

Comparison of soil quality from three on-site farms in Ohio

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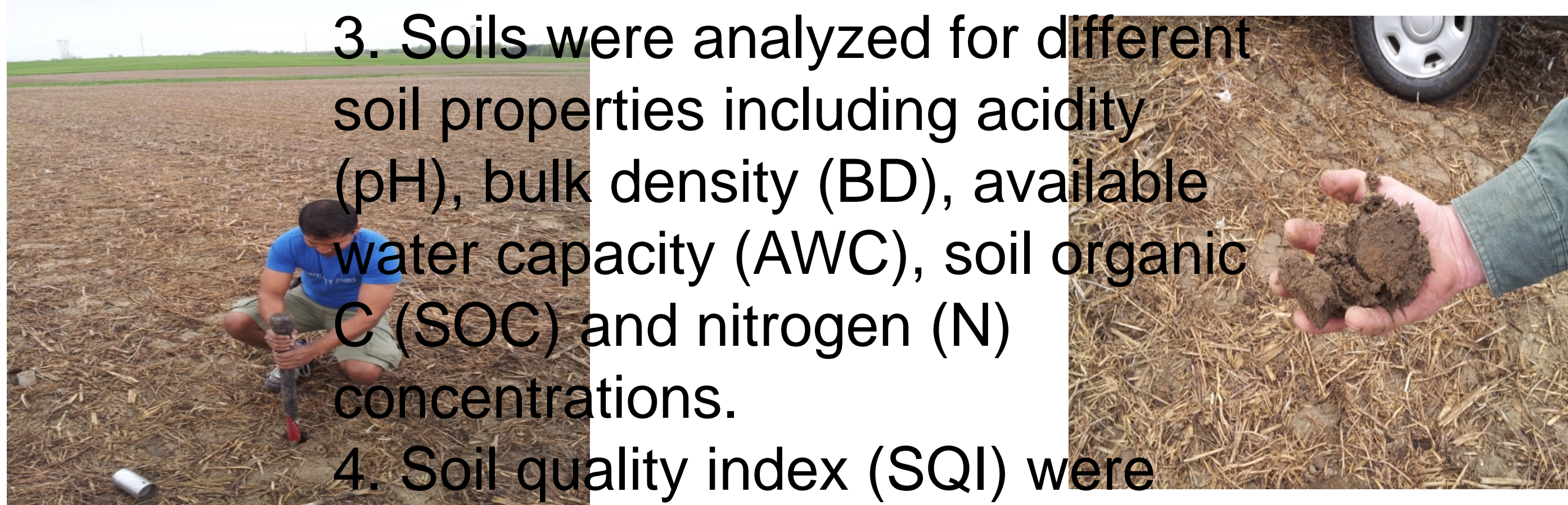
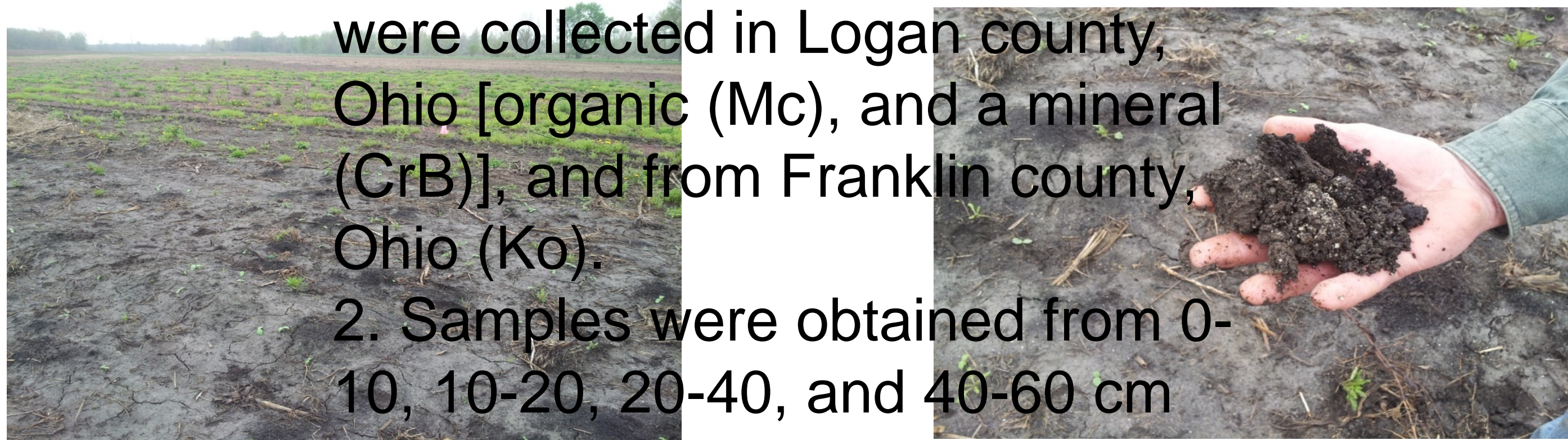
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Introduction and Rationale

