

Glyphosate and AMPA losses from no-tilled and autumn ploughed fields

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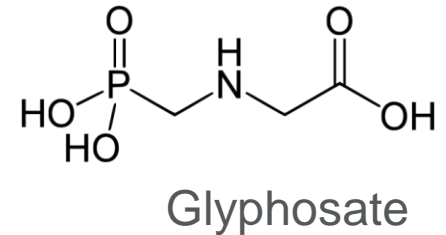
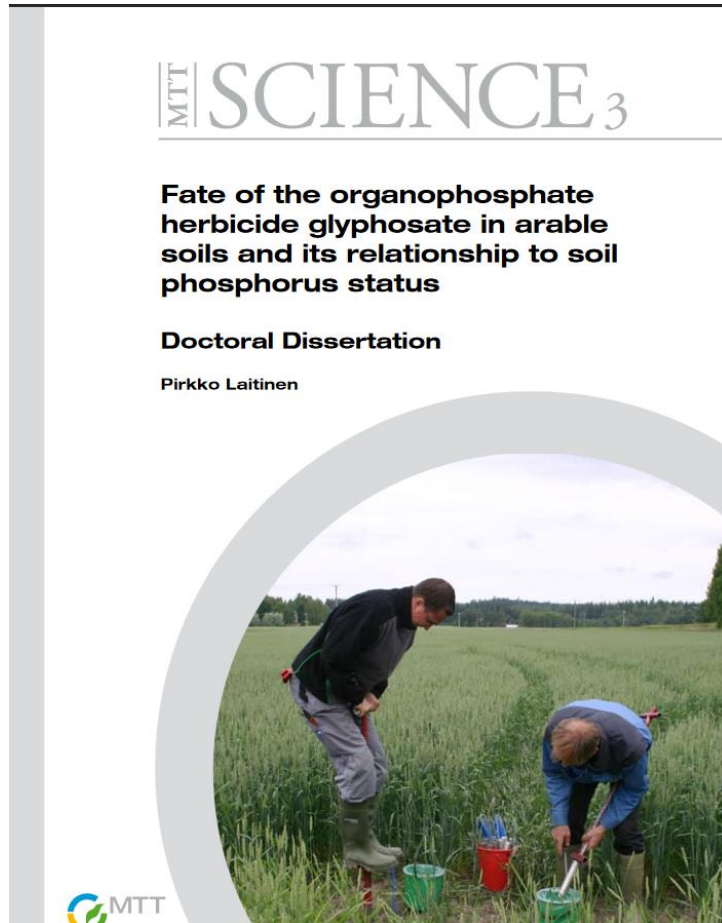


Photo: H. Jalli, Luke

1. Background



- Laitinen (2009) studied glyphosate and AMPA mostly in coarse soils
- Clay soils with direct drilling exist in southern and southwestern Finland
- Use of glyphosate is common in direct drilling
- Phosphorus is concentrated in surface soil layer in direct drilling.
- Glyphosate competes with phosphorus for the same sorption sites (Al and Fe oxide/hydroxides).

