No-Tillage in a Maize-Based Cropping System Leads to Soil Compaction in the Topsoil Layer of a Sandy Textured Soil in a Semi-Arid Region

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THE 2ND GLOBAL CONFERENCE ON SANDY SOILS

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Where everything else begins, that place isn’t the same everywhere

Maize in South Africa

- Semi-arid sandy soils, particularly in the northwestern Free State, which contributes substantially to national maize yields.

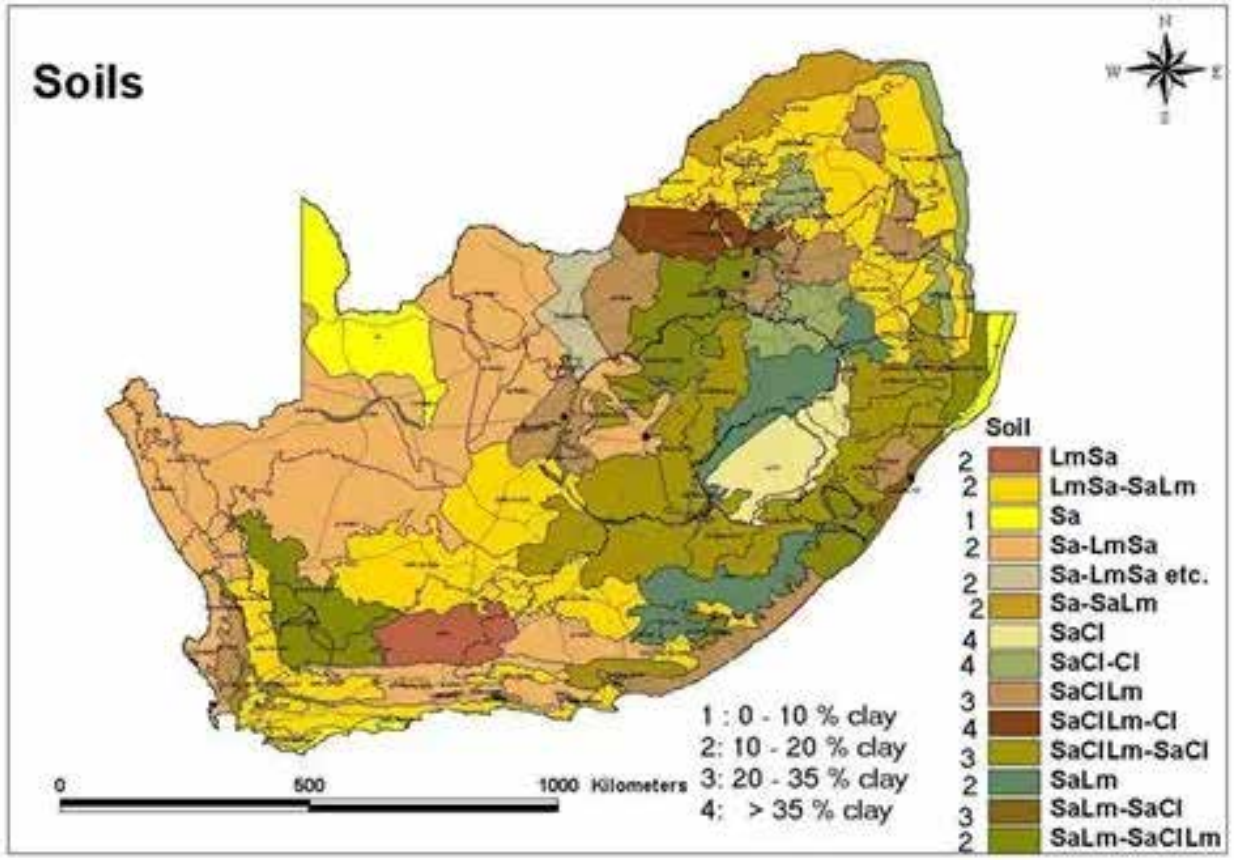
The sandy soils of SA

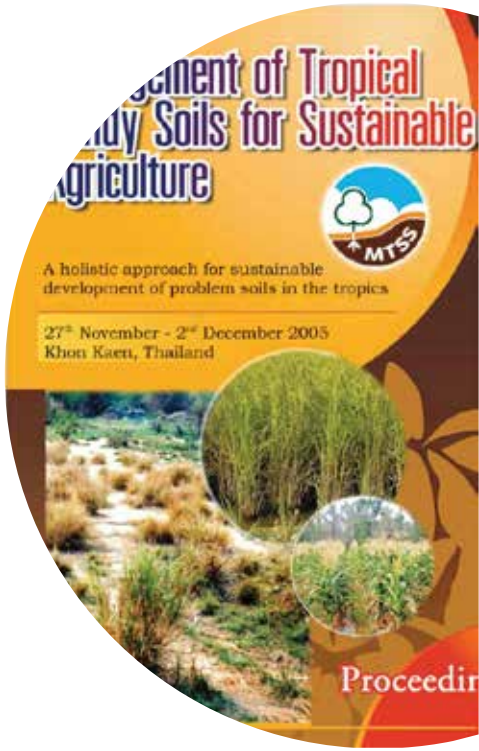