The purpose of conducting on-farm field research is to develop fact-based answers to farming's challenging questions and generate targeted "real world" data. This study is a comparative assessment of quality of one muck or organic (Mc), and two mineral (CrB, and Ko) soils. While Mc and CrB were compared for long and short-term tillage operations, Ko soil had cover crop (peas and turnips) and no cover crop or control management. Specific objective includes changes in soil quality under different management practices (CT: conventional tillage, NT: no-tillage, CC: cover crops, NCC: no-cover crops) and cropping systems on soil quality.

Experimental Procedure

1. Soil samples from on-farm sites were collected in Logan county, Ohio [organic (Mc), and a mineral (CrB)], and from Franklin county, Ohio (Ko).
2. Samples were obtained from 0-10, 10-20, 20-40, and 40-60 cm depths.
3. Soils were analyzed for different soil properties including acidity (pH), bulk density (BD), available water capacity (AWC), soil organic C (SOC) and nitrogen (N) concentrations.
4. Soil quality index (SQI) were calculated from three methods.



Results and Discussion

Soil		pH	BD	AWC	SOC	N	Grain*
Mc	CT	7.4a	0.6b	209a	15.5a	1.0a	154b
	NT	7.3a	0.6b	287a	14.8a	0.9a	259a
CrB	CT	7.5a	1.4b	10c	2.5b	0.2b	118a
	NT	7.3a	1.6a	25b	2.2b	0.2b	132a

* Corn

1. Organic or muck soil (Mc) had significantly improved soil parameters than those of the mineral soil (CrB).
2. Long-term tillage did not affect properties of the native organic or muck (Mc) soil.
3. The CT significantly affected BD, and AWC of CrB soil.
4. The NT increased corn grain yield in Mc soil.

