

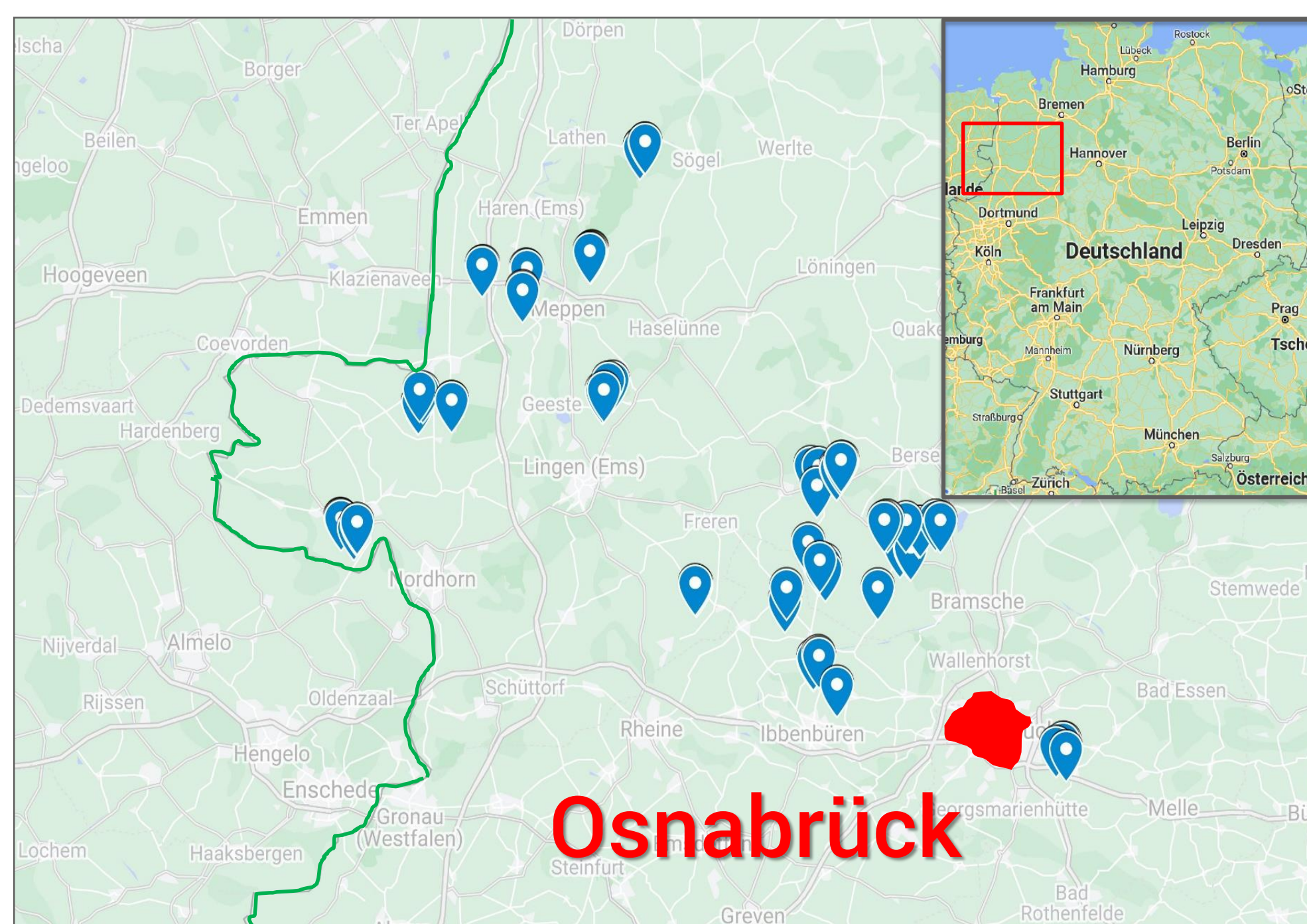
Measurement of plant-available P, K and Mg contents as well as pH values of soils on farmers' fields and in long-term fertilization trials using the Stenon FarmLab

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Background

- To achieve optimal nutrient availability for plants, fertilizer application rates should take into account the soil status of plant-available nutrients.
- Regular soil sampling and subsequent laboratory analysis are therefore common agricultural practice.
- These procedures are laborious, time-consuming and costly, and the delivery of the lab results to farmers often takes longer.
- So-called "in-situ" soil analysis using various soil "sensors" might offer a quick and cheap alternative procedure.

