
ASUS

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THIRD AFRICA CONGRESS ON CONSERVATION AGRICULTURE
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No-Till System Sustainability Achieved in Southwestern Paraná, Brazil : Lessons learnt for scaling CA in Africa

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Theme:
Building a Resilient Future in Africa
through Conservation Agriculture and Sustainable Mechanization

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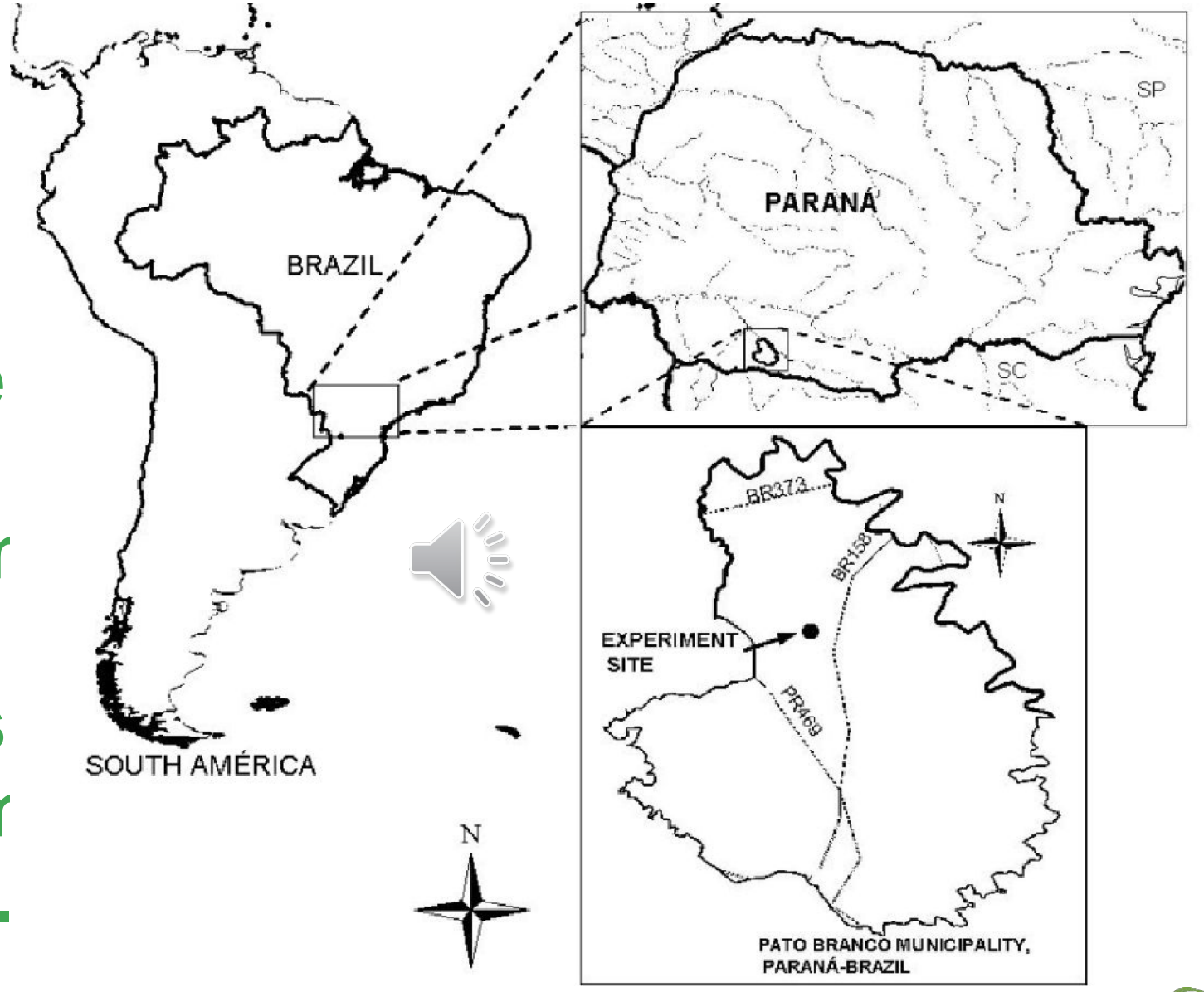
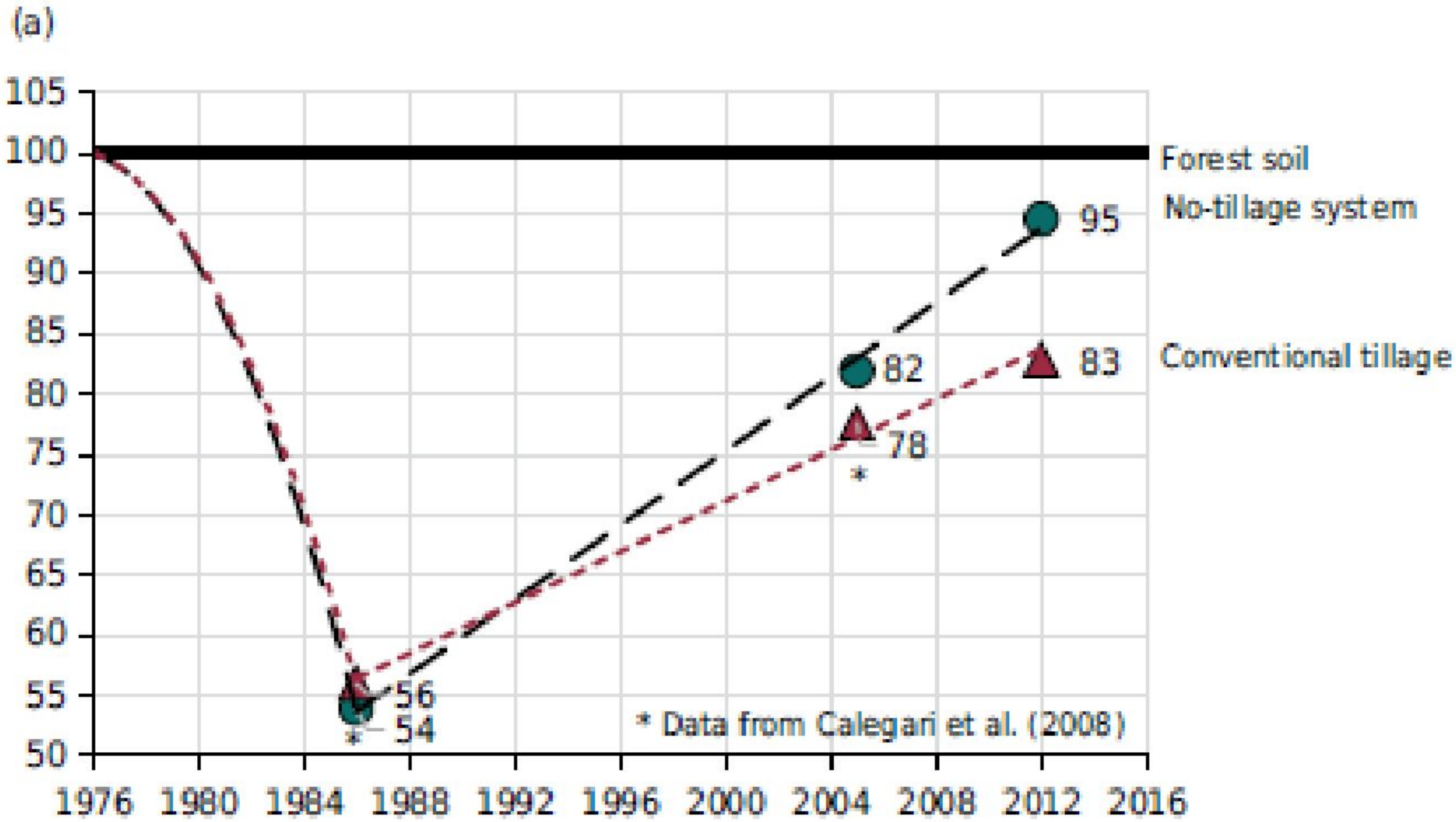
Burning of forests to clear land for cultivation during the 1950s and 1960s.
Conventional tillage until 1995-00.
NT system, which exponentially increased in Brazil from 1 million hectares in the early 1990s to 35 million hectares in 2022/23.