<http://www.mtt.fi/mtttiede/pdf/mtttiede3.pdf>

2. Experimental site and measurements of GlyFos (2011–2015)

Kotkanoja leaching field, Jokioinen



AP = Autumn ploughing
DD = Direct drilling

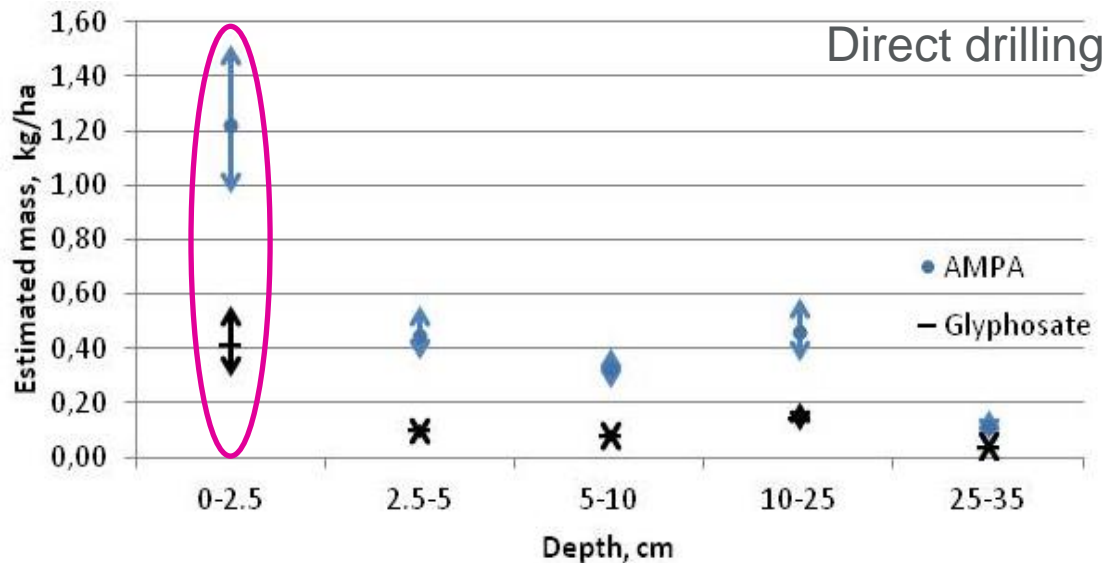
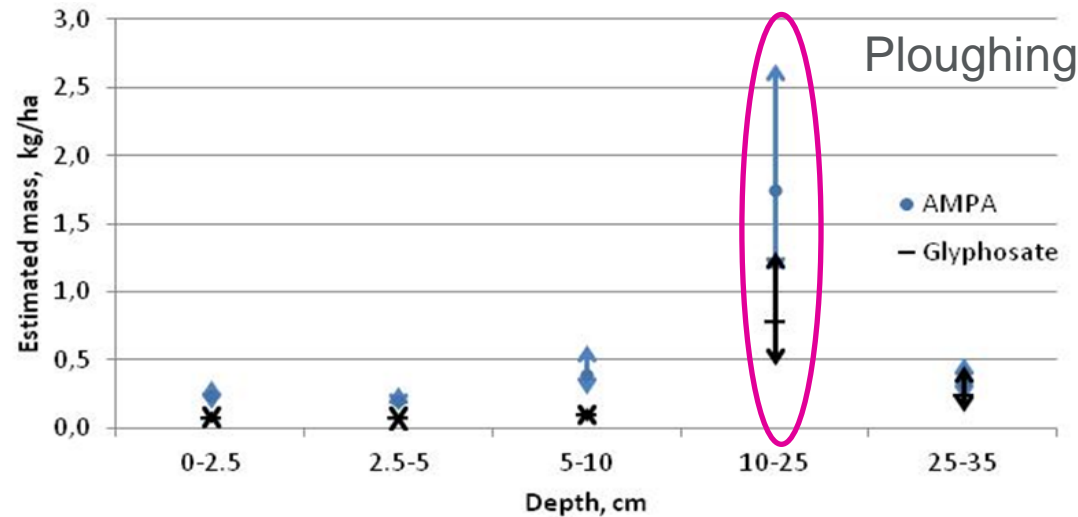
1. The behaviour of glyphosate and AMPA in clay soil
 - Concentrations and amounts of glyphosate and AMPA
 - Dissipation half life times (DT50)
2. To quantify glyphosate and AMPA losses as *dissolved* and *particulate form* in drainage flow and in surface runoff from clay soils under direct drilling (no-till) and autumn ploughing

3. Results from the Kotkanoja experimental field



Photo: J. Heikkinen, Luke

Glyphosate and AMPA in soil



Biggest amounts:

Ploughing: 10–25 cm

Direct drilling: surface soil layer, 0–2,5 cm

AMPA is presented as glyphosate equivalent (multiplied by 1.5226)

E. Petruneva, 2015. Comparison of glyphosate persistence in clay soil on no-tilled and autumn ploughed plots. University of Helsinki.

