Supplementary

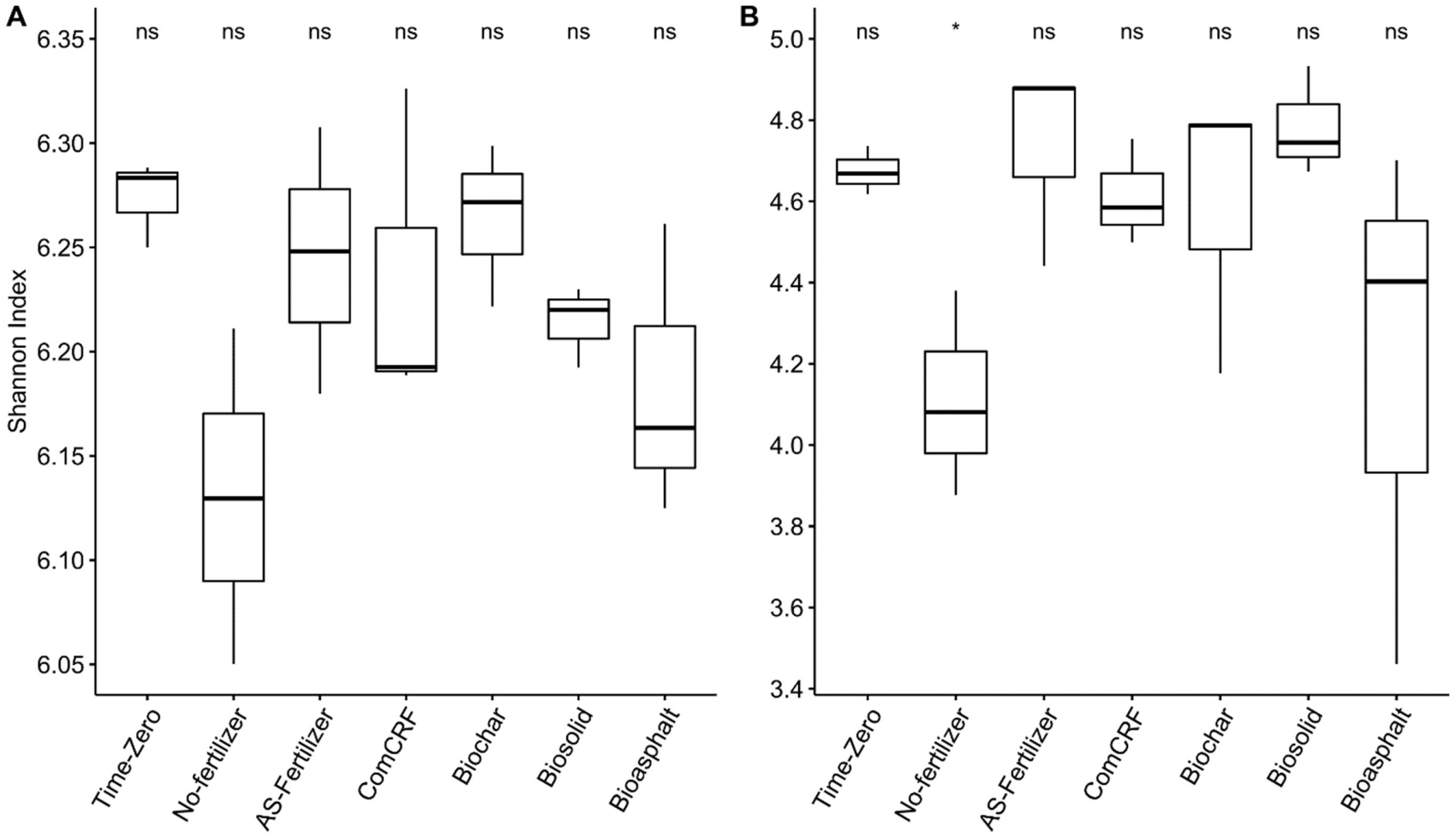

Figure S1: Alpha diversity using Shannon index, Bacterial (A) and Fungal (B) asterisk represent comparisons made using Kruskal-Wallis test with *p<0.05.

