

# The Rotation of Prairie Strips' Influence on Plant & Soil Health

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## A Prairie Strip Legacy Improves Crop Health and Sustains Soil Health

### Background

- Prairie strips (PSs) are contour plantings of diverse perennial, native plants from the Midwest US, that have been shown to have **disproportional benefits** to the amount of land they occupy (usually ~10%).
- Overwhelming benefits of PSs to water quality, soil health, wildlife, and pollinators [1].
- 15,000+ acres of prairie strips are planted across 15 states [2]. Prairie strips are also a part of the USDA CRP's CLEAR initiative (CP-43, [3]).
- With soil health benefits concentrated under the prairie strip, farmers and researchers wondered:  
**RESEARCH Q: what happens to soil and crops formerly under PSs when we rotate at 10-15 year intervals?**
  1. Hypothesis 1: soil health will decline after termination and tillage
  2. Hypothesis 2: soybean yields may increase but maize yields will decrease

### Materials & Methods

- We used a three, paired-catchment approach. A PS Catchment, Control (no-tilled maize-soybean rotation), and 'Disturbance Control' (tilled portion of maize-soybean rotation). We sampled three times in each watershed (n = 9).
- In 2020, three PSs were terminated by using glyphosate and tilled similarly to the Disturbance Control with chisel plow. Soybeans were planted in 2021, maize in 2022.
- In 2021, we monitored soybean stand count, root biomass, nodule count/size using SNAP [4], and N-fixing activity using leghemoglobin method [5].
- We measured SPAD [6], stand count, and yield in 2021 and 2022.
- Soybean and maize yields were calculated using combine yield monitor data.
- Soil samples collected in 2021, 2022 and analyzed for gravimetric water content (GWC), microbial biomass carbon and nitrogen (MBC, MBN, [7]), aggregate stability with Slakes app [8], and soil erosion using mesh pads [9].

