Buffer zones along water courses

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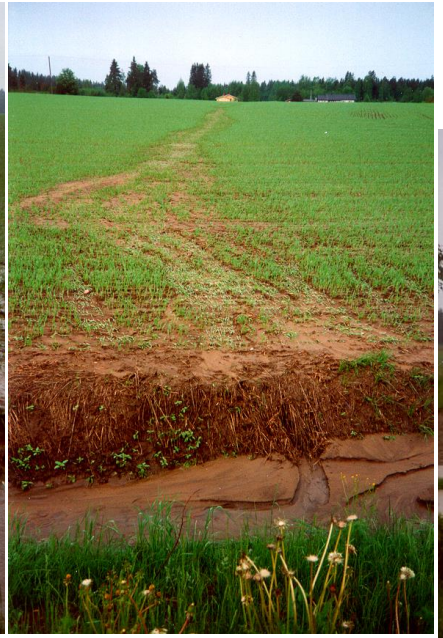
Water Management in Agricultural Landscapes

Workshop No. 5

Catalogue of measures
- supporting multiple ecosystem services

November 9th 2021, 12:30-14:30 (CET) on Zoom

Erosion events



A right kind of buffer in the right place

1-m-wide headlands along a main ditch

A buffer strip at least 3-meter-wide is needed along water courses.

The longer, steeper or more erodibility the slope, the wider BZ is needed.

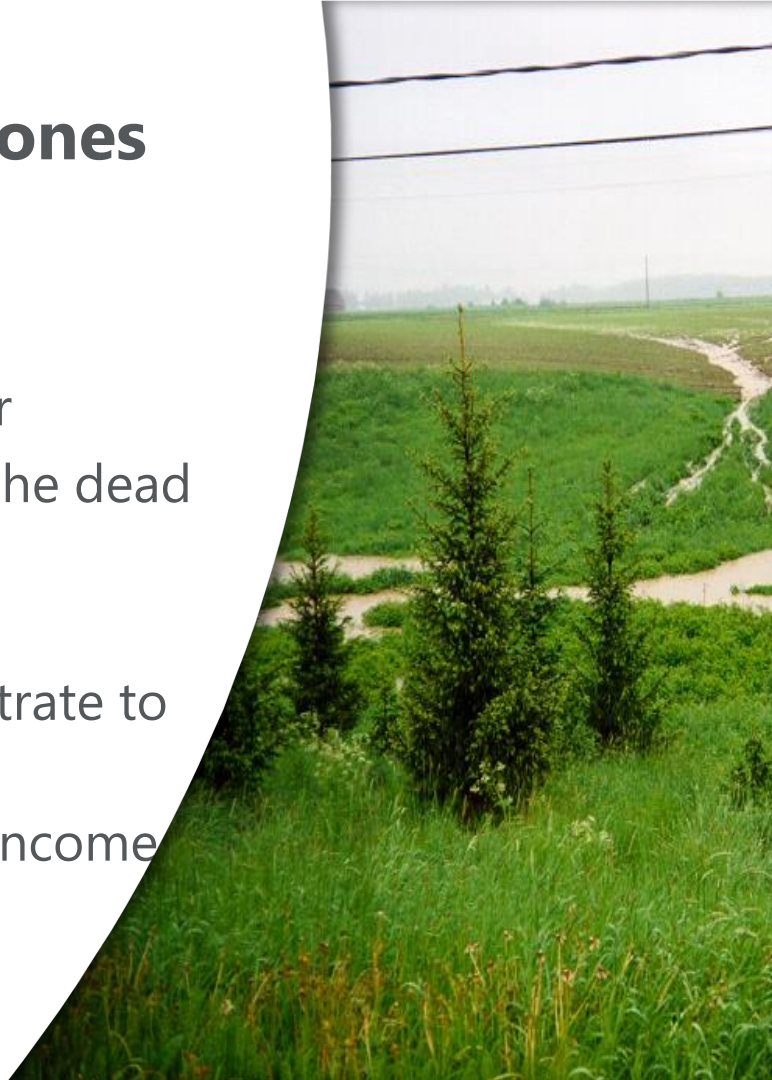
A grassed waterway can be established in fields with concentrated water flows to control erosion.