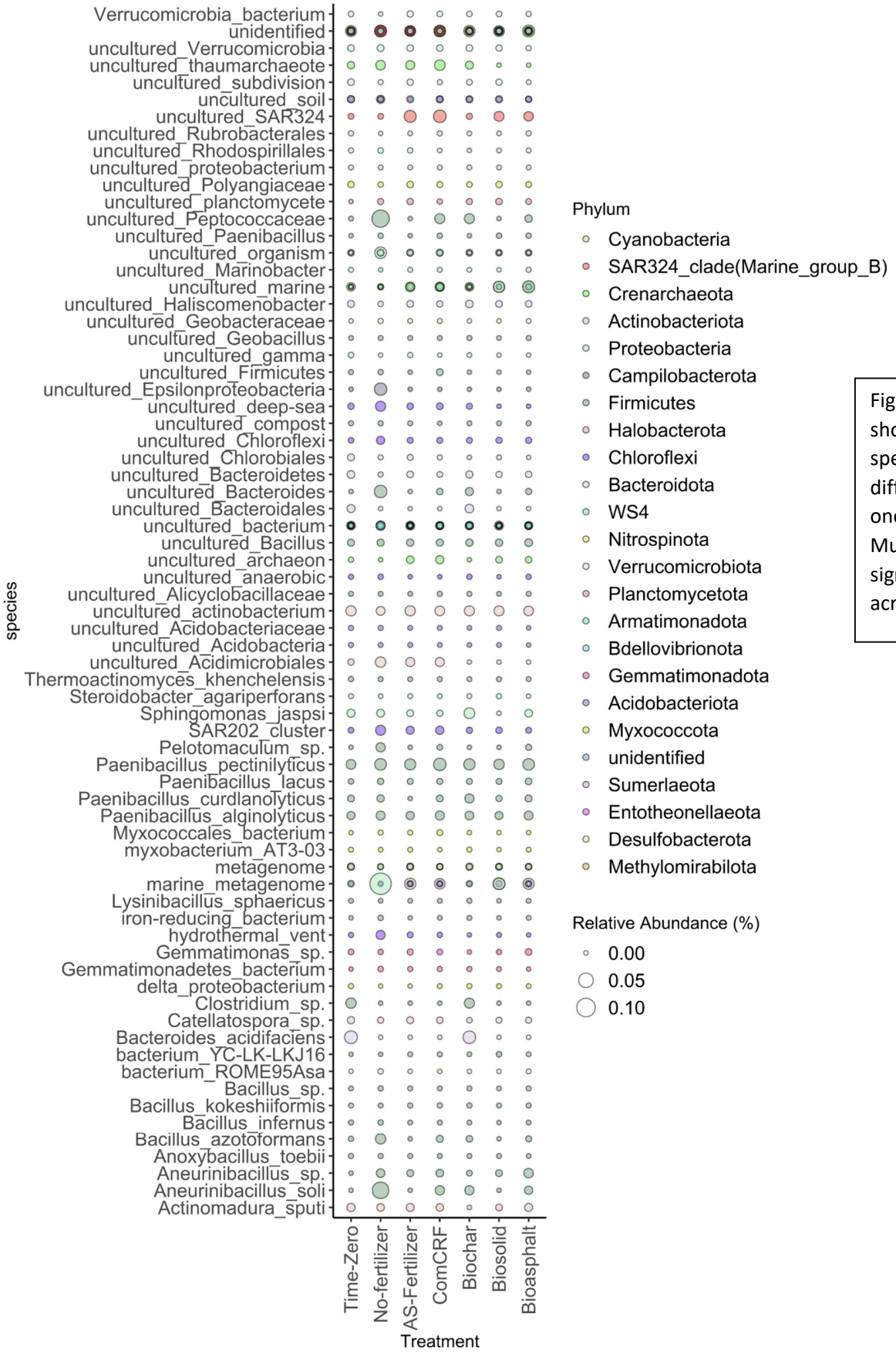

Figure S2: Bubble plot showing prokaryotic species significantly different for at least one treatment. Multiple dots together signify same grouping across different phyla.

