

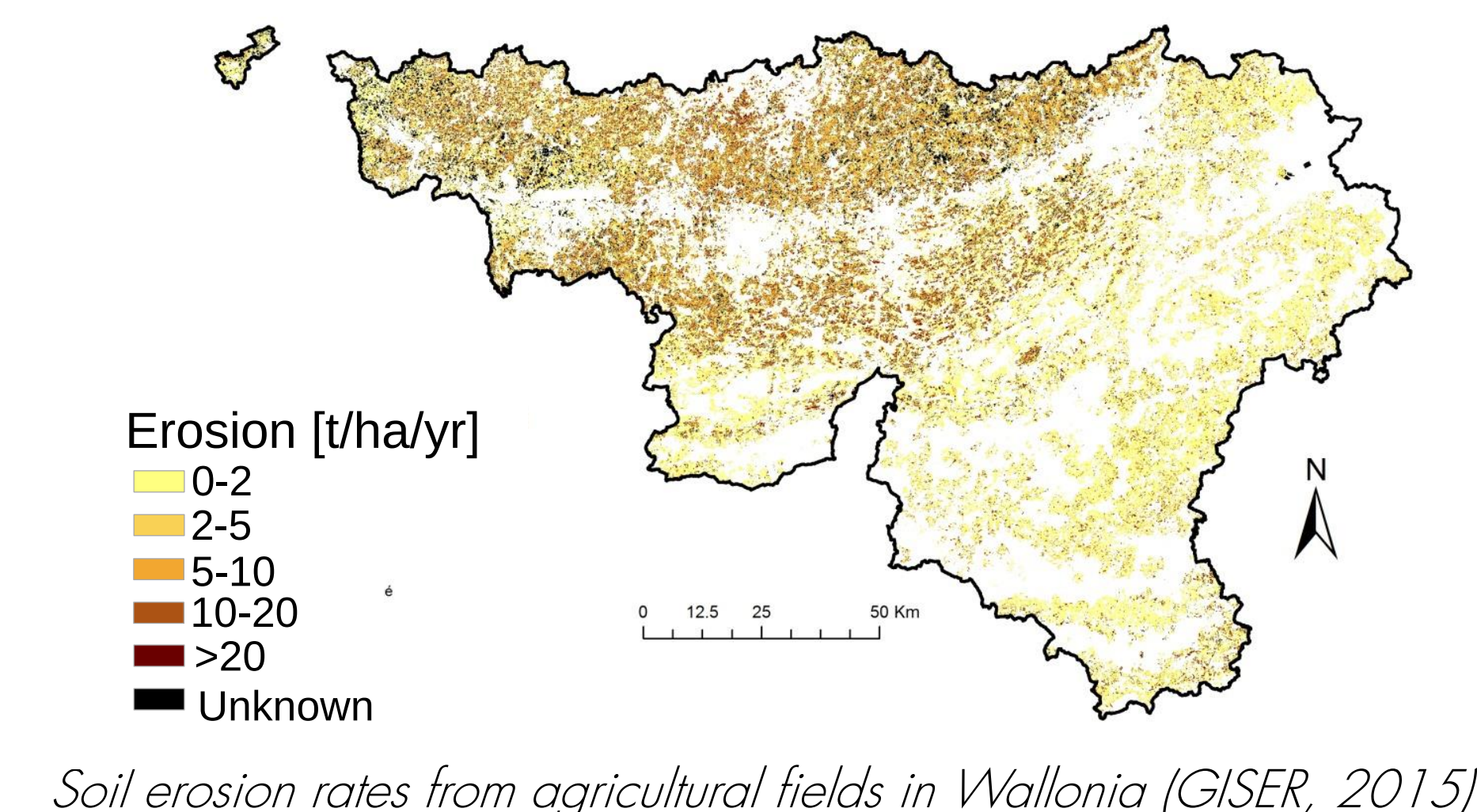
Effectiveness of undersown crops and strip tillage at reducing erosion and pesticide transfer in maize crop

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Context

- Spring crops (maize, potato, sugarbeet) are particularly susceptible to runoff and soil erosion
- Climate change : increase in rainstorms frequency and intensity
- Sediment-laden runoff from agricultural land causes environmental (fertiliser & pesticide losses) and infrastructure damage
- Soil loss rates under « conventionnal » agricultural practices are not sustainable
- Need to find economically viable but more sustainable farming practices