Survey on farmers' fields

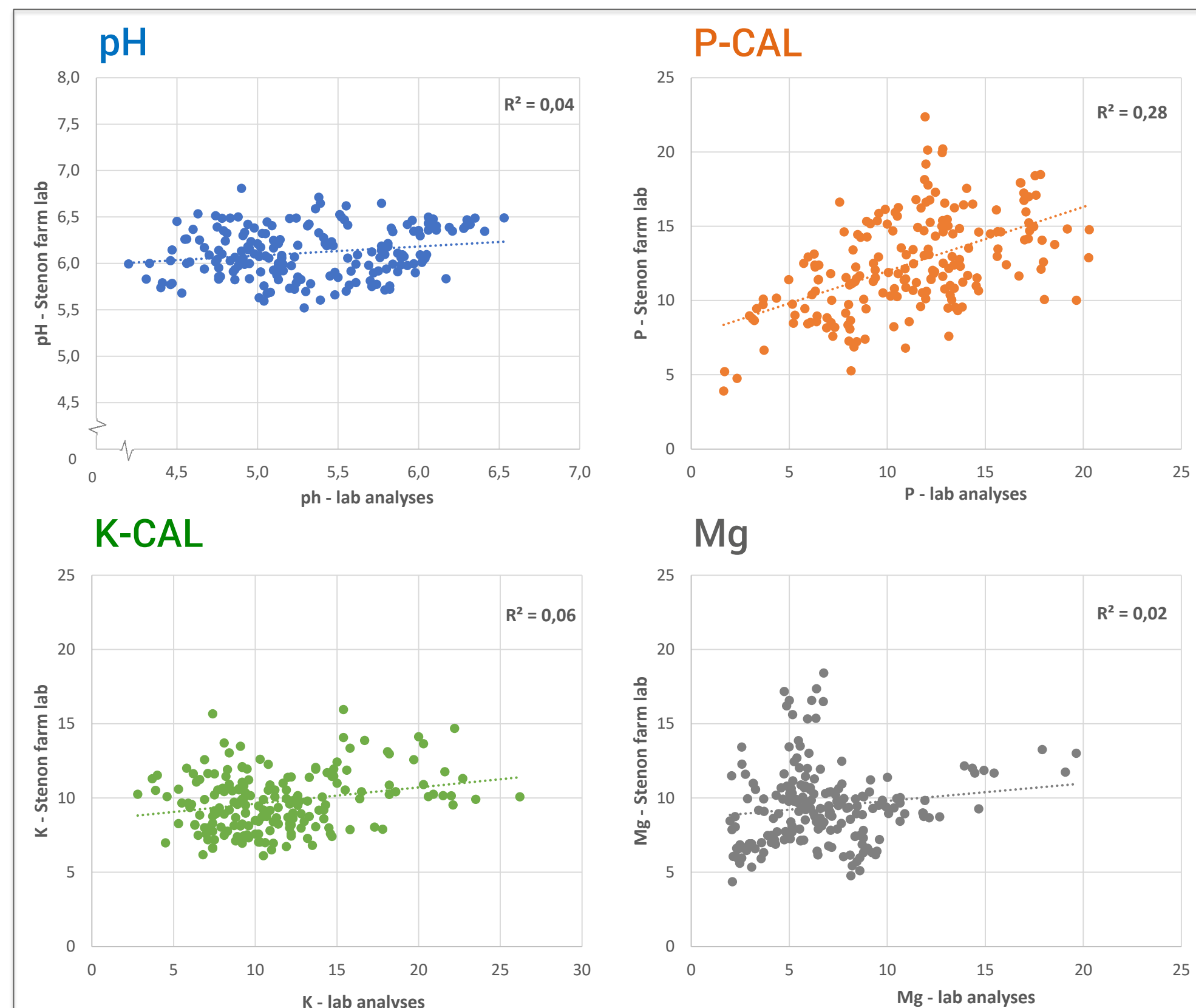


M&M

- Survey study in western Lower Saxony on 64 farmers' fields
- 3 FarmLab measurements at each of the corners of a 2 m triangle
- 3 individual soil samples from each triangle corner
- Soil drying/sieving => standard lab analysis (pH, plant available P/K/Mg)
- Regression analysis based on 192 data pairs for each soil parameter

Results

- Typical variation in lab soil pH values for sandy soils (4.2 – 6.5), while FarmLab values show only a pH range from 5.5 – 6.8
- Soil P range similar for lab analysis and FarmLab, but fewer values at the low end for FarmLab
- Soil K range for FarmLab much smaller (6.1 – 16.0 mg/100 g) compared to lab analysis (2.8 – 26.2 mg/100 g)
- Very few FarmLab Mg values below 5 mg/100g
- Correlations between lab and FarmLab values for all 4 soil parameters are very low ($R^2 = 0.02 - 0.28$)

