

Sea minerals reduce dysbiosis, improve pasture productivity and plant morphometrics in pasture dieback affected soils

Supplementary Data

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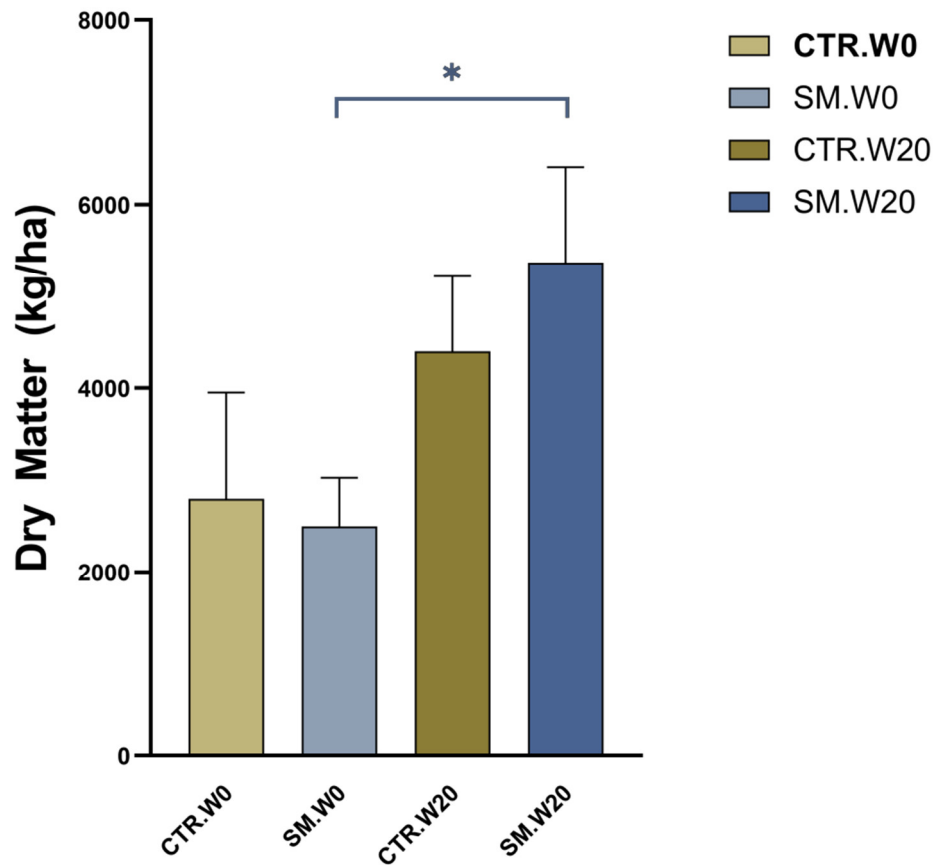


Figure S1. Dry matter alterations 20 weeks post SM application. * = $p < 0.05$

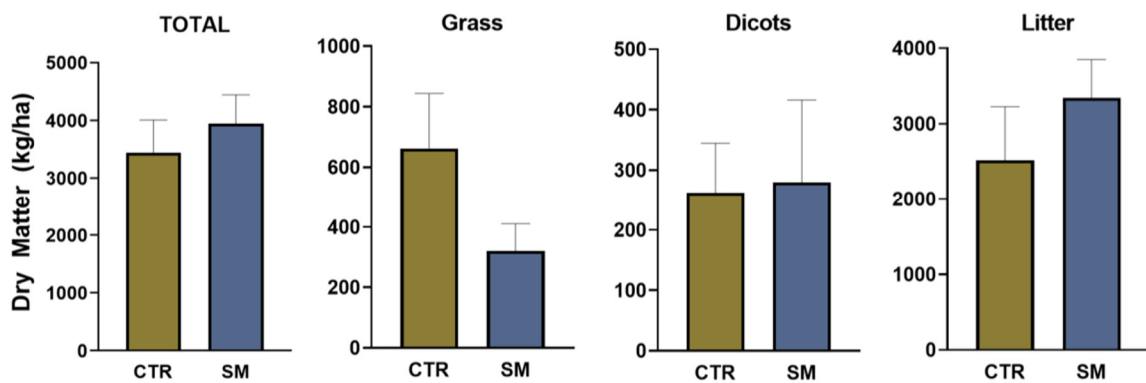


Figure S2. Eleven months after the single application, dry matter showed marginally increased total dry matter in SM compared to CTR, the same trend from the data at 20 weeks. Additionally, the amount of grass was noticeably but marginally lower.