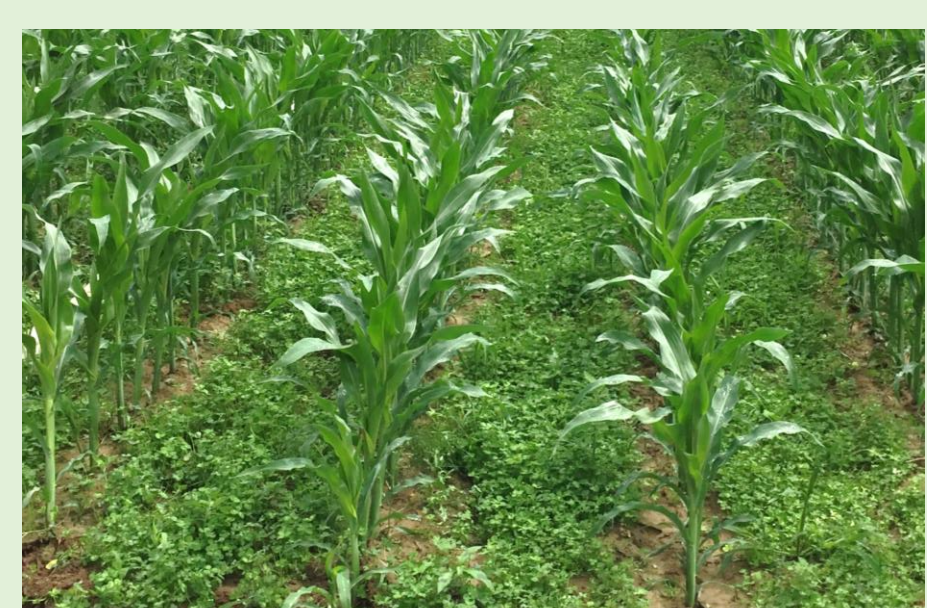


Solutions : novel soil and water conservation practices ?

Maize intercrop

= Intercropping maize with white clover or red fescue

→ Protect between-rows surface against sealing, improve soil infiltration, provide winter cover crop after maize harvest, improve soil structure (long term).



Maize intercropped with white clover (late June)



Maize intercropped with red fescue



Control maize crop (without intercrop)

Strip-tillage in maize

= Only tine-tilling the maize rows, leaving between-rows surface undisturbed

→ Benefits of reduced tillage : crop residues limiting soil crusting, improved infiltration and soil cohesion. But still cultivating the sowing row (good plant emergence).



Strip-tiller used on field trials



Soil surface after strip-tillage (Bonlez, 27/4/21)



Soil surface in strip-tillage (left) and conventionnal (right) cropping systems (Ittre, 30/5/22)

Experimental design



One experimental subplot



Conservation practices, together with conventional practices, are tested on 60m² field subplots, on agricultural loamy soils in central Belgium. Randomized complete bloc design with 3 replicates per practice



Troughout the cropping season, evolution of the weather – soil – crop system is monitored :

- Rainfall
- Soil saturated hydraulic conductivity (single ring infiltrometer), and soil surface state (roughness and crust development)
- Vegetation cover, crop yields at harvest



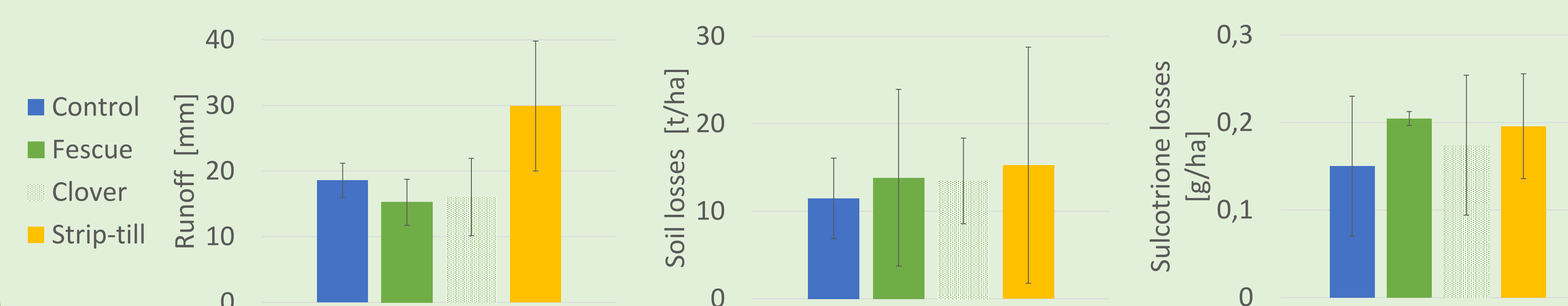
Downstream of each subplot, water runoff and sediments are collected into a tank. After each rain event :

