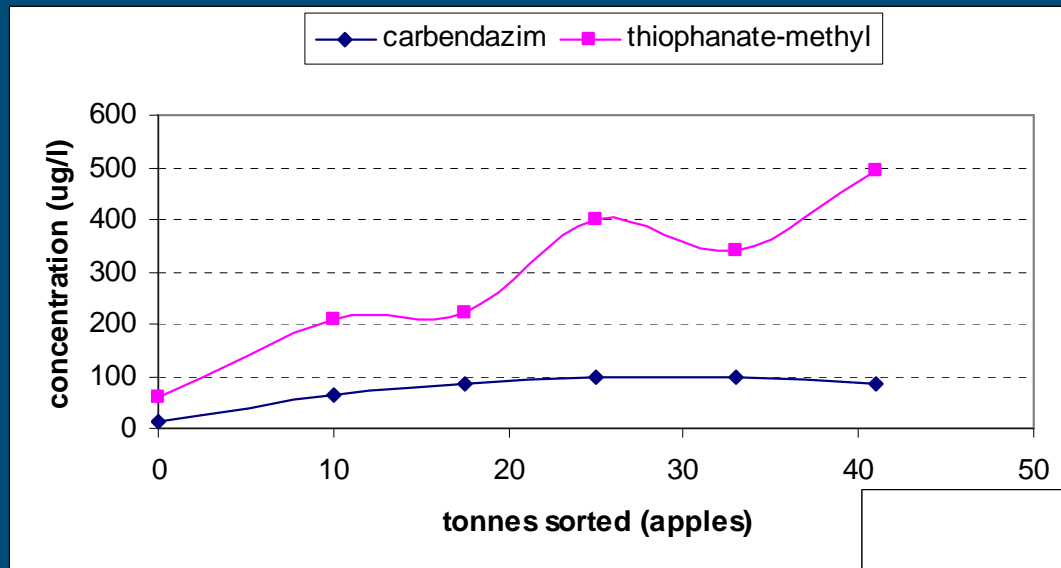


Grading and sorting of fruit



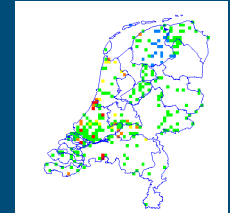
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Concentrations of pesticides in transporting water



Pesticides from grading and sorting

- 4000 liters discharged weekly
- 1400 µg/l thiophanate-methyl
- 5600000 µg thiophanate-methyl
- Ecotox value thiophanate-methyl: 0.5 µg/l
- Discharging contaminates 11200 m³ up to this ecotox value
- 53333 meters of standard ditch
- Discharge of waste water contaminated with pesticides is forbidden under Dutch law.
- Due to the lack of simple and cheap purification systems, it is common practice.



Purification systems



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Conclusions

- Significant numbers of fruit growers do not work according to legislation for filling and washing stations.
 - Economical considerations? => cheap and practical solutions.
 - Ignorance (bad behavior)?
- Campaigns to increase farmers' awareness should be intensified (e.g. in cooperation with TOPPS).
 - Careless handling of spraying equipment and material leads to point source contamination.
 - Why working on spray drift reduction, whilst ignoring point sources contamination?
- Risk assessments and measurements are necessary (=> worst case scenario's to identify relevance of different point source pathways).



Thank you for your attention

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