- Aeolian parent material, were deposited between 1.8 and 5 million years ago on a Palaeolithic surface composed of poorly drained, clay-rich components formed from weathered dolerite, mudstone, calcrete, and shale.

Their problems

- High susceptibility to wind erosion, inherent compaction issues, low organic matter content, and poor nutrient and water retention capacity.

Distribution of sandy soils in South Africa





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No-tillage and soil physical environment

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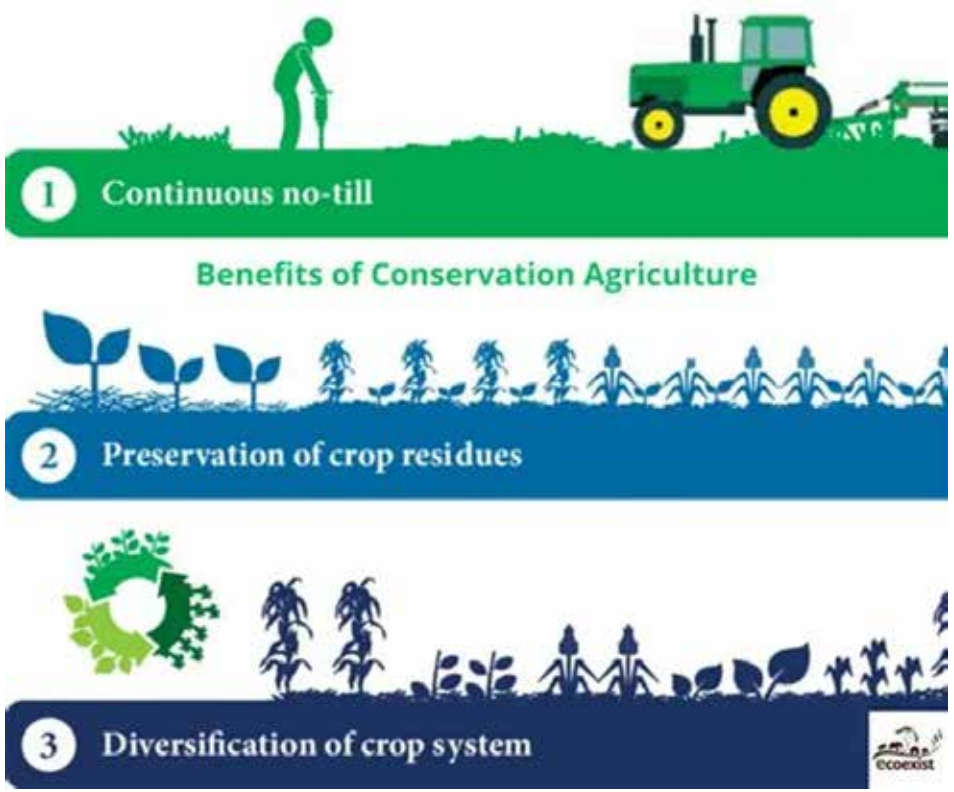
Addressing Gaps, Seeking Solutions