- Measurement of runoff volume and sediment concentration in water (soil losses)
- Pesticides analysis for herbicide concentration in water

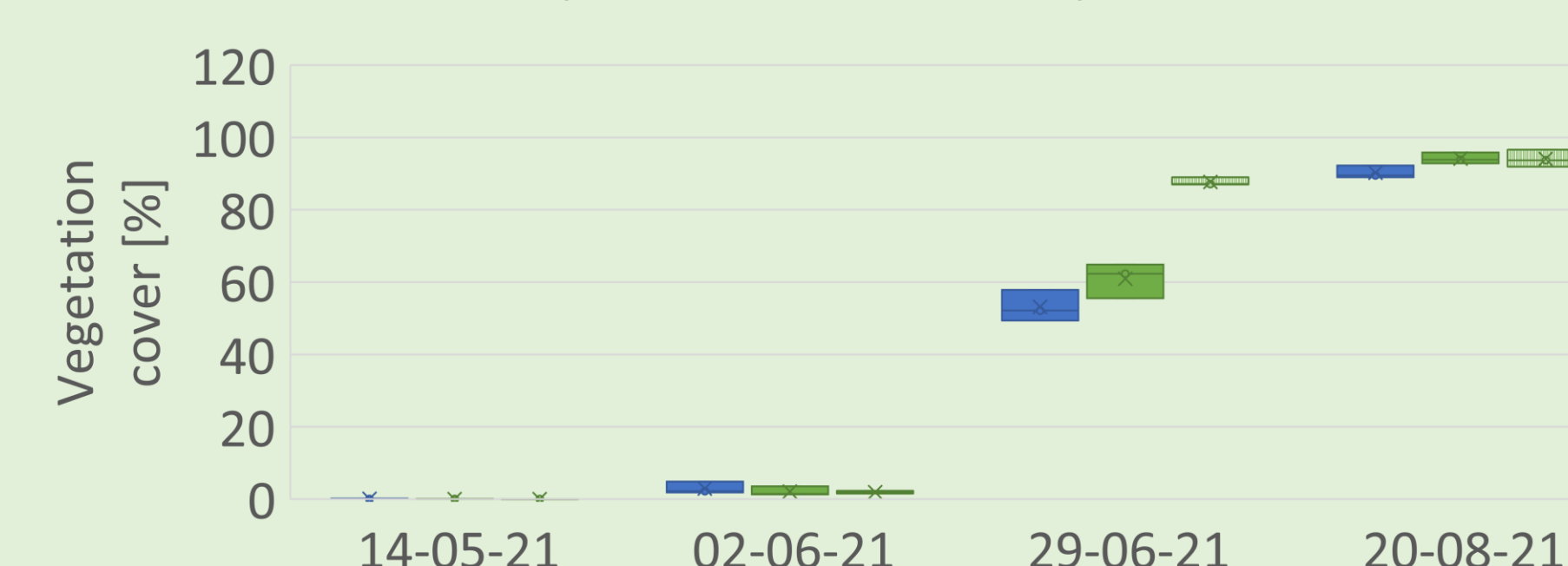
Results from 2021 field trials

Ottignies trial (no winter cover crop) : intercrops and strip-tillage

Total runoff, soil, and herbicide losses (10/5 – 15/9)