The aim of this study is to present a summary of the main results obtained in a long-term experiment, almost four decades, involving soil management systems and winter cover crops.

Rhodic Hapludox a high clay content.
Atlantic Forest until 1976 – after intensive soil tillage.
In 1986 the experimer was established: compare soil tillage's (CT and no-till system NT) and winter crops.



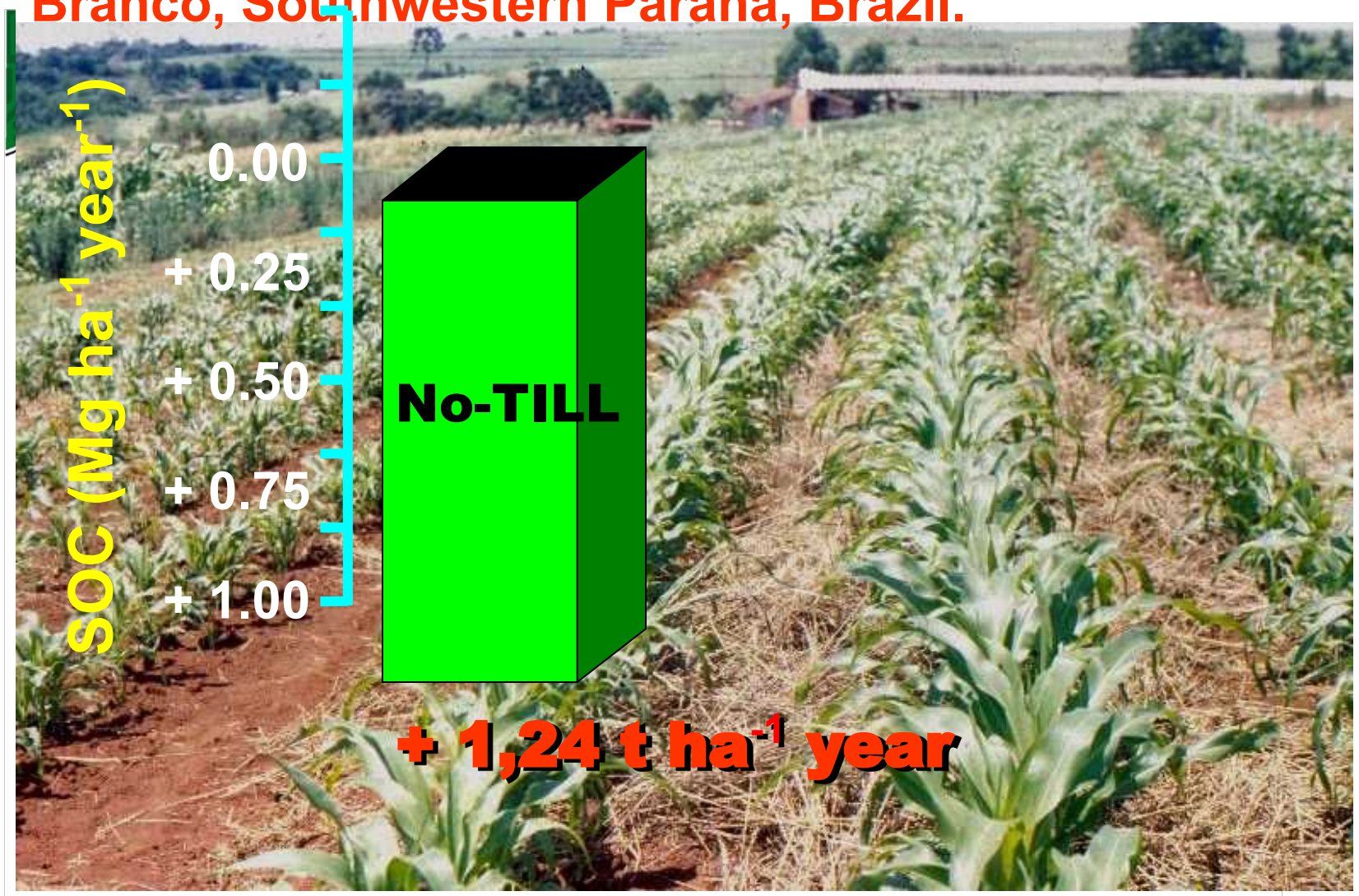


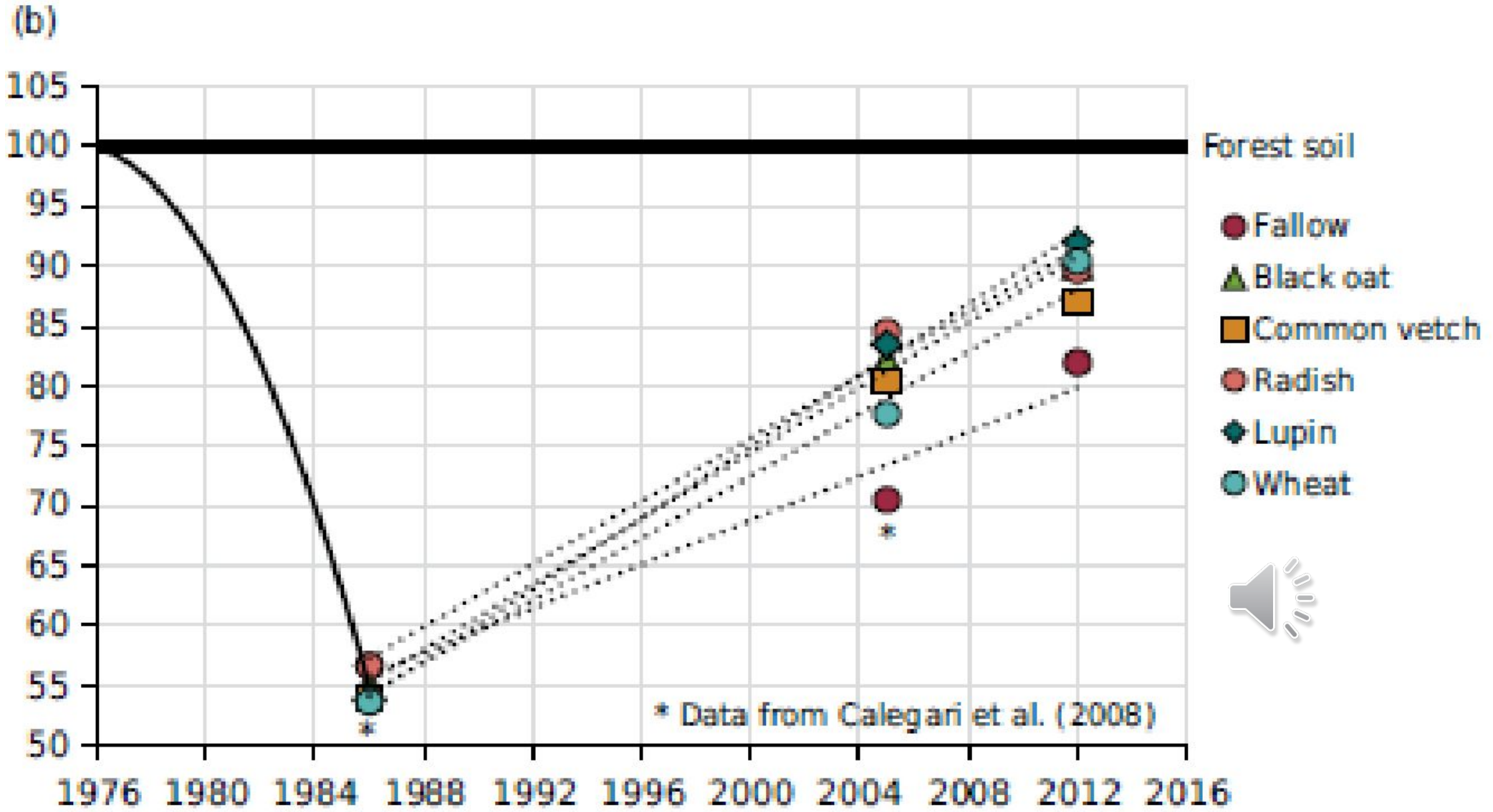
Soil organic carbon for different soil management in a Rhodic Hapludox in southwestern region of Parana State, Brazil.


SOYBEAN
OVER BLACK OAT MULCH


No-till maize over
hairy vetch +
black oat

SOIL ORGANIC CARBON (0 – 20 cm) - after 19 years – Pato Branco, Southwestern Paraná, Brazil.