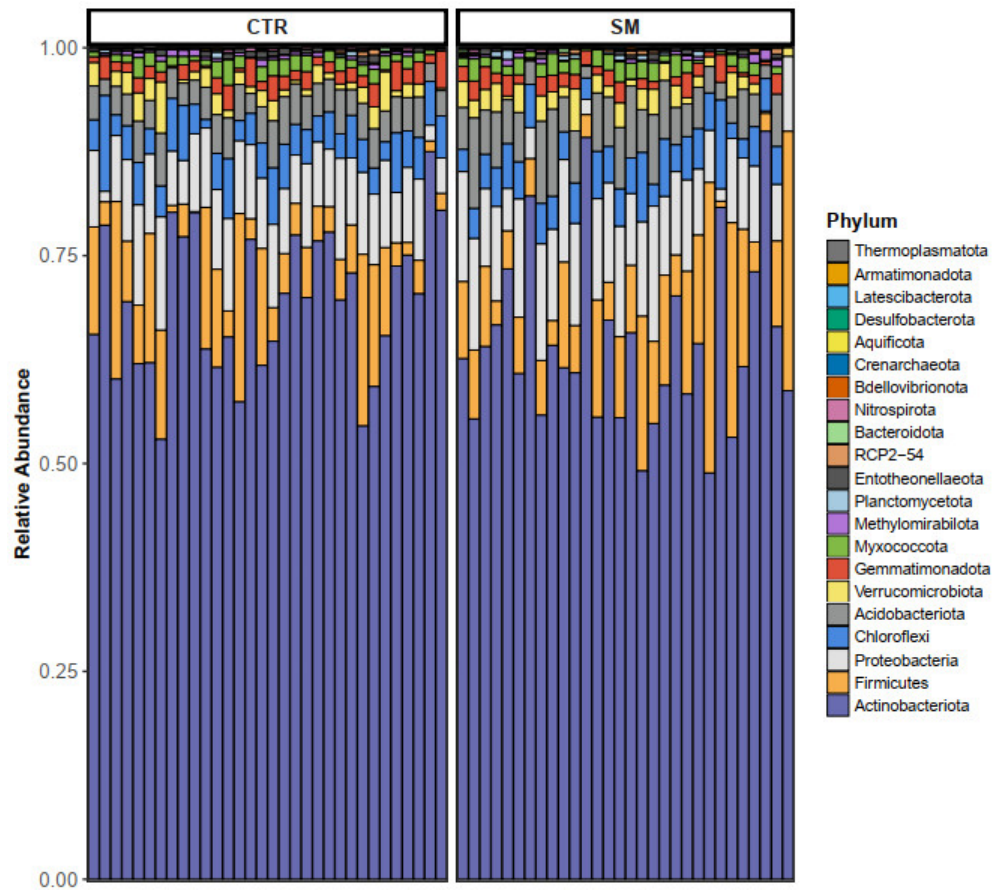


Figure S3. Phylum level taxa. Each bar represents one sample.

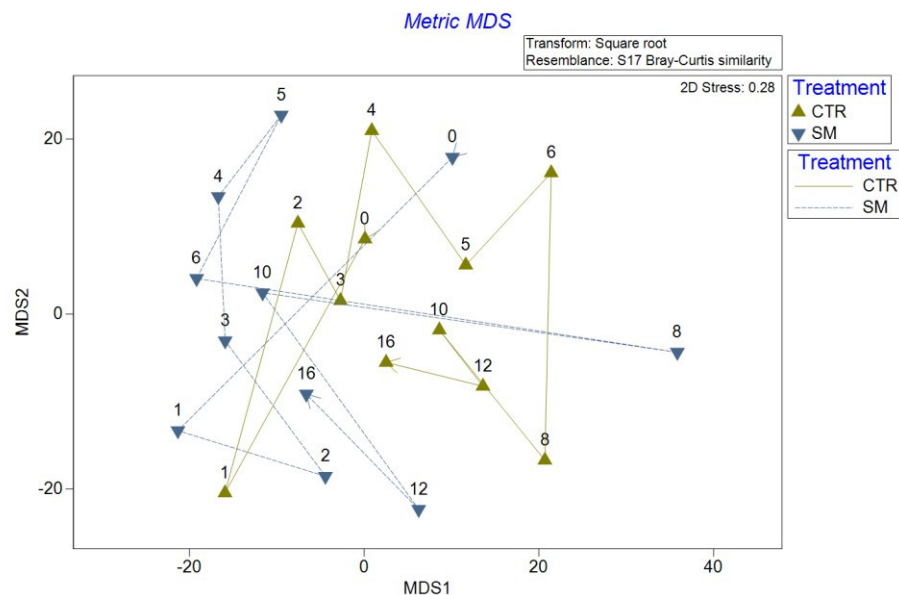


Figure S4. Temporal variation in microbiota maturation. The number above each sample shows the sampling week for CTR and SM separately. No major deviations in community structure are observed.

