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*Soil Research*

### Supplementary Material

#### **Responses of soil nutrients and microbial activity to the mill-mud application in a compaction-affected sugarcane field**

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## Supplementary Materials

**Table S1a** Variation analysis for selected physicochemical properties of pre-treatment soils.

**Table S1b** Variation analysis of key metal elements of pre-treatment soils.

**Table S2a** PCA loading factors of physicochemical properties of sugarcane field soil under different field mill-mud application.

**Table S2b** PCA loading factors of biological properties of sugarcane field soil under different field mill-mud application.

**Fig. S1** Sampling site description, soil cores (5) were randomly sampled within a subplot with a 5 cm diameter auger and divided into four layers of 0–10 cm, 10–20 cm, 20–40 cm and 40–60 cm depth in each subplot and bulked together to make a composite sample. Each point represents a sample core. Control treatment (CK, without mill-mud); mill-mud shallow furrow (ca. 20 cm) addition treatment (MS, mill-mud shallow furrow); deep trench treatment (DT, deep trench without mill-mud); deep mill-mud application (ca. 40 cm) treatment (MD, deep trench with mill-mud application).

**Table S1a**

Variation analysis for selected physicochemical properties of pre-treatment soils

Depth	pH			EC ( $\mu\text{S cm}^{-1}$ )			Sand%			Silt%			Clay%		
	Mean	‡STD	##CV%	Mean	STD	CV%	Mean	STD	CV%	Mean	STD	CV%	Mean	STD	CV%
0-10	6.01	0.26	4.38	29.08	2.91	9.04	58.20	5.43	9.34	37.30	4.90	13.15	4.50	0.52	11.46
10-20	5.92	0.55	9.22	19.30	2.22	9.06	55.20	6.24	11.30	39.60	5.45	13.76	5.20	0.72	13.91
20-40	5.92	0.38	6.43	18.60	2.14	8.12	54.20	7.15	13.20	38.70	5.51	14.24	7.10	1.02	14.31
40-60	6.26	0.38	6.01	21.96	2.99	9.28	50.90	7.03	13.82	41.20	5.12	12.43	7.90	0.96	12.11

**Table S1b**

Variation analysis for key metal elements of pre-treatment soils

Depth	Mg ( $\text{mg kg}^{-1}$ )			Pb ( $\text{mg kg}^{-1}$ )			Cu ( $\text{mg kg}^{-1}$ )			Ni ( $\text{mg kg}^{-1}$ )			Ti ( $\text{mg kg}^{-1}$ )			Mn ( $\text{mg kg}^{-1}$ )			Fe ( $\text{g kg}^{-1}$ )		
	Mean	STD	CV%	Mean	STD	CV%	Mean	STD	CV%	Mean	STD	CV%	Mean	STD	CV%	Mean	STD	CV%	Mean	STD	CV%
0-10	477.4	45.3	9.5	7.7	0.8	9.7	9.5	1.0	10.5	4.7	0.5	11.0	397.8	60.9	15.3	369.4	59.5	16.1	5.9	1.1	10.6
10--20	471.3	51.7	11.0	11.2	1.6	14.0	9.9	1.4	13.7	5.4	0.6	11.6	510.2	48.7	9.5	375.9	54.8	14.6	7.4	1.4	16.0
20-40	397.6	41.8	10.5	9.8	1.1	11.6	8.4	0.9	10.5	5.6	0.8	14.6	456.6	84.3	18.5	437.1	50.5	11.6	8.8	1.4	16.2
40-60	602.7	60.1	10.0	17.5	2.1	11.8	10.8	0.9	8.8	10.6	1.2	11.5	695.3	99.9	14.4	305.8	47.4	15.5	13.3	1.4	10.4

‡ STD (Standard deviation);

## CV (Coefficient of variation);

§§The reported data are the means of 6 composite samples across the paddock (ca. 50 ha). Means within a column for each depth followed by the same letter are not different at the  $P < 0.05$  level of significance.

**Table S2a**

PCA loading factors of physicochemical properties of sugarcane field soil under different field mill-mud application.

	BD	pH	C%	N%	total P (mg kg <sup>-1</sup> )	Colwell P (mg kg <sup>-1</sup> )	NH <sub>4</sub> (mg kg <sup>-1</sup> )	NO <sub>3</sub> (mg kg <sup>-1</sup> )	HWEOC (mg kg <sup>-1</sup> )	HWETN (mg kg <sup>-1</sup> )
Principal Component 1	-0.81	-0.28	0.86	0.82	0.81	0.72	0.65	0.49	0.86	0.78
Principal Component 2	-0.06	0.87	0.16	-0.30	0.38	0.52	-0.01	0.40	-0.36	-0.22

<sup>†</sup>BD, bulk density; TC, total C; TN, total N; TP, total P; HWEOC, hot water extractable organic C; HWETN, hot water extractable total N.

**Table S2b**

PCA loading factors of biological properties of sugarcane field soil under different field mill-mud application.

	Microbial Activity (μg fluorescein per g dry soil per hour )	Phosphatase Activities (μg <i>p</i> -np per g dry soil per hour)	β-glucosidase Activities (μg <i>p</i> -np per g dry soil per hour)	MBC (mg kg <sup>-1</sup> )	MBN (mg kg <sup>-1</sup> )
Principal Component 1	0.92	0.74	0.85	0.85	0.64
Principal Component 2	-0.25	0.03	0.13	-0.21	0.28

<sup>†</sup>*p*-np, *p*-nitrophenol.

Fig. S1