(Too) slow development of intercrop vegetation cover

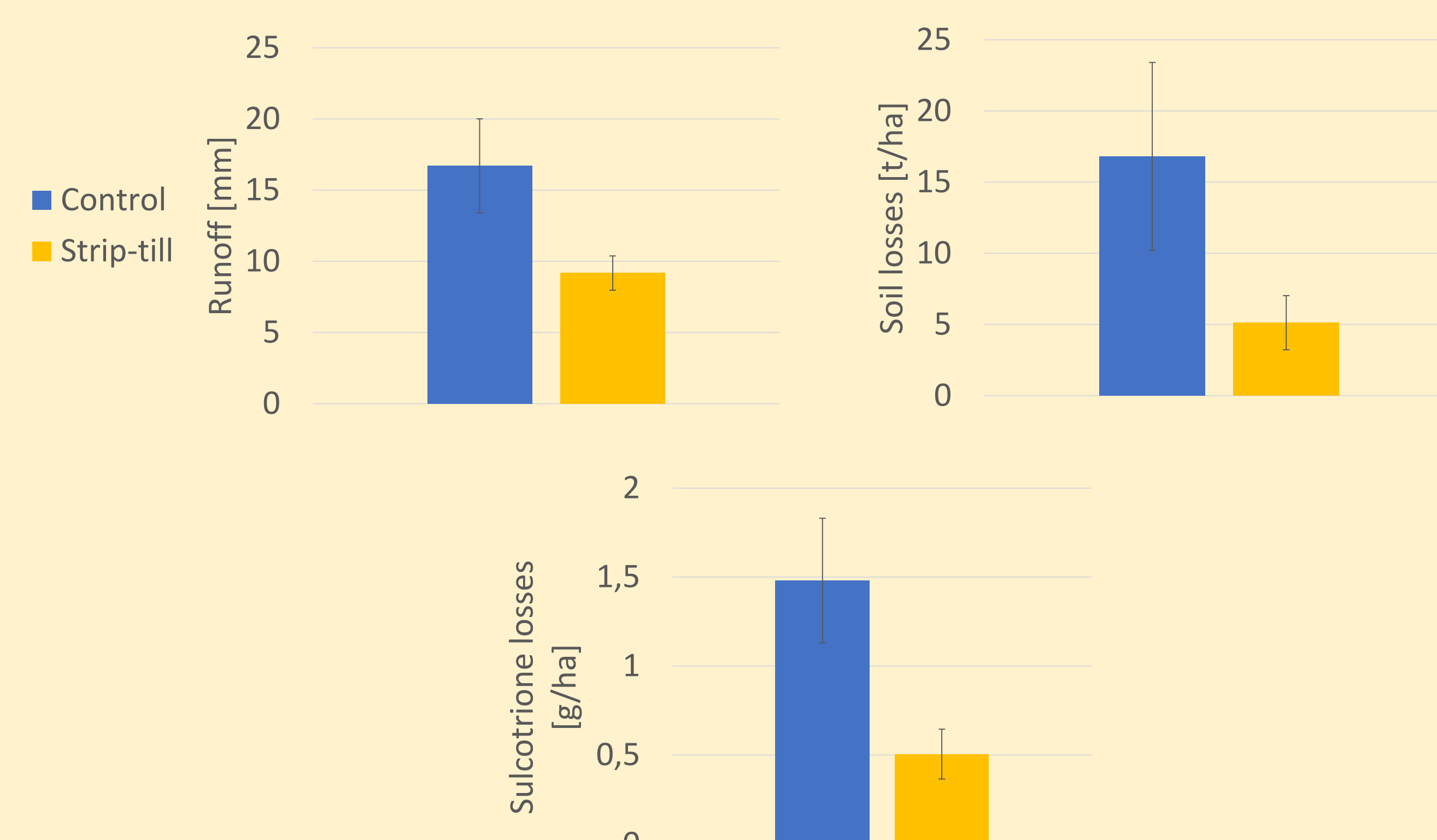


Rill formation in strip-tilled maize rows



Bonlez trial (winter cover crop) : strip-tillage

Total runoff, soil, and herbicide losses (4/5 – 16/9)



Crop yields differences between conservation and control practices < 10% (not stat. significant)

→ Intercropping maize with red fescue or white clover faces weed control challenges and does not seem to significantly reduce runoff and soil and herbicide losses during the maize cropping season

→ Strip-tillage appears as an effective reduced tillage practice in maize that strongly mitigates runoff, erosion, and herbicide losses, given a well-developed winter cover crop