Tables

Table S1: Corn yield and Biomass

Treatment	Yield	Biomass
Control	55.73 ± 7.73	85.36 ± 8.30
AS	133.94 ± 24.58	149.23 ± 3.40
CCRF	152.00 ± 9.17	157.60 ± 6.65
S1 – Biochar[ɵ]	165.20 ± 4.43	156.57 ± 18.27
S2 – Biosolid[ɵ]	172.53 ± 6.24	142.60 ± 6.36
S3 – Bioasphalt[ɵ]	131.33 ± 11.59	133.16 ± 7.30

∗Data published in another paper that is under review ɵ Sample names used in this study

Table S2: Fertilizer descriptions (wt. % amount with moistures)

Treatment	Descriptions	Yield (g)
Time zero	-	-
Control (No-Fertilizer)	-	55.73
Ammonium Sulphate (AS)	99% Pure AS (21-0-0)	133.94
ComCRF	Proprietary formulation	152.00
Biochar (S1)	40% AS + 55% BC + 5% RS	165.20
Biosolid (S2)	50% AS + 15% BC + 15% BS + 20% RS	172.50
Bioasphalt (S3)	15% AS + 30% BC + 10% Be + 45% BA	131.31

BC = Biochar, RS = Rice starch, BS = Biosolid, BA = Bio-asphalt, Be = Bentonite

Table S3: Soil Properties

Properties	Average	Units
pH	7.933	
Soluble Salts	0.267	mmholem
Organic matter	4.133	LOI-%
KCl-nitrate	6.400	ppm N
Nitrate (0-8 in)	15.333	Lbs N/A
Phosphorus	61.000	ppm P
Potassium	230.333	ppm
Calcium	2821.000	ppm
Magnesium	366.000	ppm
Sodium	13.333	ppm
Sufate	14.667	ppm S
Zinc	11.517	ppm
Iron	15.833	ppm
Manganese	4.900	ppm
Copper	0.840	ppm
Sum of Cations	17.800	me/100g

H	0.000	% Base Saturation
K	3.000	% Base Saturation
Ca	79.333	% Base Saturation
Mg	17.000	% Base Saturation
Na	0.333	% Base Saturation

Table S4: Commercial fertilizer ingredients

Ingredients	**Percent**	**MF**
Total Nitrogen	15%	N
Available Phosphate	9%	P_2O_5
Soluble Potash	12%	K_2O
Magnesium	1.30%	Mg
Sulphur	6%	S
Boron	0.02%	B
Copper	0.05%	Cu
Iron	0.46%	Fe
Manganese	0.06%	Mn
Molybdenum	0.02%	Mo
Zinc	0.05%	Zn

Table S5: Taxonomic distribution of the prokaryotic community in soil for each treatment

Taxa Level	AS-Fertilizer	Bioasphalt	Biochar	Biosolid	ComCRF	No-fertilizer	Time-Zero
phylum	35*	40	37	37	38	**44**$^{\Psi}$	35*
class	86	97	95	90	98	**112**$^{\Psi}$	85*
order	207	217	220	203*	218	**244**$^{\Psi}$	209
family	296	315	325	286*	309	**347**$^{\Psi}$	314
genus	474	**536**$^{\Psi}$	509	469*	486	533	522
species	274*	**320**$^{\Psi}$	301	282	299	313	300

$^{\Psi}$Highest *Lowest

Table S6: Taxa different in high yield compared to other treatments at lowest taxa.