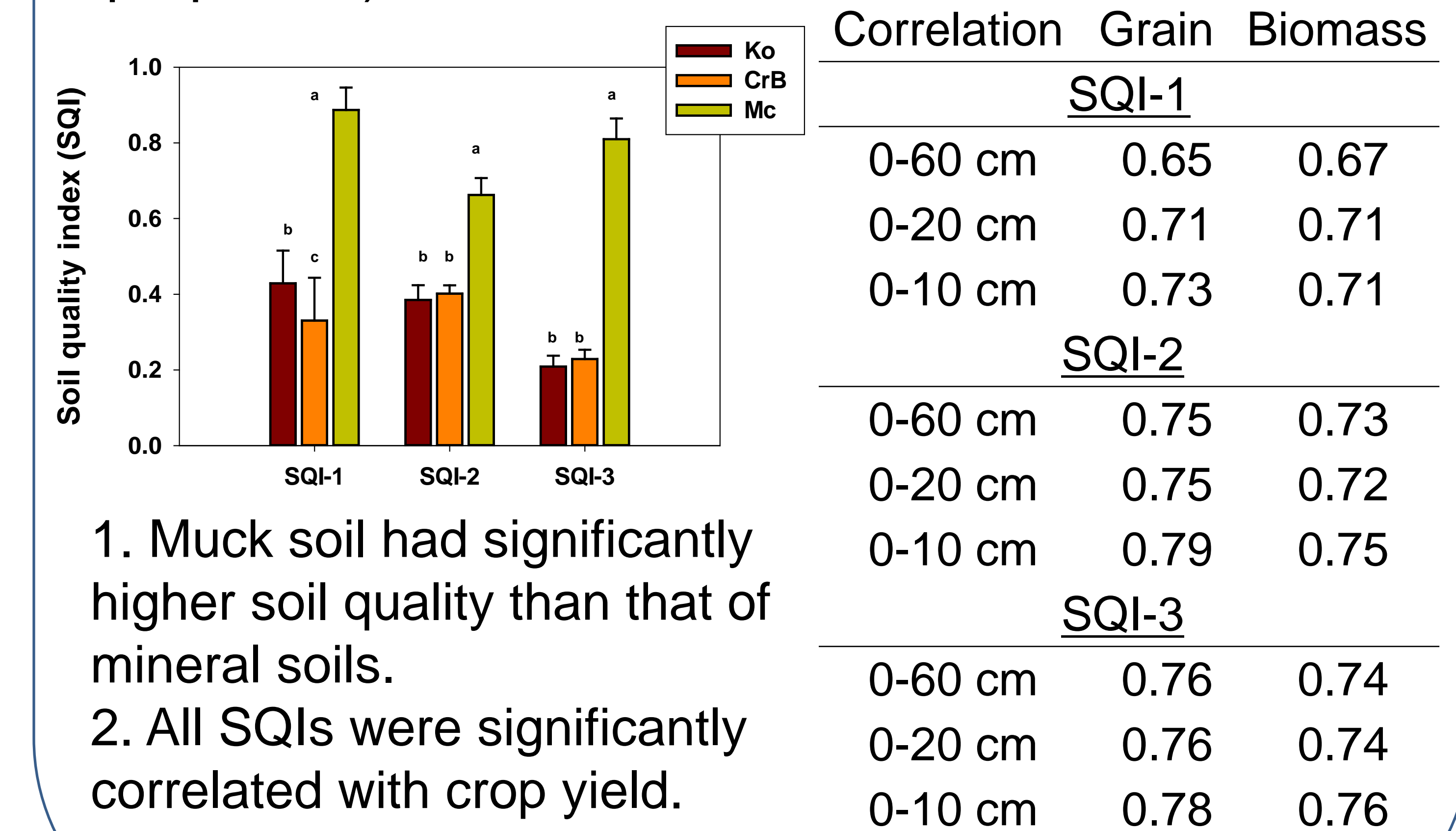
Soil		pH	BD	AWC*	SOC	N	Grain*
Ko	CC	5.7b	1.3a	38a	2.5a	0.3a	68a
	NCC	6.7a	1.5a	39a	2.3b	0.2a	73a

* Soybean

1. Cover crops significantly decreased soil pH and increased SOC concentration compared to those of control.
2. Increase in SOC concentration even over a short period of one season could be associated with high input of biomass-C, and changes in microbial activity.
3. Soybean grain yield was relatively higher under CC than under control.

Results and Discussion

Soil Quality Index = Rating of Soil (based on soil properties)**



1. Muck soil had significantly higher soil quality than that of mineral soils.
2. All SQIs were significantly correlated with crop yield.

**Comparison of soil quality index using three methods; PLOS ONE; Accepted, in press (2014); Mukherjee, A., and Lal, R.

Conclusions

1. Further research needs to assess whether or not these increments are temporal as the CT practice in CrB and CC in Ko were introduced only a year ago.
2. Some improvements in soil characteristics are positive even after one season of establishing selected cover crops, so growers are encouraged to try further.
3. In order to effectively predict particular crop yield one must include soil fertility and microbial parameters in the model of SQI.

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