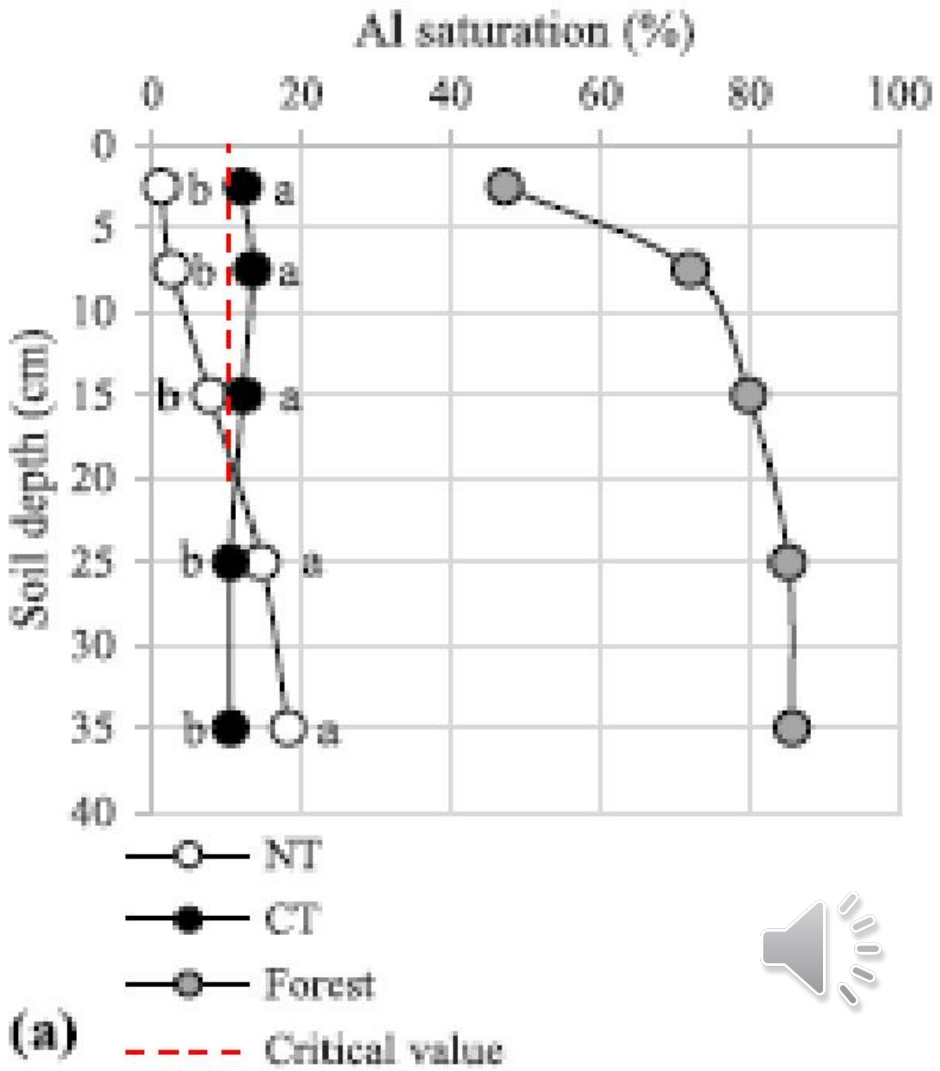


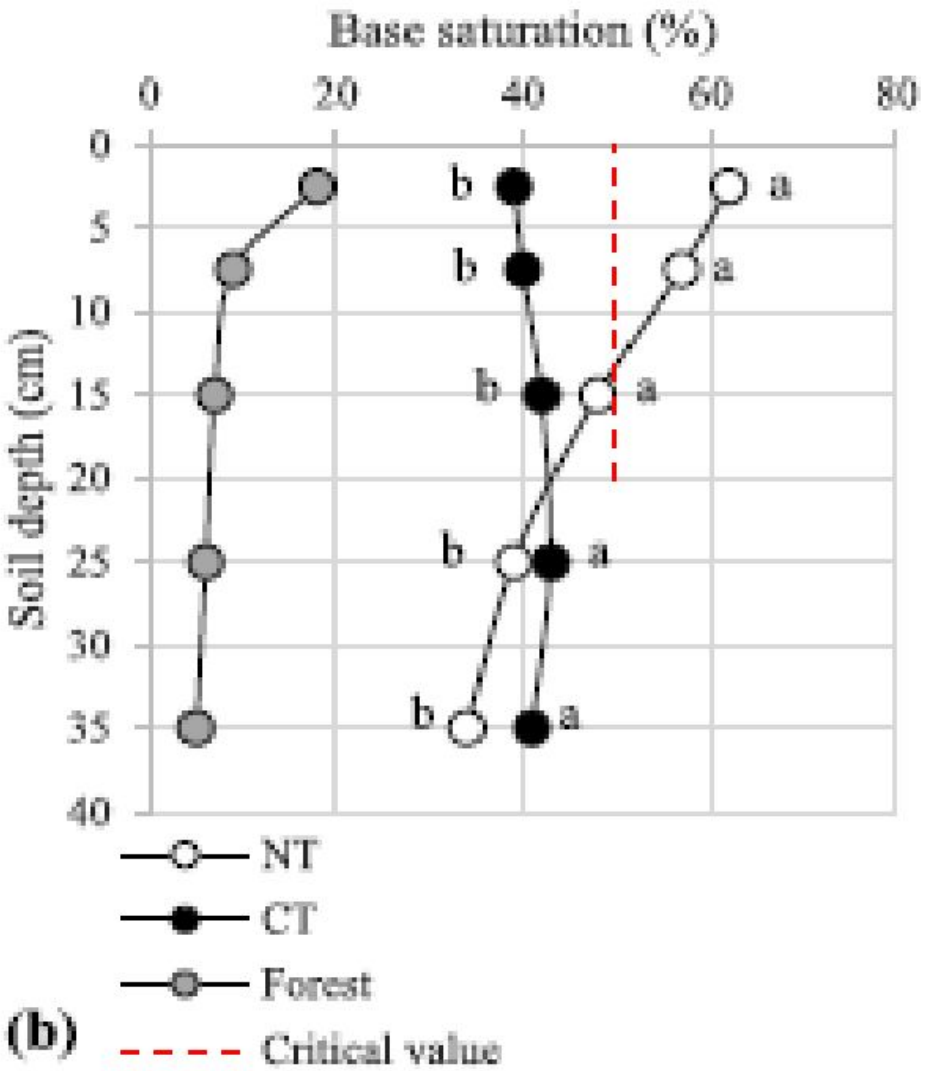


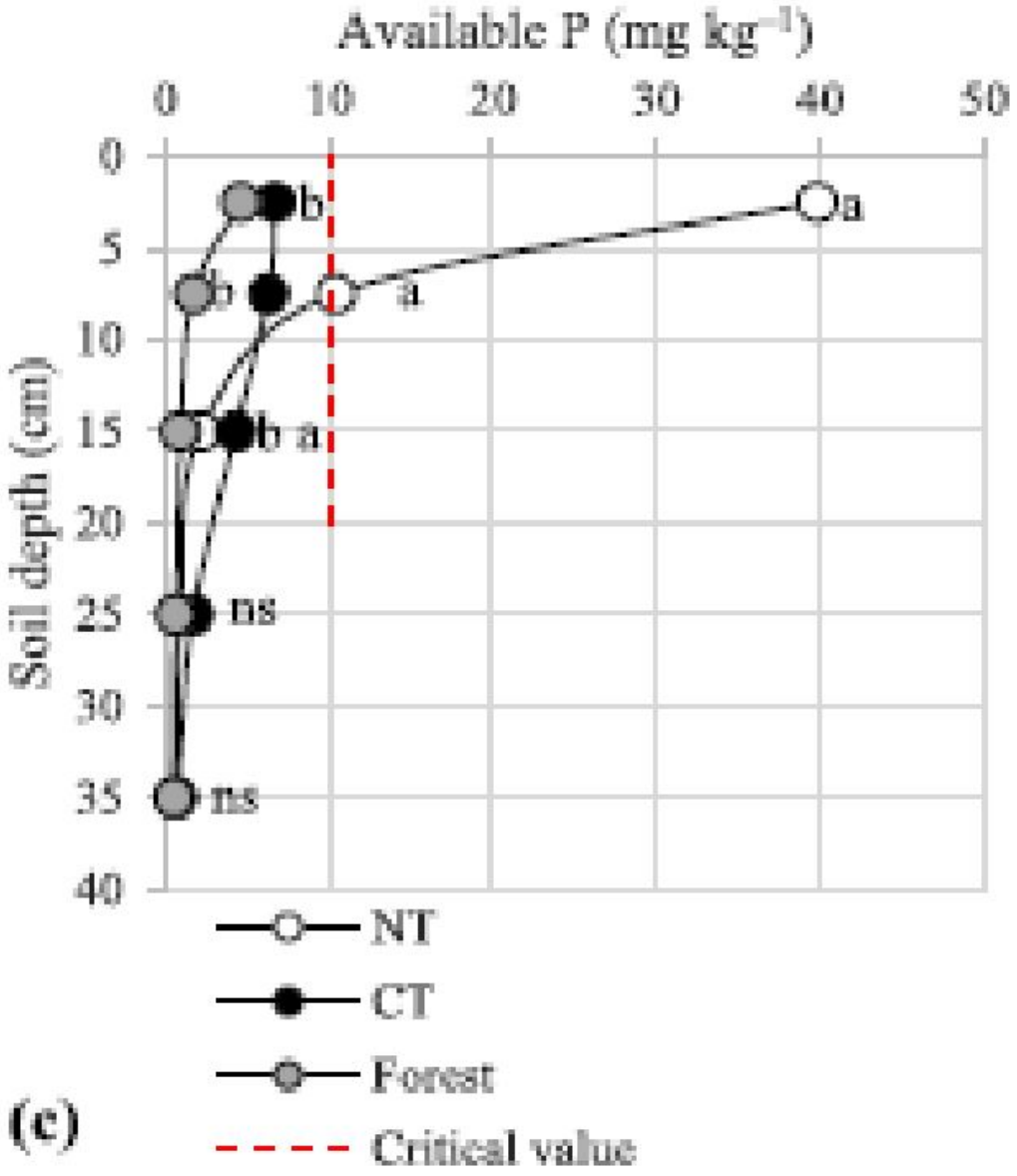
Soil organic carbon for different cropping systems in a Rhodic Hapludox in southwestern region of Parana State, Brazil.