Benefits of buffer zones

- Prevents soil tillage and fertilization near surface water
- Permanent vegetation cover controls erosion in slopes
- Increases infiltration
- Decreases water flow from fields to surface water
- Removes soil particles, nutrients and pollutants
- Carbon sequestration
- Decrease of GHG emissions
- Increasing biodiversity in water and on land
- Improves landscape

Weaknesses / threats of buffer zones

- P sorption capacity of soil may decrease over time
- Retention of dissolved reactive P may be poor
- Freezing and thawing events liberate P from the dead plant material of BZs into spring runoff.
- Spread of weeds, pests, and plant deseases
- Trees may shade crops, their roots may penetrate to the drainpipes
- Reduction of agricultural land => decreased income



Buffer strip experimental field

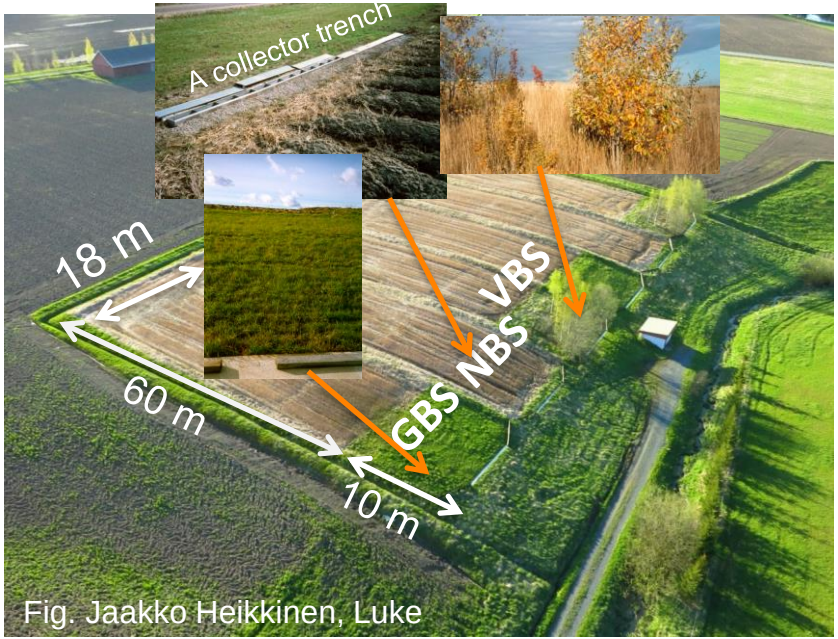


Fig. Jaakko Heikkinen, Luke

- A 6-plot field (~0.7 ha) was established on a clay soil at Jokioinen (60° 48'N and 23° 28'E) in 1989
- 10-m-wide buffer strips were planted on a steep slope of 12–18% on four plots in 1991
- Runoff water to a depth of 30 cm flows into a 9-m-wide collector trench on each plot