High Yield	**Other**	**Taxa**
Biochar	Bioasphalt	d__Bacteria.p__Firmicutes.c__Clostridia.o__Clostridia.f__Hungateiclostridiaceae.g__Acetivibrio.s__uncultured_bacterium
Biochar	Time Zero Soil	d__Bacteria.p__Firmicutes.c__Bacilli.o__Thermoactinomycetales.f__Thermoactinomycetaceae.g__Shimazuella.s__Shimazuella_sp.
Biochar	Bioasphalt	d__Bacteria.p__Bacteroidota.c__Bacteroidia.__.__.__.__
Biochar	No fertilizer	d__Bacteria.p__Bacteroidota.c__Bacteroidia.__.__.__.__
Biochar	Time Zero Soil	d__Bacteria.p__Bacteroidota.c__Bacteroidia.__.__.__.__
Biochar	Bioasphalt	d__Bacteria.p__Proteobacteria.c__Gammaproteobacteria.o__Methylococcales.f__Methylococcaceae.g__Methylocaldum.s__Methylocaldum_tepidum
Biochar	No fertilizer	d__Bacteria.p__Proteobacteria.c__Gammaproteobacteria.o__Methylococcales.f__Methylococcaceae.g__Methylocaldum.s__Methylocaldum_tepidum
Biosolid	No fertilizer	d__Bacteria.p__Actinobacteriota.c__Actinobacteria.o__Frankiales.f__Geodermatophilaceae.__.__
Biosolid	Time Zero Soil	d__Bacteria.p__Acidobacteriota.c__Vicinamibacteria.o__Subgroup_17.f__Subgroup_17.g__Subgroup_17.__
Biosolid	No fertilizer	d__Bacteria.p__Proteobacteria.c__Gammaproteobacteria.o__Burkholderiales.f__Burkholderiaceae.__.__
Biochar	Biosolid	d__Bacteria.p__Verrucomicrobiota.c__Verrucomicrobiae.o__Chthoniobacterales.f__Chthoniobacteraceae.g__Chthoniobacter.s__uncultured_Spartobacteria
Biochar	Biosolid	d__Bacteria.p__Proteobacteria.c__Gammaproteobacteria.o__Methylococcales.f__Methylococcaceae.g__Methylocaldum.s__Methylocaldum_tepidum

Table S7: Taxonomic distribution of the fungal community in soil for each treatment

TaxaLevel	**AS-Fertilizer**	**Bioasphalt**	**Biochar**	**Biosolid**	**ComCRF**	**No-fertilizer**	**Time-Zero**
phylum	**10** $^{\Psi}$	9	9	**10** $^{\Psi}$	**10** $^{\Psi}$	9	**10** $^{\Psi}$
class	16*	16*	16*	**18** $^{\Psi}$	17	16*	16*
order	23*	24	24	**26** $^{\Psi}$	24	23*	24
family	27	26	26	**28** $^{\Psi}$	25*	25*	25*
genus	28	27	27	**30** $^{\Psi}$	25*	26	28
species	**28** $^{\Psi}$	26	24*	**28** $^{\Psi}$	24*	25	27