The field dissipation half life time of glyphosate

Kotkanoja experimental field (direct drilling)

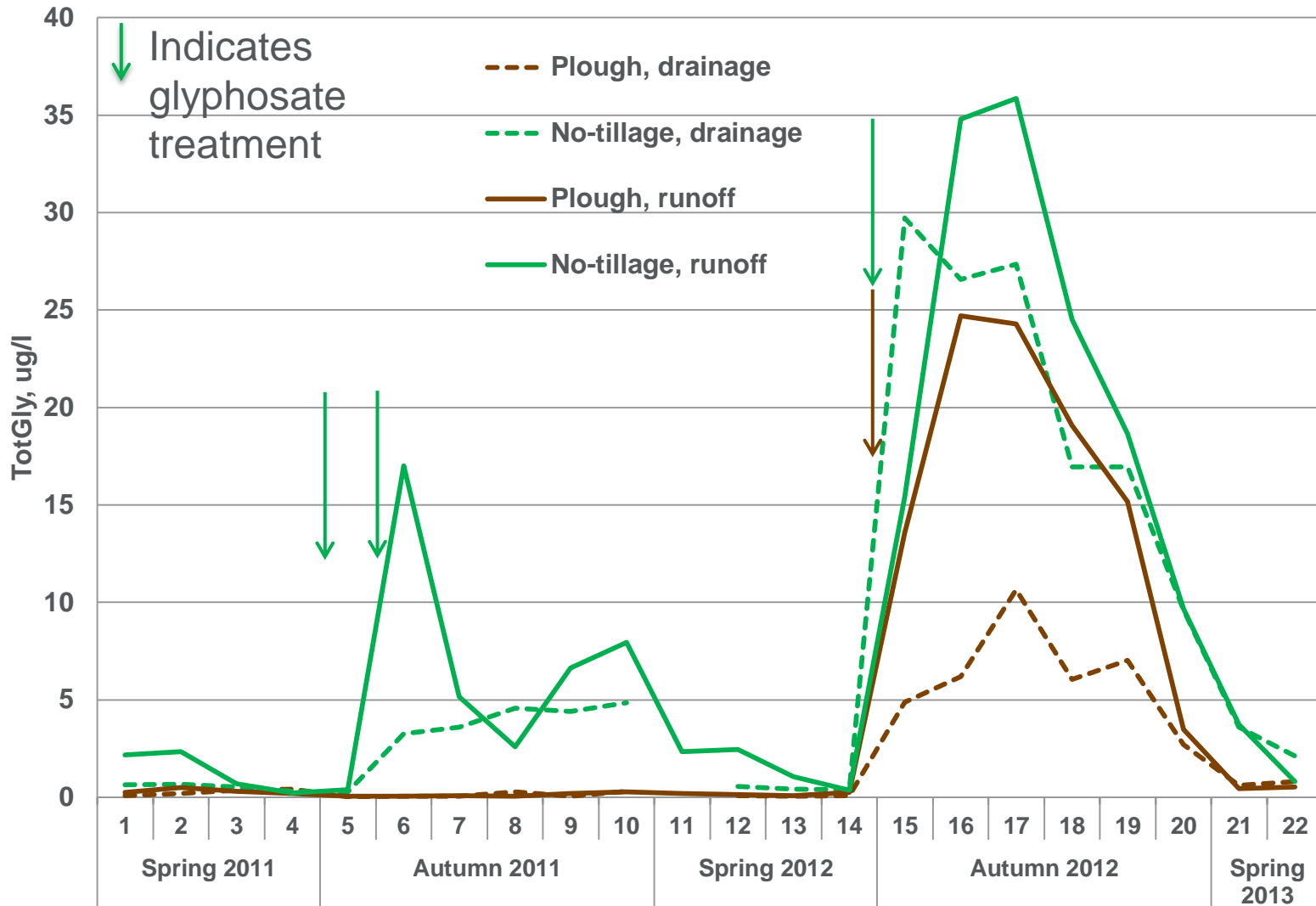
During winter time: 229–232 days (0–2.5 cm, 0–5 cm and 0–10 cm); 458 days (0–25 cm)

According to Laitinen et al. (2006) in Turenki (fine sand) and in Perniö (clay soil)

During winter time: 7–8 months or 210–250 days (0–28 cm),

During growing season: 8–55 days (0–3 cm) and 48–57 days (0–28 cm)