### Results

#### Crops

FIGURE 1. Soybean Nodules

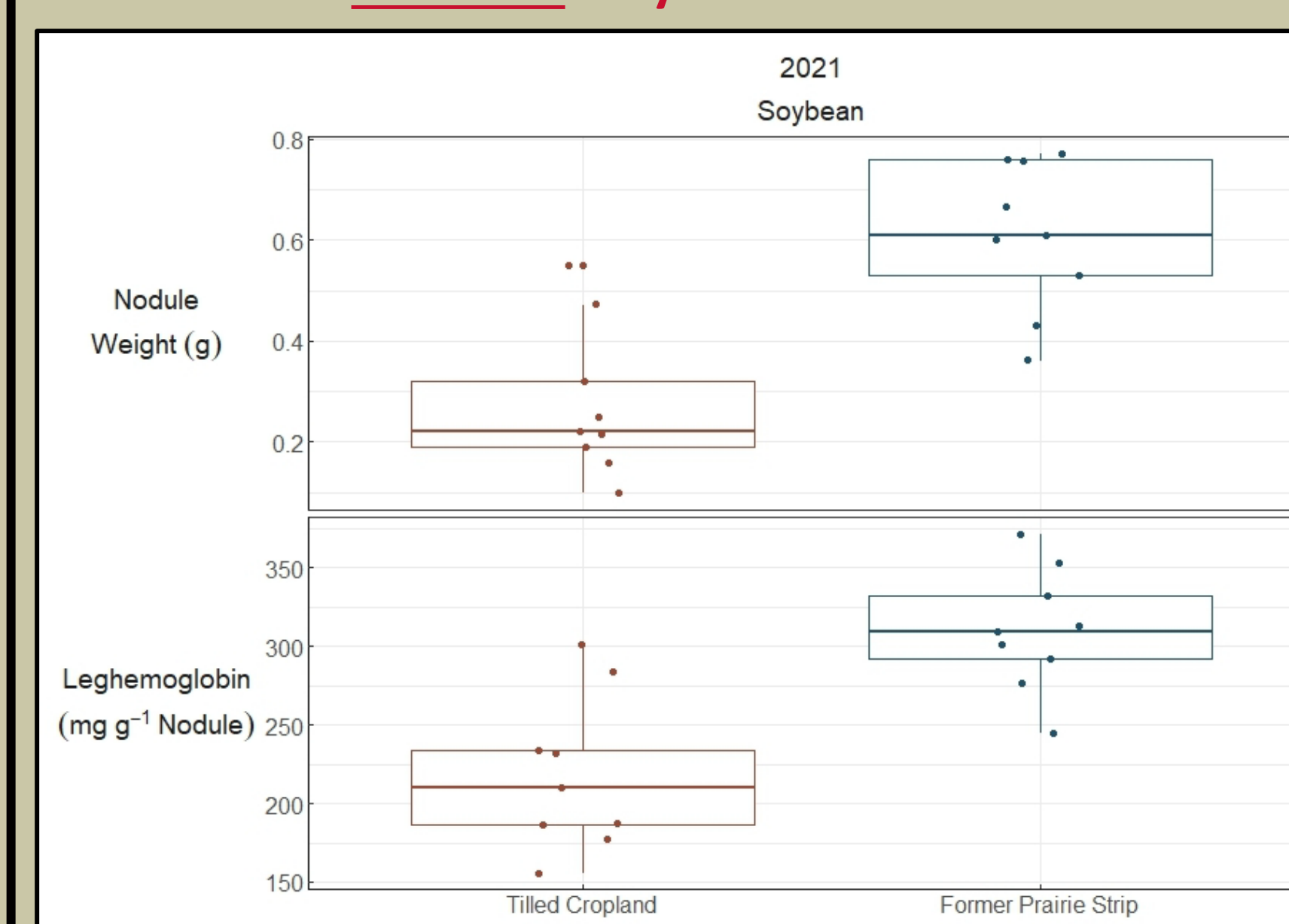