$^{\Psi}$Highest *Lowest

Table S8: Genera of fungus significantly different for treatment method

group1	group2	p	p.adj	p.format	p.signif	method	taxa
Time-Zero	ComCRF	0.000629	0.0063	0.00063	***	Wilcoxon	unidentified
Time-Zero	AS-Fertilizer	0.004263	0.034	0.00426	**	Wilcoxon	unidentified
Time-Zero	Biosolid	0.031319	0.19	0.03132	*	Wilcoxon	unidentified
No-fertilizer	ComCRF	0.000817	0.0074	0.00082	***	Wilcoxon	unidentified
No-fertilizer	Bioasphalt	0.038035	0.19	0.03803	*	Wilcoxon	unidentified
No-fertilizer	AS-Fertilizer	7.13E-22	1.50E-20	< 2e-16	****	Wilcoxon	unidentified
No-fertilizer	Biosolid	6.74E-19	1.30E-17	< 2e-16	****	Wilcoxon	unidentified
Biochar	ComCRF	0.000262	0.0029	0.00026	***	Wilcoxon	unidentified
Biochar	AS-Fertilizer	0.007398	0.052	0.0074	**	Wilcoxon	unidentified
Biochar	Biosolid	0.049275	0.2	0.04928	*	Wilcoxon	unidentified
Time-Zero	No-fertilizer	0.009901	0.2	0.0099	**	Wilcoxon	Mortierella
No-fertilizer	Biochar	0.013806	0.26	0.0138	*	Wilcoxon	Mortierella
No-fertilizer	ComCRF	0.04703	0.8	0.047	*	Wilcoxon	Mortierella
No-fertilizer	AS-Fertilizer	0.005601	0.12	0.0056	**	Wilcoxon	Mortierella
No-fertilizer	Biosolid	0.024235	0.44	0.0242	*	Wilcoxon	Mortierella
Time-Zero	No-fertilizer	0.026364	0.45	0.02636	*	Wilcoxon	Aspergillus
Time-Zero	ComCRF	0.000443	0.0093	0.00044	***	Wilcoxon	Aspergillus
Time-Zero	Bioasphalt	0.005904	0.11	0.0059	**	Wilcoxon	Aspergillus
Biochar	ComCRF	0.005153	0.1	0.00515	**	Wilcoxon	Aspergillus
Biochar	Bioasphalt	0.04267	0.64	0.04267	*	Wilcoxon	Aspergillus
ComCRF	AS-Fertilizer	0.02807	0.45	0.02807	*	Wilcoxon	Aspergillus
ComCRF	Biosolid	0.005852	0.11	0.00585	**	Wilcoxon	Aspergillus
Bioasphalt	Biosolid	0.049567	0.69	0.04957	*	Wilcoxon	Aspergillus
Time-Zero	ComCRF	0.002784	0.058	0.0028	**	Wilcoxon	Mauginiella
Time-Zero	Bioasphalt	0.010507	0.21	0.0105	*	Wilcoxon	Mauginiella
No-fertilizer	ComCRF	0.021577	0.41	0.0216	*	Wilcoxon	Mauginiella
Biochar	ComCRF	0.021577	0.41	0.0216	*	Wilcoxon	Mauginiella
ComCRF	AS-Fertilizer	0.021577	0.41	0.0216	*	Wilcoxon	Mauginiella
ComCRF	Biosolid	0.021569	0.41	0.0216	*	Wilcoxon	Mauginiella
Time-Zero	No-fertilizer	0.000233	0.0047	0.00023	***	Wilcoxon	Psathyrella
Time-Zero	Biochar	0.005221	0.094	0.00522	**	Wilcoxon	Psathyrella
Time-Zero	Bioasphalt	0.001755	0.033	0.00175	**	Wilcoxon	Psathyrella
Time-Zero	AS-Fertilizer	0.048945	0.73	0.04895	*	Wilcoxon	Psathyrella
Time-Zero	Biosolid	0.006313	0.11	0.00631	**	Wilcoxon	Psathyrella
ComCRF	AS-Fertilizer	0.027611	0.44	0.02761	*	Wilcoxon	Psathyrella
No-fertilizer	AS-Fertilizer	0.043599	0.92	0.044	*	Wilcoxon	Batrachochytrium
Biochar	Biosolid	0.043868	0.92	0.044	*	Wilcoxon	Bannoa
Time-Zero	ComCRF	0.013427	0.28	0.013	*	Wilcoxon	Dactylella
Time-Zero	Bioasphalt	0.03693	0.74	0.037	*	Wilcoxon	Dactylella
Time-Zero	No-fertilizer	0.00583	0.12	0.0058	**	Wilcoxon	Mrakia
Time-Zero	ComCRF	0.033699	0.61	0.0337	*	Wilcoxon	Mrakia
No-fertilizer	Biochar	0.023889	0.45	0.0239	*	Wilcoxon	Mrakia
No-fertilizer	Biosolid	0.013021	0.26	0.013	*	Wilcoxon	Mrakia
No-fertilizer	ComCRF	0.048128	0.96	0.048	*	Wilcoxon	Scutellinia

group1	group2	p	p.adj	p.format	p.signif	method	taxa
No-fertilizer	Bioasphalt	0.048128	0.96	0.048	*	Wilcoxon	Scutellinia
No-fertilizer	AS-Fertilizer	0.027636	0.58	0.028	*	Wilcoxon	Scutellinia
Time-Zero	No-fertilizer	0.003884	0.07	0.0039	**	Wilcoxon	Bipolaris
Time-Zero	ComCRF	0.001084	0.022	0.0011	**	Wilcoxon	Bipolaris
Time-Zero	Bioasphalt	0.001084	0.022	0.0011	**	Wilcoxon	Bipolaris
Time-Zero	AS-Fertilizer	0.015635	0.25	0.0156	*	Wilcoxon	Bipolaris
Time-Zero	Biosolid	0.010889	0.19	0.0109	*	Wilcoxon	Bipolaris