Sustainable soil management practices to protect the unique fragile sandy soils of South Africa

Conservation agriculture

Nonetheless, most research on soil physical properties has been conducted outside of Africa, particularly in North America, Europe, and Asia

Assess the presence and degree of soil compaction, which we know relatively little about on a sandy textured topsoil under conservation agricultural practices in a semi-arid region of South Africa



Our approach to uncovering the answers

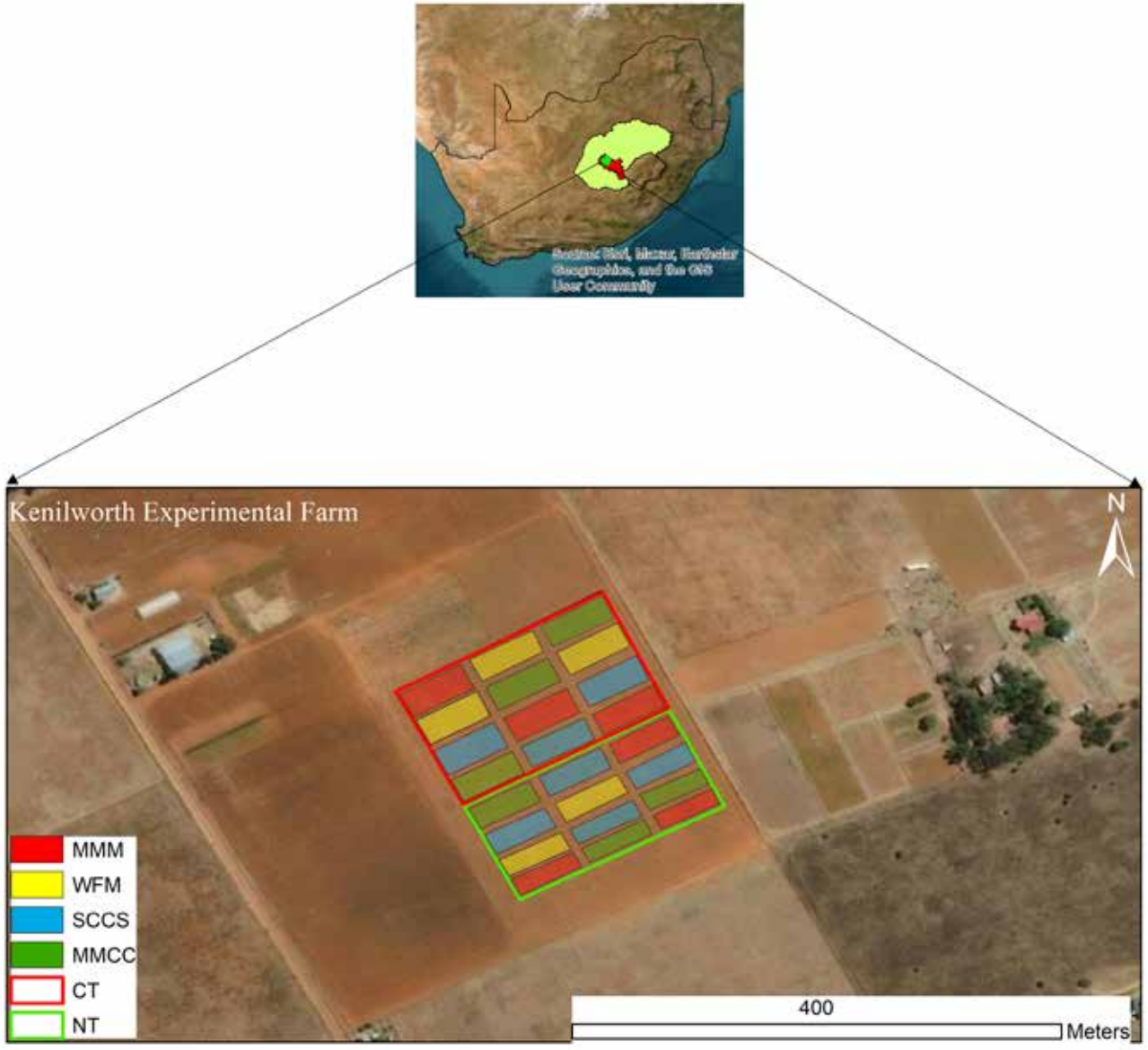