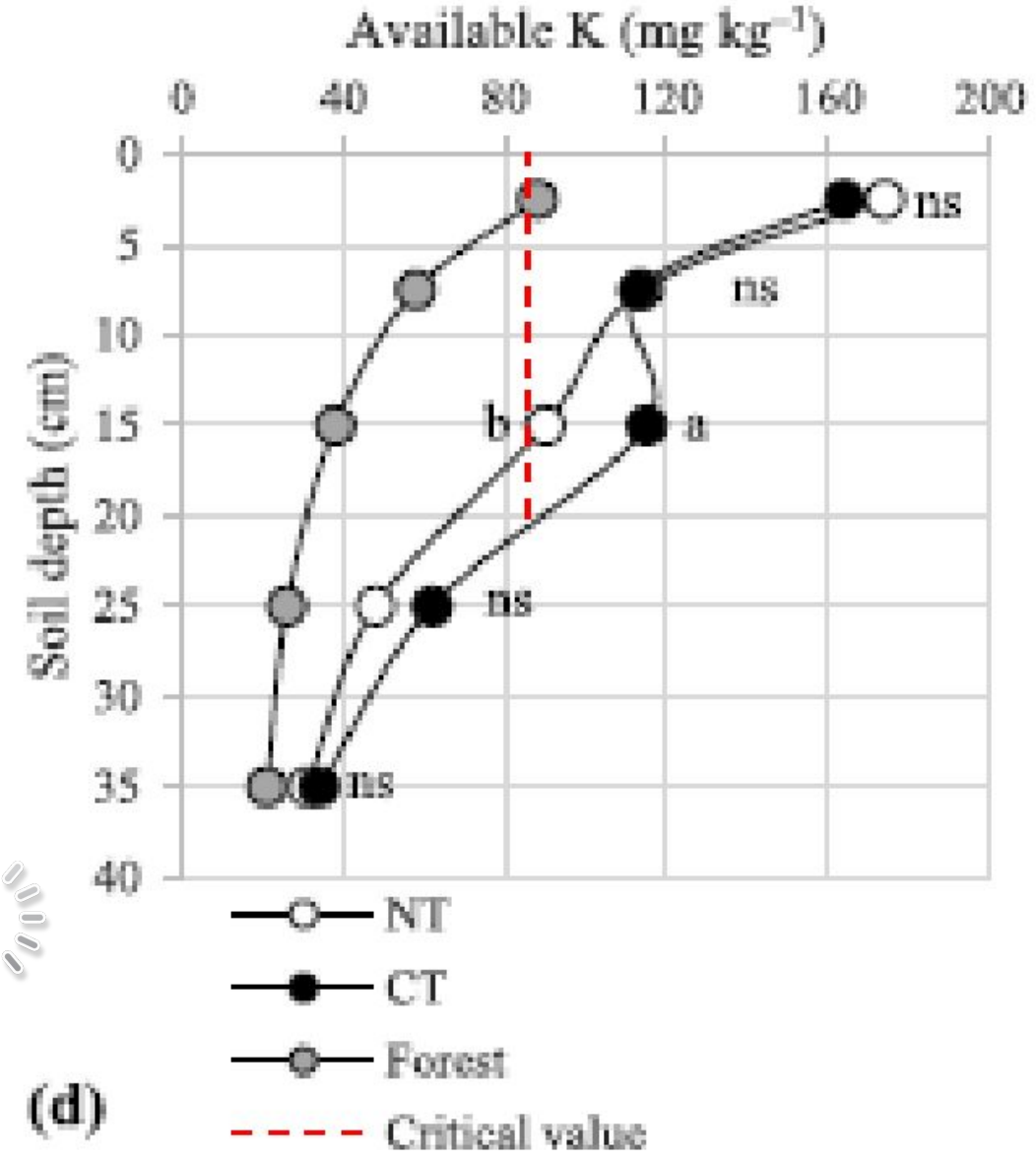
Mean weight diameter (MWD), geometric mean diameter (GMD), and aggregate stability (AS) in clayed Oxisol of Brazil affected by soil management and winter treatment

