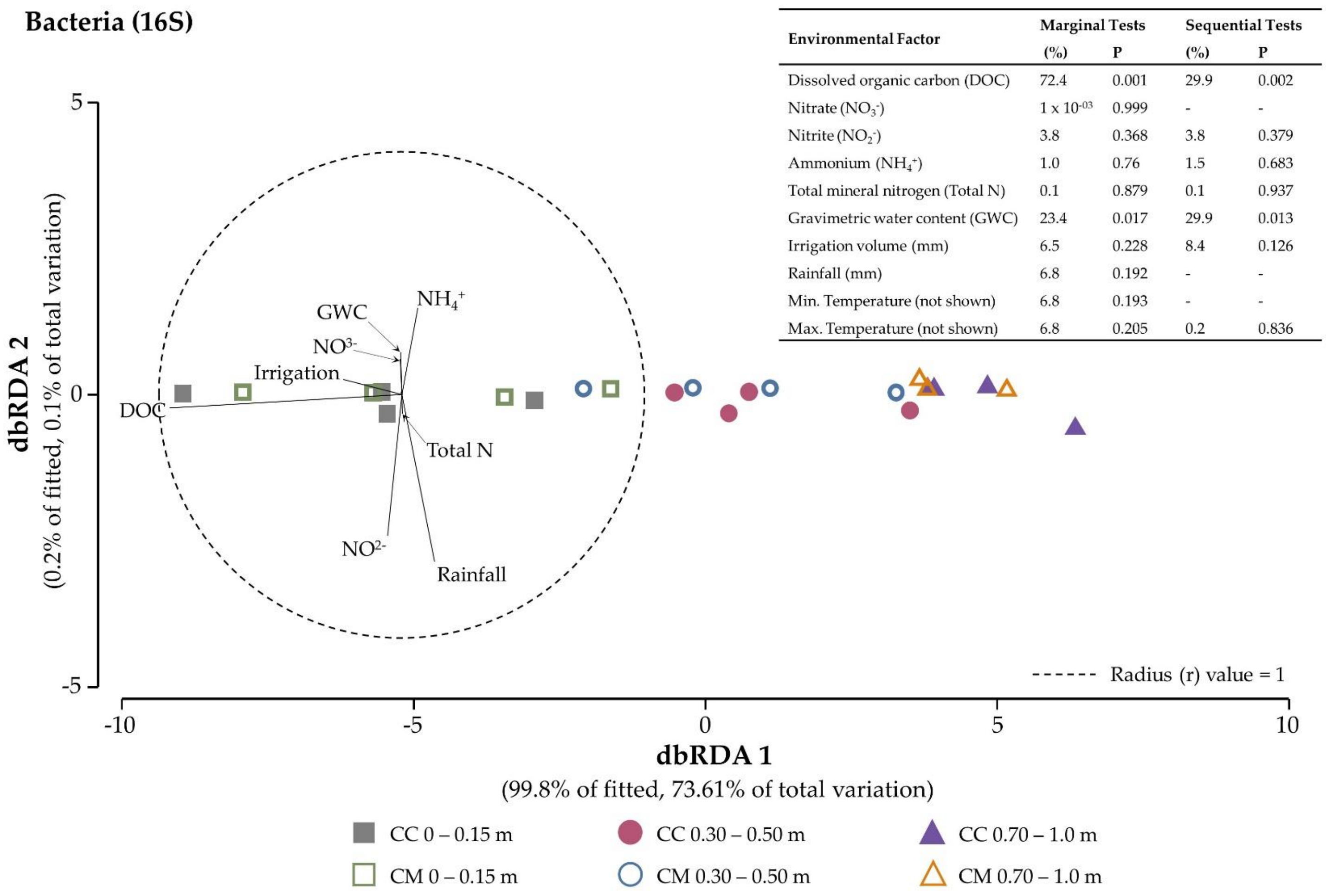

Environmental Factor	Marginal Tests (%)	Marginal Tests P	Sequential Tests (%)	Sequential Tests P
Dissolved organic carbon (DOC)	72.4	0.001	29.9	0.002
Nitrate (NO_3^-)	1×10^{-03}	0.999	-	-
Nitrite (NO_2^-)	3.8	0.368	3.8	0.379
Ammonium (NH_4^+)	1.0	0.76	1.5	0.683
Total mineral nitrogen (Total N)	0.1	0.879	0.1	0.937
Gravimetric water content (GWC)	23.4	0.017	29.9	0.013
Irrigation volume (mm)	6.5	0.228	8.4	0.126
Rainfall (mm)	6.8	0.192	-	-
Min. Temperature (not shown)	6.8	0.193	-	-
Max. Temperature (not shown)	6.8	0.205	0.2	0.836

Figure S1. Distance-based redundancy analysis (dbRDA) plot of 16S absolute abundance OTU data against environmental factors (Table S1) where, based on a distance-based linear model (DISTLM) sequential tests [1,2].