FIGURE 2. Crop Growth

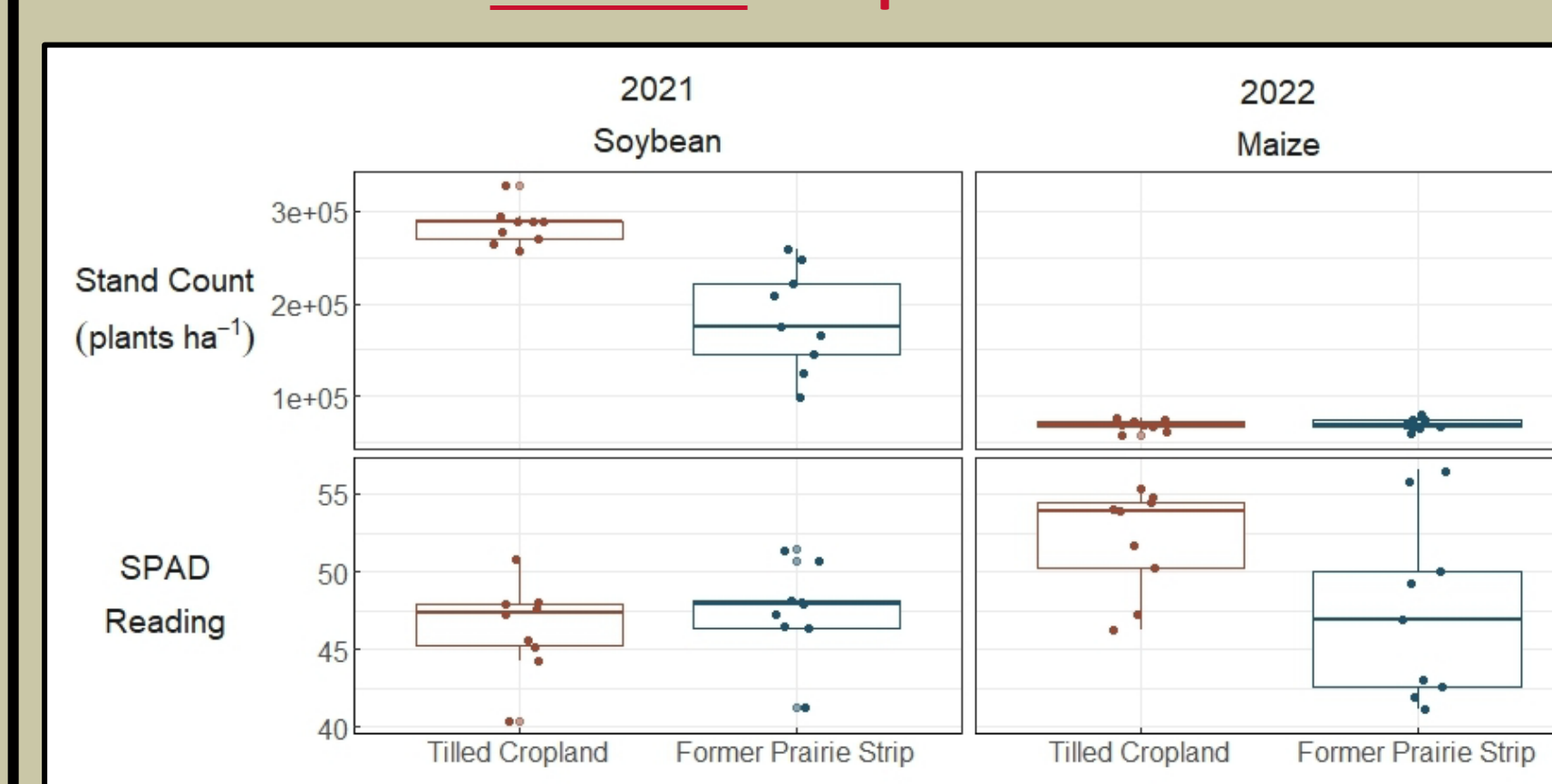
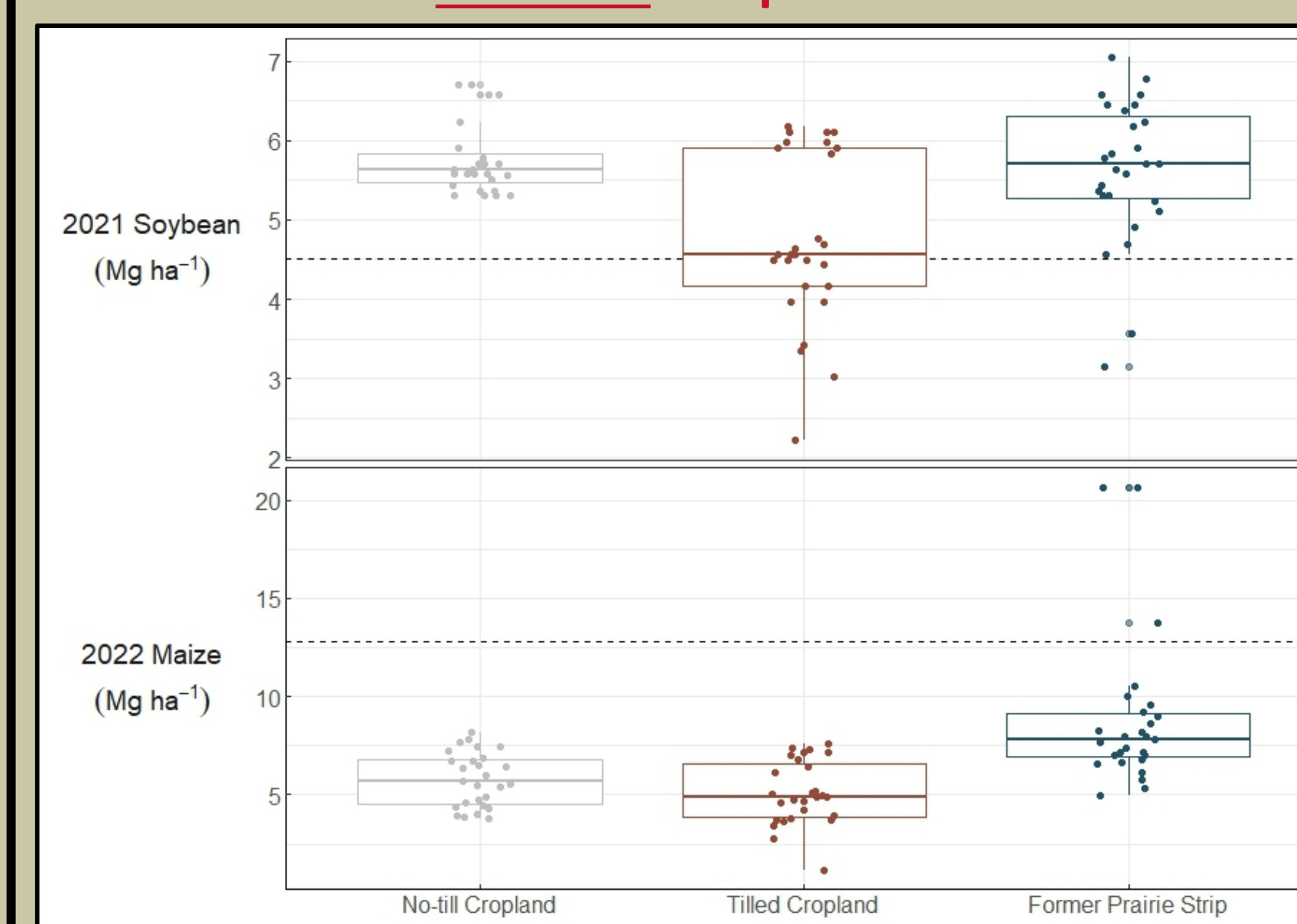