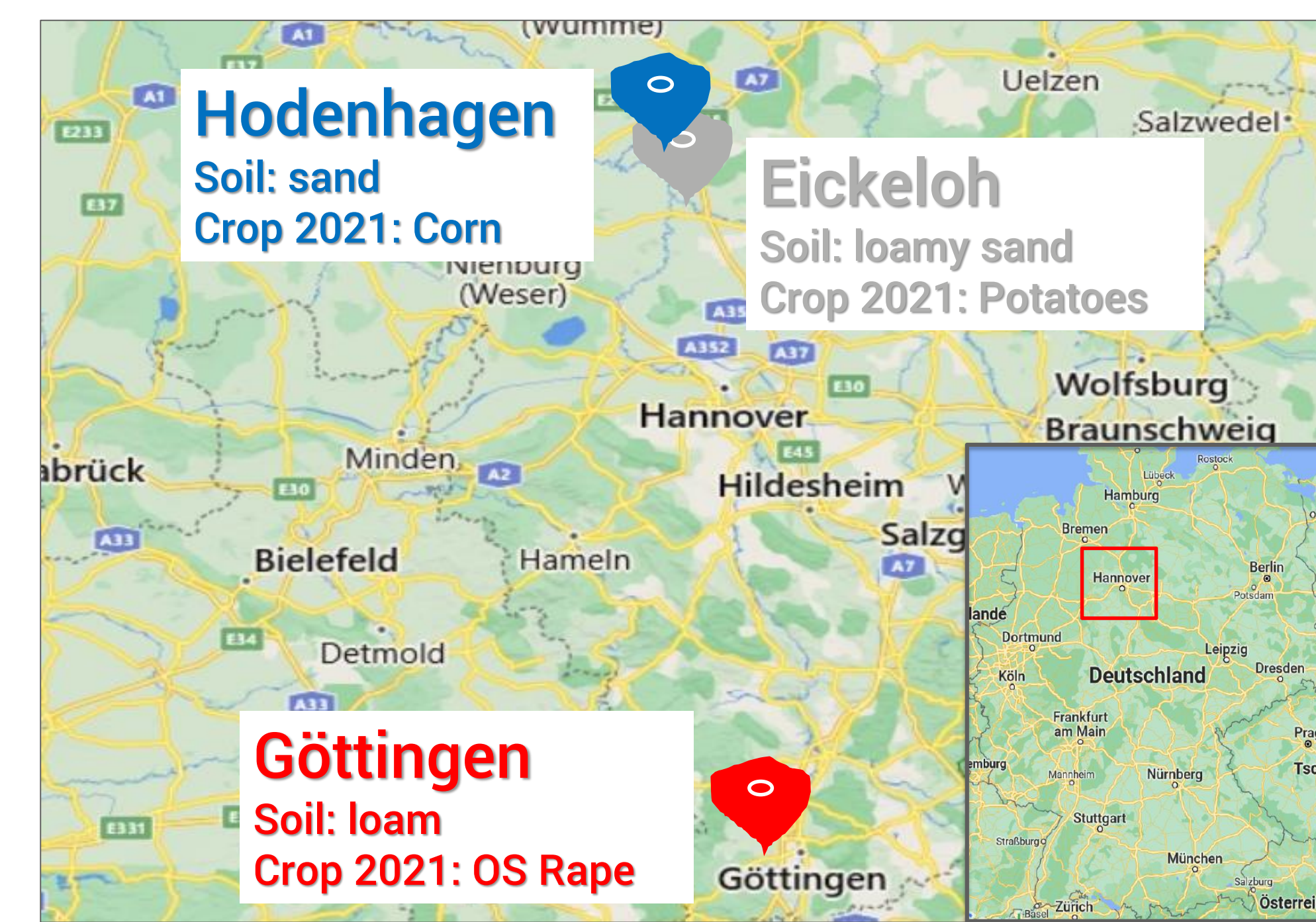


Objective

- Stenon offers the FarmLab for on-field soil analysis with 2 sensors
 - Electrical impedance spectroscopy
 - Optical spectroscopy (UV/Vis)
- Stenon claim: a comprehensive soil characterization (soil mineral N, plant available nutrients such as P, K, Mg, but also soil organic matter and pH) is possible.
- Independent check of the comparability between results of the standard laboratory tests and the FarmLab is necessary.



Long-term P-/K fertilization trials



M&M

- Studies on 3 P and 3 K long-term field trials of the University of Göttingen (plot size 8 x 10 m)
- 4 treatments (each with 4 replications):
 - unfertilized control
 - 0.5 x P-/K crop offtake
 - 1 x P-/K crop offtake
 - 1.5- (or 2-) x P/K crop offtake
- 1 FarmLab measurement + soil sampling (0 – 30 cm) in the center of each plot
- Soil drying/sieving => standard lab analysis (pH, plant available P/K/Mg)
- Regression analysis for each individual P/K trial

Results

- 22 (out of 24) regression analysis show R^2 values < 0.2 for the relationship between FarmLab and lab data (6 trials x 4 parameters)
- P trials:**
 - FarmLab data indicate considerably higher soil P values compared to standard soil analysis on light sandy soils
 - Lab data: good differentiation for soil P according to P application rates
 - FarmLab: no differentiation for the light sandy soils
- K trials:**
 - For all K treatments on the 3 trial sites FarmLab data indicate similar soil K status (9 – 12 mg /100 g soil)
 - Lab data: clear differentiation at all 3 experimental sites
 - FarmLab data: no differences between the 4 K application rates