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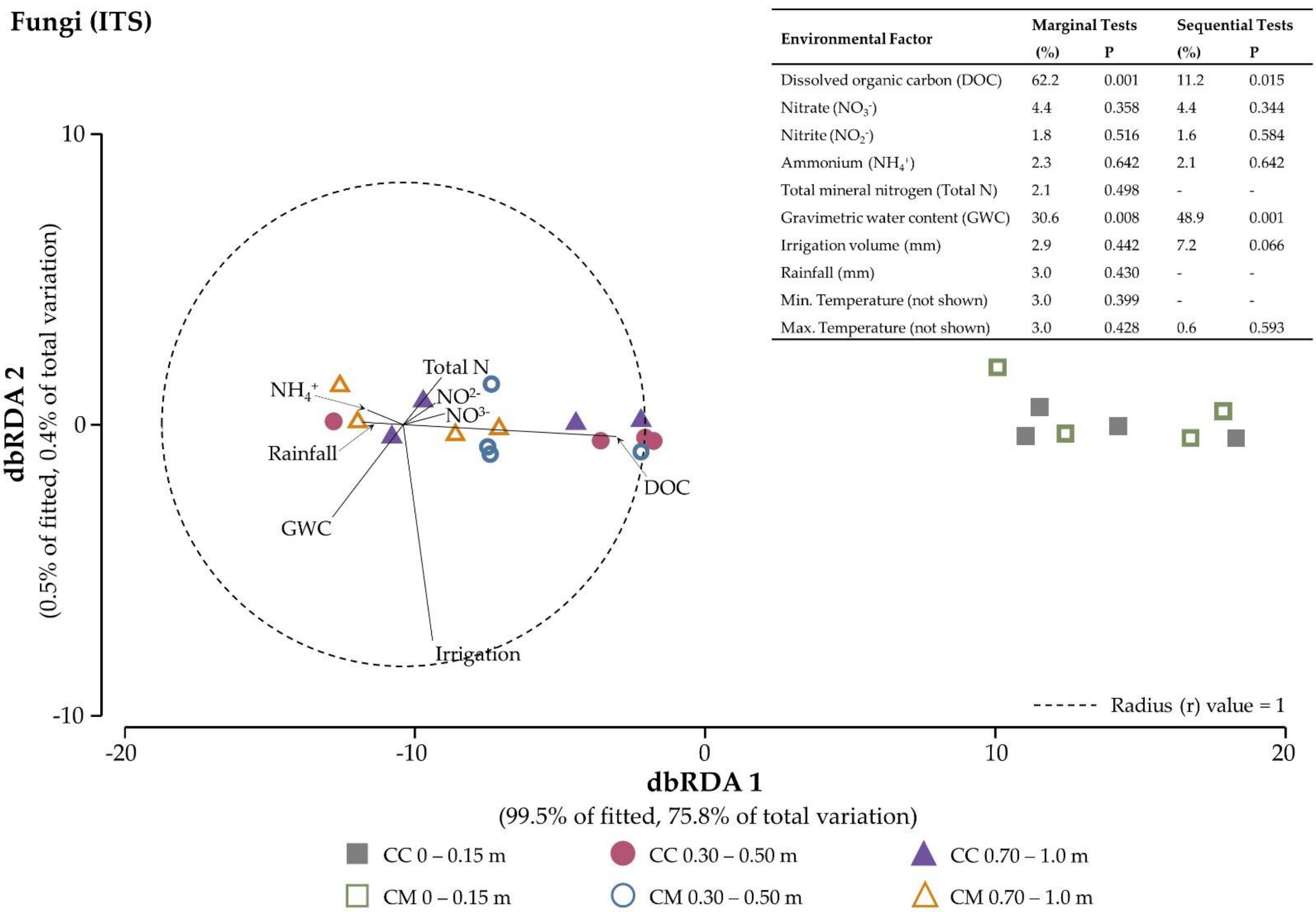
1. Legendre, P.; Anderson, M.J. Distance-based redundancy analysis: testing multispecies responses in multifactorial ecological experiments. *Ecological monographs* **1999**, *69*, 1-24.
2. Anderson, M.J.; Gorley, R.N.; Clarke, K.R. PERMANOVA+ for PRIMER: Guide to Software and Statistical Methods. First edition ed.; PRIMER-E: Plymouth, UK., 2008.



Environmental Factor	Marginal Tests (%)	P	Sequential Tests (%)	P
Dissolved organic carbon (DOC)	62.2	0.001	11.2	0.015
Nitrate (NO_3^-)	4.4	0.358	4.4	0.344
Nitrite (NO_2^-)	1.8	0.516	1.6	0.584
Ammonium (NH_4^+)	2.3	0.642	2.1	0.642
Total mineral nitrogen (Total N)	2.1	0.498	-	-
Gravimetric water content (GWC)	30.6	0.008	48.9	0.001
Irrigation volume (mm)	2.9	0.442	7.2	0.066
Rainfall (mm)	3.0	0.430	-	-
Min. Temperature (not shown)	3.0	0.399	-	-
Max. Temperature (not shown)	3.0	0.428	0.6	0.593

Figure S2. Distance-based redundancy analysis (dbRDA) plot of ITS absolute abundance OTU data against environmental factors (Table S1), based on a distance-based linear model (DISTLM) sequential tests [1,2].