FIGURE 3. Crop Yields



Treatment: No-till Cropland, Tilled Cropland, Former Prairie Strip

#### Soils

FIGURE 4. Plant-available Nutrients

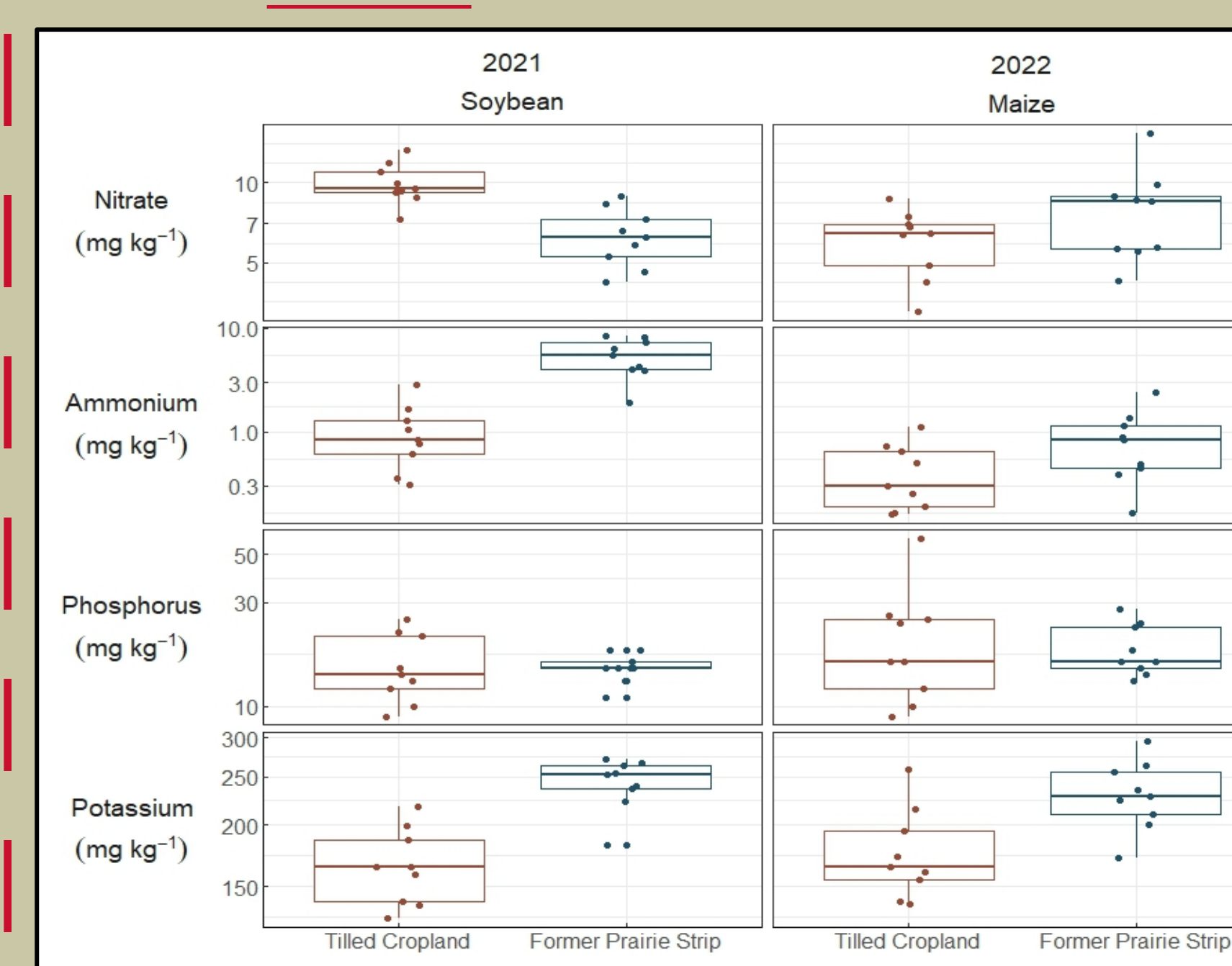


FIGURE 5. Soil Water and Microbial Biomass

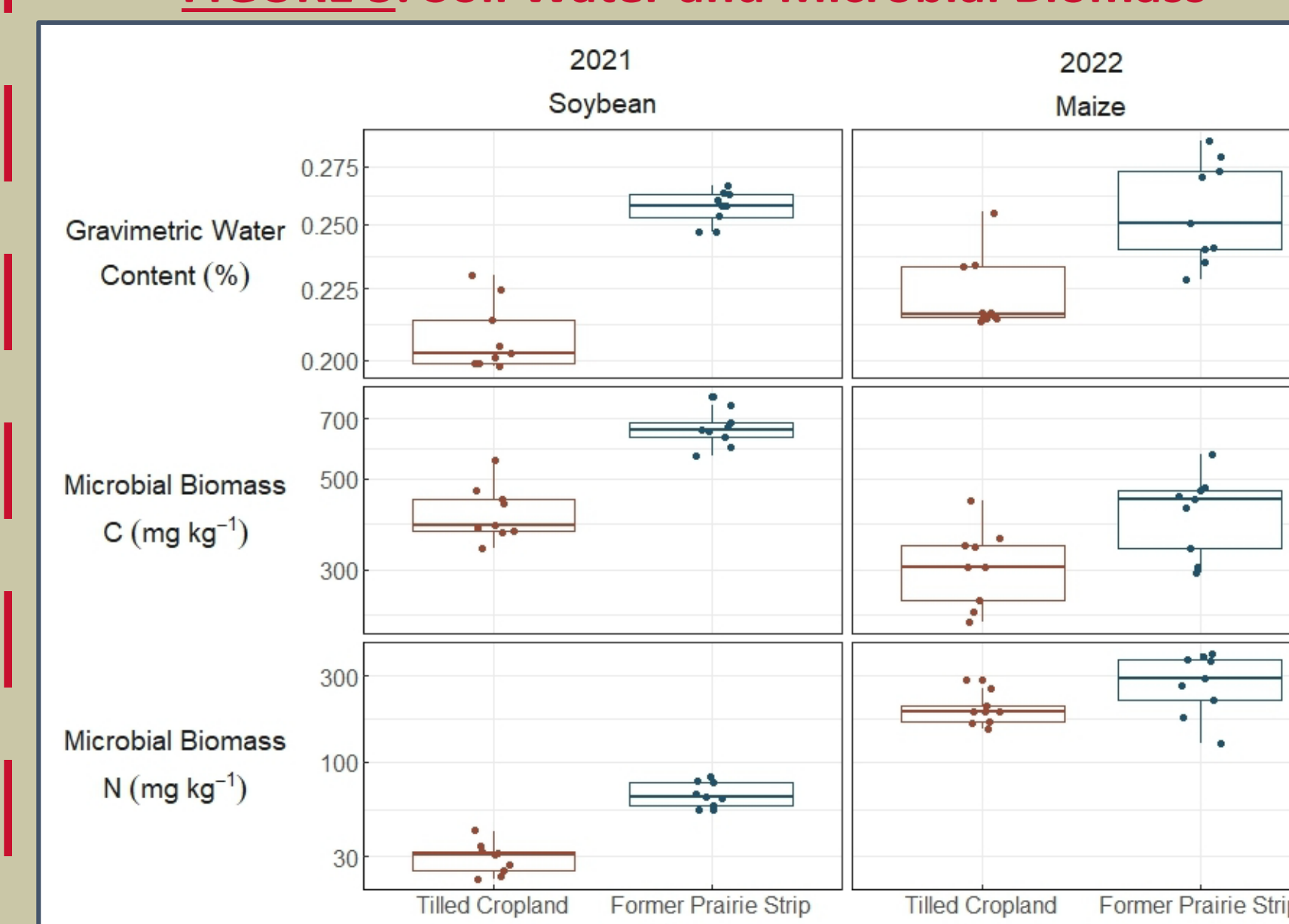
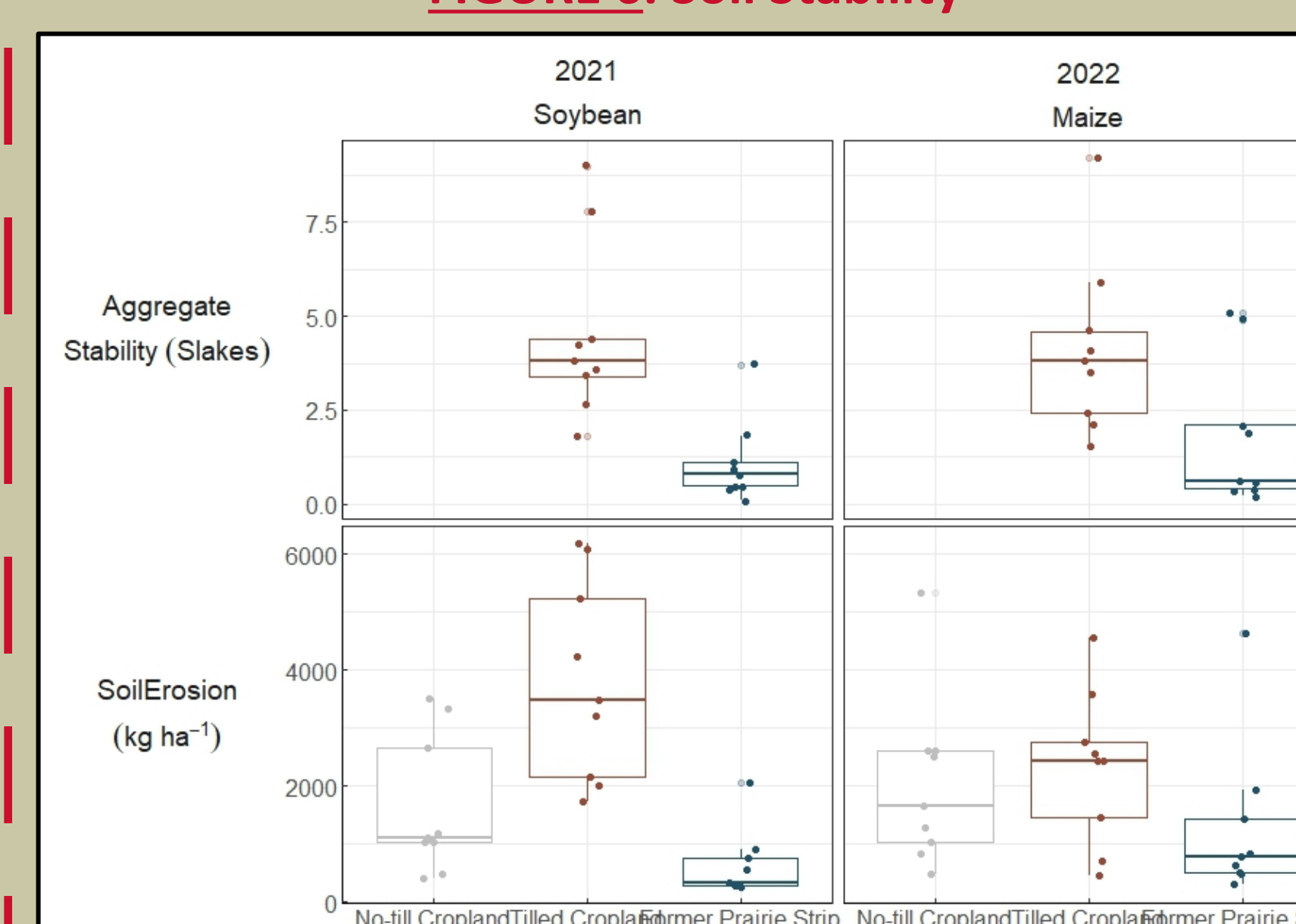


FIGURE 6. Soil Stability



### Key Findings

- Former prairie strip's effects on **SOYBEANS** are...
  - increased nodule weight by 121% and N-fixation activity by 42% [FIG. 1]
  - decreased stand counts by 36% [FIG. 2]
  - no difference in yield [FIG. 3]... compared to tilled cropland
- Former prairie strip's effect on **MAIZE** is...
  - decreased SPAD by 36% [FIG. 2]
  - increased yield by 60% [FIG. 3]... compared to tilled cropland
- Former prairie strip's effect on **SOIL** is...
  - decreased nitrate 37% in Year 1 [FIG. 4]
  - increased ammonium and potassium by 416% and 46% in Year 1 [FIG. 4]
  - increased water content by up to 24% [FIG. 5]
  - increased microbial biomass: MBC 35%, MBN 123% [FIG. 5]
  - increased soil stability by up to 7x [FIG. 6]... compared to tilled cropland
- soil erosion decreased by 83% compared to tilled cropland and by 61% compared to no-till [FIG. 6]

### Acknowledgements

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