Environmental conditions

- MAP: 528 mm
- MAT: 11.0ºC to 25.5ºC
- Cimate : Semi arid
- Soil type: Bansvlei

Soil form make up

- Topsoil: Orthic A
- Subsoil: Red apedal

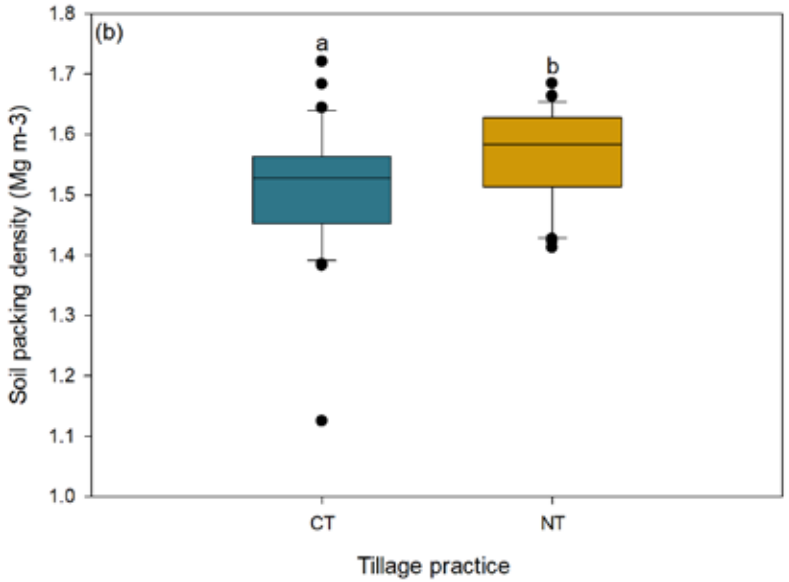
  Soft plinthic

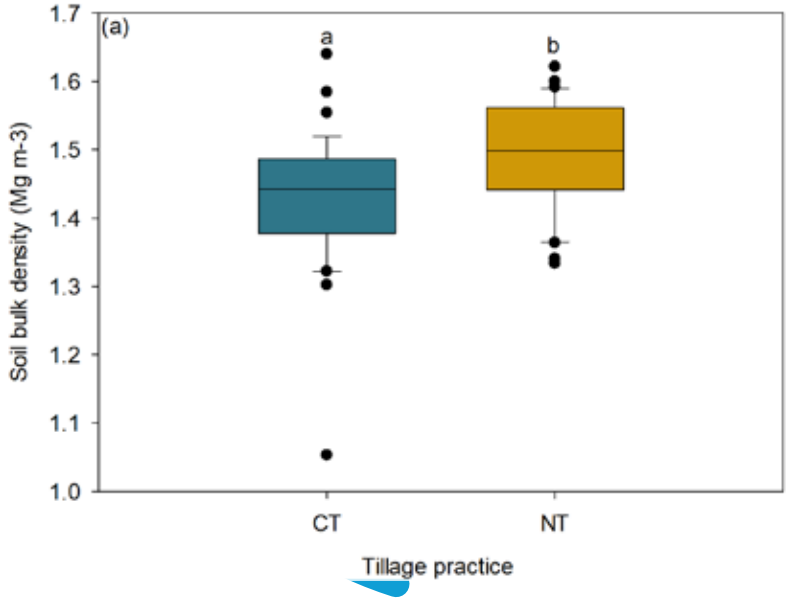


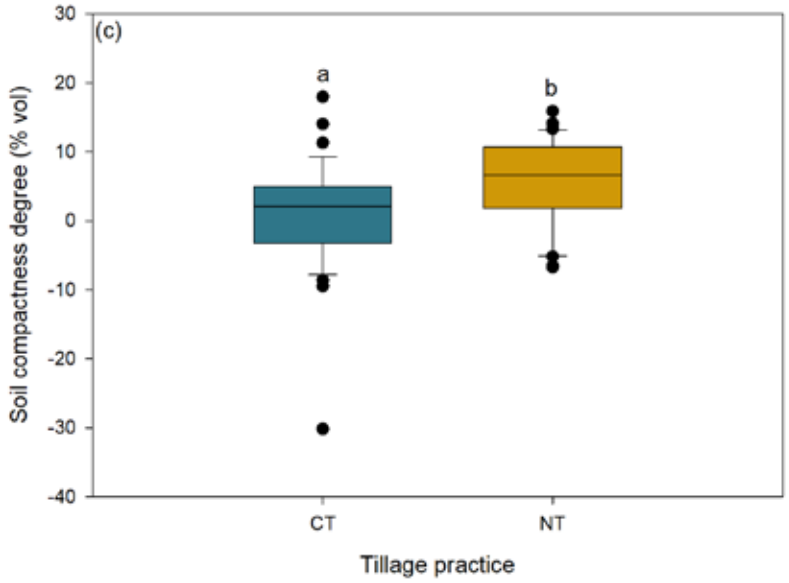
Our Investigation Moved from Field to Laboratory to Insight

Soil sampling	Sampling strategy
	Number of samples collected
Laboratory analysis	Preparation
	Soil nutrients
	Soil chemical properties