References

1. Anderson, M.J.; Gorley, R.N.; Clarke, K.R. PERMANOVA+ for PRIMER: Guide to Software and Statistical Methods. First edition ed.; PRIMER-E: Plymouth, UK., 2008.
2. Legendre, P.; Anderson, M.J. Distance-based redundancy analysis: testing multispecies responses in multifactorial ecological experiments. *Ecological monographs* **1999**, *69*, 1-24.

Table S1. Compilation of available soil characteristics and environmental parameters over the two growing seasons. Underlined superscript numbers correspond to footnote numbers.

Time	System	Depth (m)	DOC (mg/kg) [1]	Mineral N (μg/g) [2]				P (μg P g^{-1} soil) [3]	Exchangeable cations (cmol(+) kg^{-1}) [4]				pH [4]
				NO_3^-	NO_2^-	NH_4^+	Total		K	Ca	Mg	Na	
S1 Pre Oct 2015	CC	0–0.15	-	34.5	39.1	0.1	73.7	-	1.4	18.3	8.5	0.5	7.2
		0.30–0.50	-	23.2	11.7	0.0	34.9	-	0.9	18.3	9.2	1.0	7.2
		0.70–1.0	-	11.5	41.0	0.0	52.6	-	1.0	15.5	10.1	1.8	7.4
	CM	0–0.15	-	20.9	51.4	0.0	72.3	-	1.6	17.5	8.1	0.4	7.2
		0.30–0.50	-	14.5	20.2	0.0	34.6	-	1.3	17.5	8.8	0.8	7.2
		0.70–1.0	-	6.4	4.5	0.0	10.9	-	1.1	16.0	9.9	1.6	7.3
S1 In Jan 2016	CC	0–0.15	72.4	47.0	0.0	0.0	47.0	669	-	-	-	-	-
		0.30–0.50	42.3	51.3	0.1	0.0	51.3	588	-	-	-	-	-
		0.70–1.0	22.5	25.5	0.1	3.6	29.2	629	-	-	-	-	-
	CM	0–0.15	64.0	43.1	0.0	0.0	43.1	680	-	-	-	-	-
		0.30–0.50	37.4	59.2	1.2	1.2	61.6	567	-	-	-	-	-

		0.70–1.0	27.8	8.4	0.0	0.0	8.5	824	-	-	-	-	-
S2 Pre Oct 2016	CC	0–0.15	-	5.6	0.1	1.4	7.1	-	-	-	-	-	-
		0.30–0.50	-	22.3	0.0	0.2	22.5	-	-	-	-	-	-
		0.70–1.0	-	30.2	0.0	0.6	30.8	-	-	-	-	-	-
	CM	0–0.15	-	3.1	0.2	0.5	3.8	-	-	-	-	-	-
		0.30–0.50	-	18.8	0.1	0.3	19.3	-	-	-	-	-	-
		0.70–1.0	-	19.3	0.1	0.4	19.8	-	-	-	-	-	-
S2 In Jan 2017	CC	0–0.15	84.7	9.4	0.0	3.1	12.5	-	-	-	-	-	-
		0.30–0.50	48.5	16.3	0.1	1.5	17.9	-	-	-	-	-	-
		0.70–1.0	29.6	34.3	0.0	1.7	36.0	-	-	-	-	-	-
	CM	0–0.15	80.4	29.0	0.0	1.9	30.9	-	-	-	-	-	-
		0.30–0.50	53.8	9.3	0.0	1.2	10.6	-	-	-	-	-	-
		0.70–1.0	32.4	15.1	0.1	13.0	28.2	-	-	-	-	-	-

[1] Water extractable DOC, subset of data published in Osanai, *et al.* [1]

[2] Mineral N extracted in 2M KCl and analysed using a San++ Automated Wet Chemistry Analyser (Continuous Flow Analyzer) (Skalar Analytical B.V., Netherlands).

[3] Total extractable P, subset of data published in Polain, *et al.* [2]

[4] Exchangeable cations extracted in alcoholic 1 M NH_4Cl solution at pH 8.5 and soil pH determined using 0.01 M $CaCl_2$, with methods and data published in Hulugalle, *et al.* [3]

[5] Gravimetric Water Content (GWC) determined by drying a known mass of sample at 100°C for 3 days until a stable weight was obtained, where soil water content (g/g) was the difference in soil weight (g) between field fresh and oven dried soils, divided by the weight of oven dried soils (g).

[6] Irrigation volumes were retrieved from Nachimuthu, *et al.* [4]

[7] Rainfall and soil temperatures were accessed via the CottASSIST web tool developed by CSIRO [5]. Rainfall is the cumulative total for the three months prior to sampling.

References

1. Osanai, Y.; Knox, O.; Nachimuthu, G.; Wilson, B. Increasing soil organic carbon with maize in cotton-based cropping systems: Mechanisms and potential. *Agriculture, Ecosystems & Environment* **2020**, *299*, 106985.
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5. CSIRO. CottASSIST. Availabe online: https://www.cottassist.com.au/ (accessed on 2018).