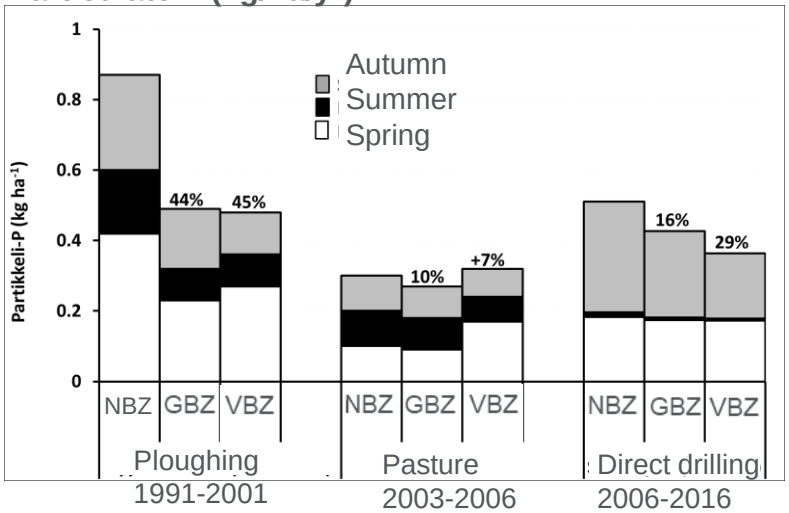
Treatments (two replicates):
GBS = Grass buffer strip (mown)
NBS = No buffer strip
VBS = Vegetated buffer strip (scrubs, trees, herbs)

Experiments:
The source field area and NBS were under:
1. Conventional tillage: autumn plowing, sowing in spring (1991–2001)
2. Pasture (2003–2005)
3. No-till: (2006–Sept. 2021)
4. Pulp and paper mill sludge (Oct 2021–

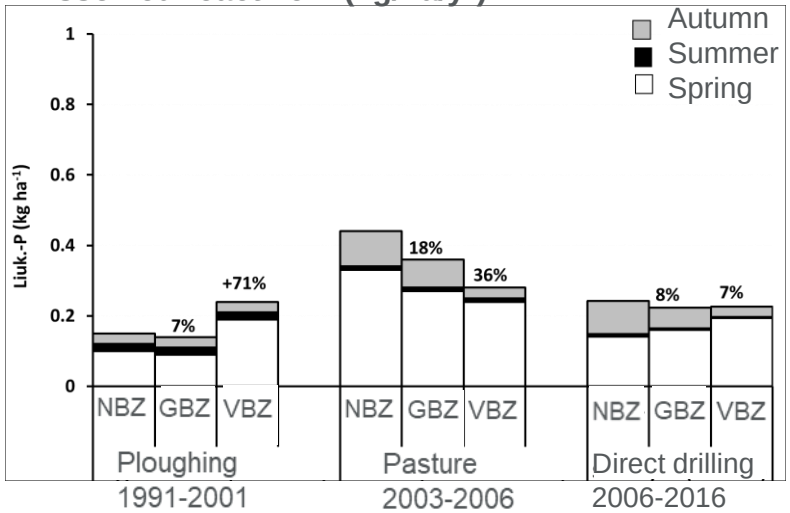
Measurements:
- Runoff (TN, NO_3-N, NH_4-N, DRP, PP, TP, Total solids) (TOC, DOC)
- Soil samples (P_{Ac}, TP, Org.C, NO_3-N, NH_4-N, TN)
- Biomass (TN, TP, DM, mass)
- Slurry (TN, TP, NH_4-N, DM)
- Continuous measurements of water flow and turbidity
- Available GHG emissons

Retention of PP and DRP in Lintupaju field

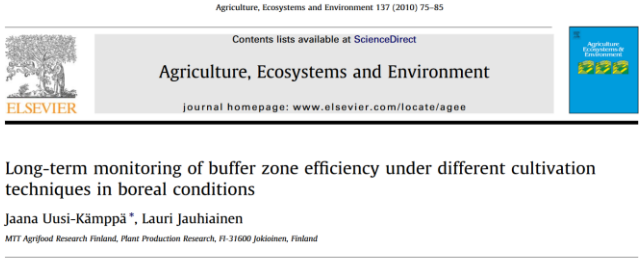
Particulate P (kg/ha/yr)



Dissolved reactive P (kg/ha/yr)



NBZ = No buffer zone
GBZ = Grassed buffer zone
VBZ = Vegetated buffer zone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Long-term monitoring of buffer zone efficiency under different cultivation techniques in boreal conditions

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Thank you!

Waterdrive

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