Statistical analysis	Basic statistics
	Inferential statics

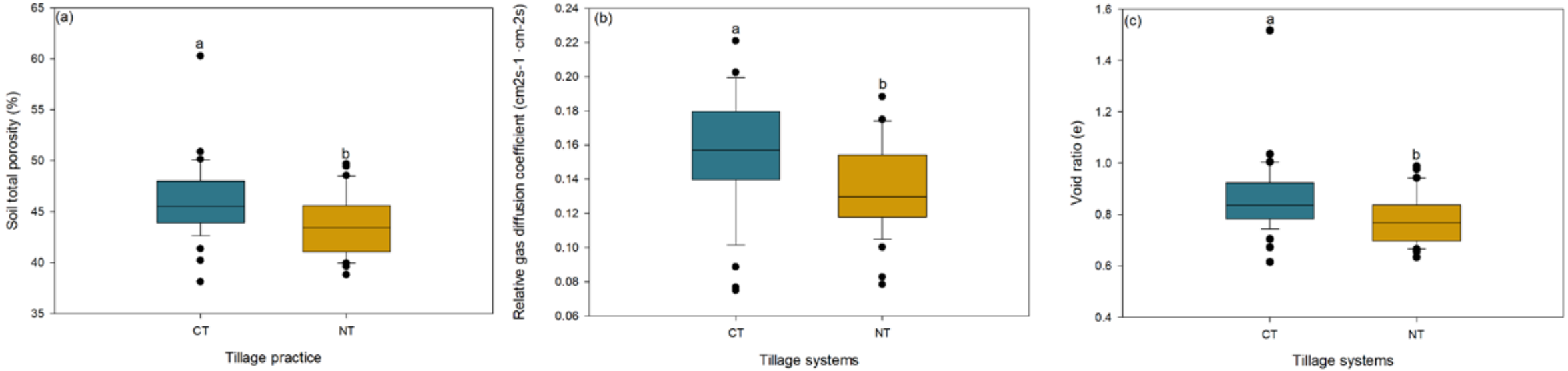
The story the sandy textured topsoil told us







We did expect to see this



Lessens from the sandy textured topsoil of the semi arid environment

SCD, PD, BD

TP, RGDC, and VR

These findings underscore the need for:

- Site-specific evaluation and tailored management strategies when adopting CA practices, such as NT, particularly in sandy soil of a semi-arid environment.

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