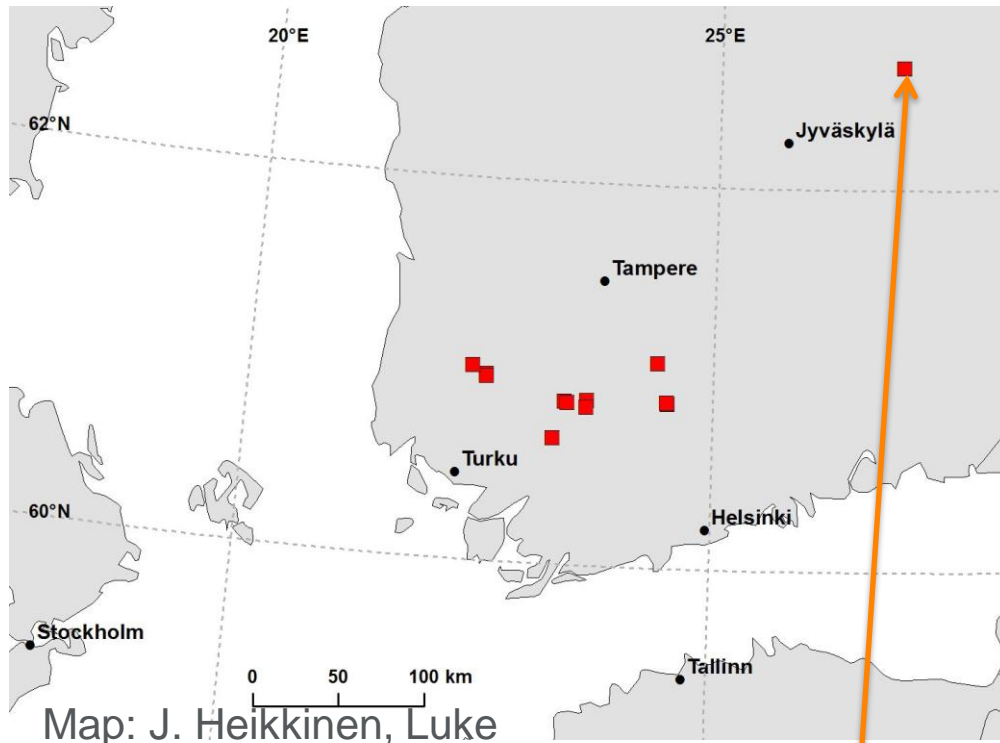
Total glyphosate in drainage flow and in surface runoff



4. Direct drilling vs. autumn ploughing

- More glyphosate than AMPA existed in runoff
- More glyphosate in runoff from direct drilling than from autumn ploughing
- Higher concentrations in surface runoff compared to drainage flow, but the losses were equal due to high drainage water flow
- The highest concentrations after glyphosate treatment in autumn 2012 due to heavy rains
- Concentrations didn't exceed the environmental quality standard for glyphosate in surface waters (100 µg/l)
- There was not strong correlation (0.6–0.7) between DRP and dissolved glyphosate in runoff
- More dissolved glyphosate than particulate glyphosate was measured in runoff from direct drilling.
- The estimated loss of glyphosate (+ AMPA) was 58 g/ha for direct drilling and 16 g/ha for autumn ploughing between 1.1.2011 and 28.4.2013 (28 months)

5. Environmental impacts of glyphosate and their decreasing – GlyFos II (2016–2018)



The fate of glyphosate in the soil at a **forest nursery located in a ground water area** is also analysed and discussed in relation to relevant ground water analysis.

1. Residues of glyphosate and AMPA in soil are monitored in southwestern Finland.

- Direct drilling / Autumn ploughing, 18 fields altogether.

Sampling (depths: 0–2,5 cm, 2,5–22,5 cm)

- In spring 2016 (before spraying)
- One day after the glyphosate treatment (spring/autumn)
- Late autumn in 2016

- Use of glyphosate and residues in soil will be compared to results from Kotkanoja experimental field.

Environmental impacts of glyphosate and their decreasing – GlyFos II (2016–2018)

2. Glyphosate may be retained and transported in soils, and there can be cascading effects on nontarget organisms. **The effects of glyphosate on crops** (oat, potato, turnip rape and horse bean) via soil are tested in a field experiment by the University of Turku.



Photo: K. Saikkonen, Luke

3. Results of GlyFos II will be **disseminated** in several times e.g. via web page (<https://www.luke.fi/projektit/glyfos-ii/>), seminars and articles. We are cooperating with ProAgria (advisor organisation) and other associations.

Thank you for your attention!

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