Soil layer (cm)	Soil management	MWD (mm)	GMD (mm)	AS (%)
0–10	No tillage	7.2 aA	4.1 aA	92 aA
	Conventional	4.2 bA	1.7 bA	85 bA
	Forest[a]	5.5	2.4	90
10–20	No tillage	6.5 aB	3.4 aB	92 aA
	Conventional	4.5 bA	1.9 bA	82 bA
	Forest[a]	6.0	2.6	89
Winter treatment				
	Fallow	5.1 b	2.1 b	86 b
	Vetch	5.8 a	2.8 a	90 a
	Lupin	5.8 a	2.7 *a*b	89 a
	Radish	5.7 a	2.7 *a*b	89 a
	Oat	5.7 a	3.3 a	90 a
	Wheat	5.6 a	3.2 a	89 a
	CV (%)	8.33	29.55	2.30


Al saturation (%)
0
20
40
60
80
100
Soil depth (cm)
0
5
10
15
20
25
30
35
40
b
a
NT
CT
Forest
Critical value
(a)


Base saturation (%)
0
20
40
60
80
Soil depth (cm)
0
5
10
15
20
25
30
35
40
b
a
NT
CT
Forest
Critical value
(b)


Available P (mg kg⁻¹)
0
10
20
30
40
50
Soil depth (cm)
0
5
10
15
20
25
30
35
40
b
a
b
a
b
a
ns
ns
NT
CT
Forest
Critical value
(c)


Available K (mg kg⁻¹)
0
40
80
120
160
200
Soil depth (cm)
0
5
10
15
20
25
30
35
40
ns
ns
b
a
ns
ns
NT
CT
Forest
Critical value
(d)

MICROBIAL

CARBON MICROBIAL BIOMASS mg kg^{-1}		NITROGEN MICROBIAL BIOMASS mg kg^{-1}		PHOSPHATASE ENZYME (mg PNP) kg^{-1} h^{-1}		ARYLSULFATASE ENZYME (mg PNP) kg^{-1} h^{-1}	
NO-TILL	CONV-TILL	NO-TILL	CONV-TILL	NO-TILL	CONV-TILL	NO-TILL	CONV-TILL
218-633	145-401	37-94	29-69	439-1435	470-721	37-97	24-65

The release of root exudates is one of the largest sources of substrate for microorganisms in the rhizosphere, increasing the diversity, number and the activity of microorganisms.

The multi species influences the soil microbial community and the biological processes and from 5 to 21% of all photosynthetically fixed carbon by plant is transferred to the rhizosphere through root exudates, which range from 20 to 50% of plant biomass.

Maize grain yield (Mg ha^{-1}) rotation with winter treatments. Exp. Station, Pato Branco, PR State, Brazil. IAPAR

	Soil management system	
Winter treatments	**No-tillage**	**Conventional tillage**
White Lupin + oat	8888 ab A	7166 a B
Hairy vetch	8814 ab A	7926 a A
Common vetch	9481 a A	8074 a B
Wheat	8055 bc A	8111 a A
Ryegrass	8555 abc A	8037 a A
Hairy vetch + black oat	9092 ab A	7055 a B
Rye	7999 bc A	7536 a A
Radish	7462 c A	7222 a A
Black oat	8444 abc A	7000 a B
Blue lupin IAPAR-24	9111 ab A	7500 a B
Fallow	8333 abc A	8036 a A
Average[1]	**8567 A**	**7606 B**

[1]Means followed by the same small letter down rows or capital letter. Across columns are not significantly different using the Tuckey test at $p = 0.05$
Interaction Soil management * winter treatments ; I = 1,21 DMS= 1301. Soil management Systems F= 24,38** . Winter treatments F= 2,40**

Advanced overview

Results shown that grow properly WC in NT, promote higher biodiversity, protecting and regenerating the soil attributes biological, physical, chemical, contribute to reducing greenhouse gases, leading to greatly improved economics compared to CT and increase cropping systems towards sustainability.

3 ACCA

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5-8 June 2023 | Rabat, Morocco

3ACCA Secretariat

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