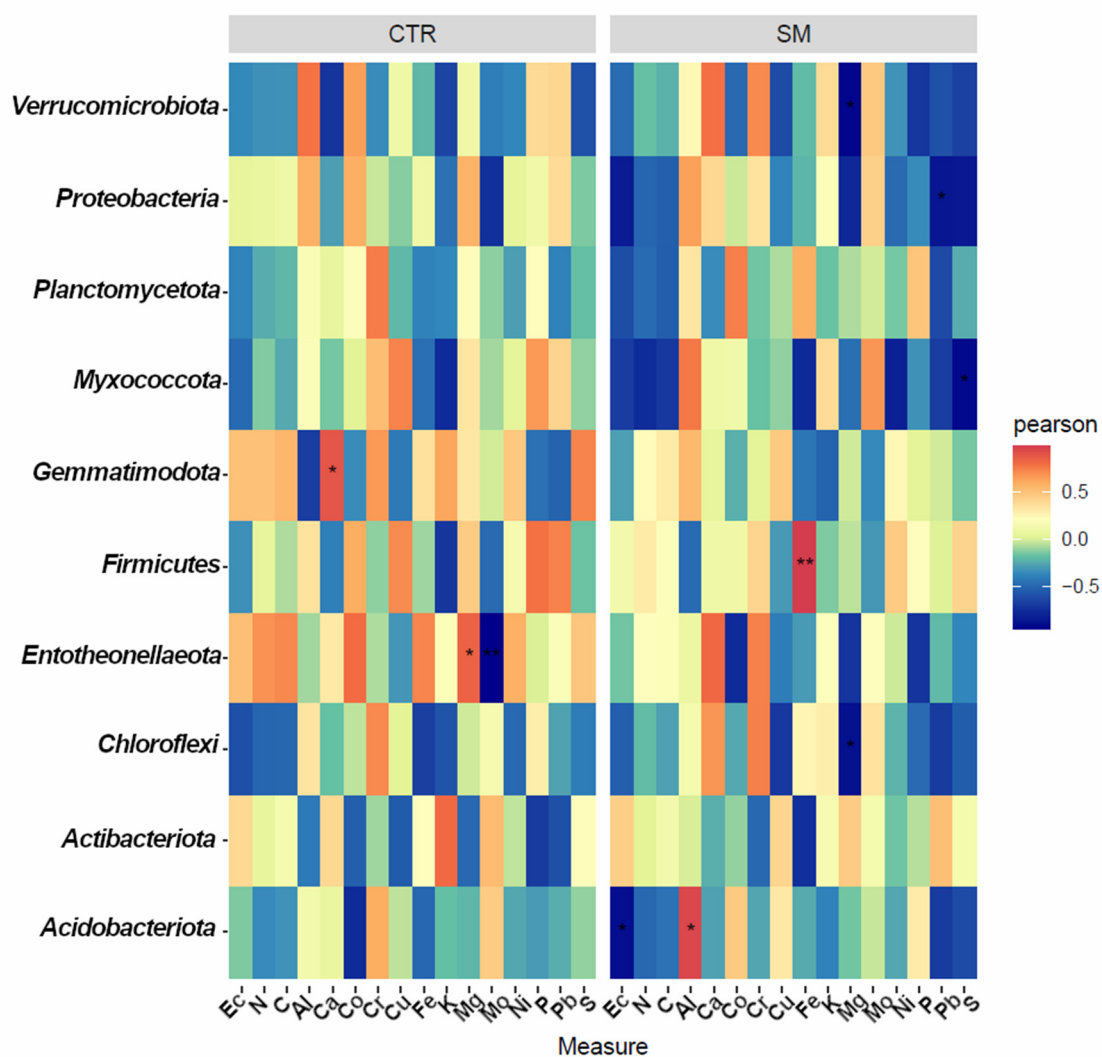


Figure S5. Interactions of soil chemistry parameters with the Phylum level microbiota analysed separately in CTR and SM. Blue colours indicate a negative correlation of mineral concentration with the particular phyla abundance, and red indicates a positive Pearson correlation, as shown in the legend. Statistical significance is indicated with an asterisk (* = $P < 0.05$, (** = $P < 0.01$)). The data was generated using Weighed Unifrac distance matrices.

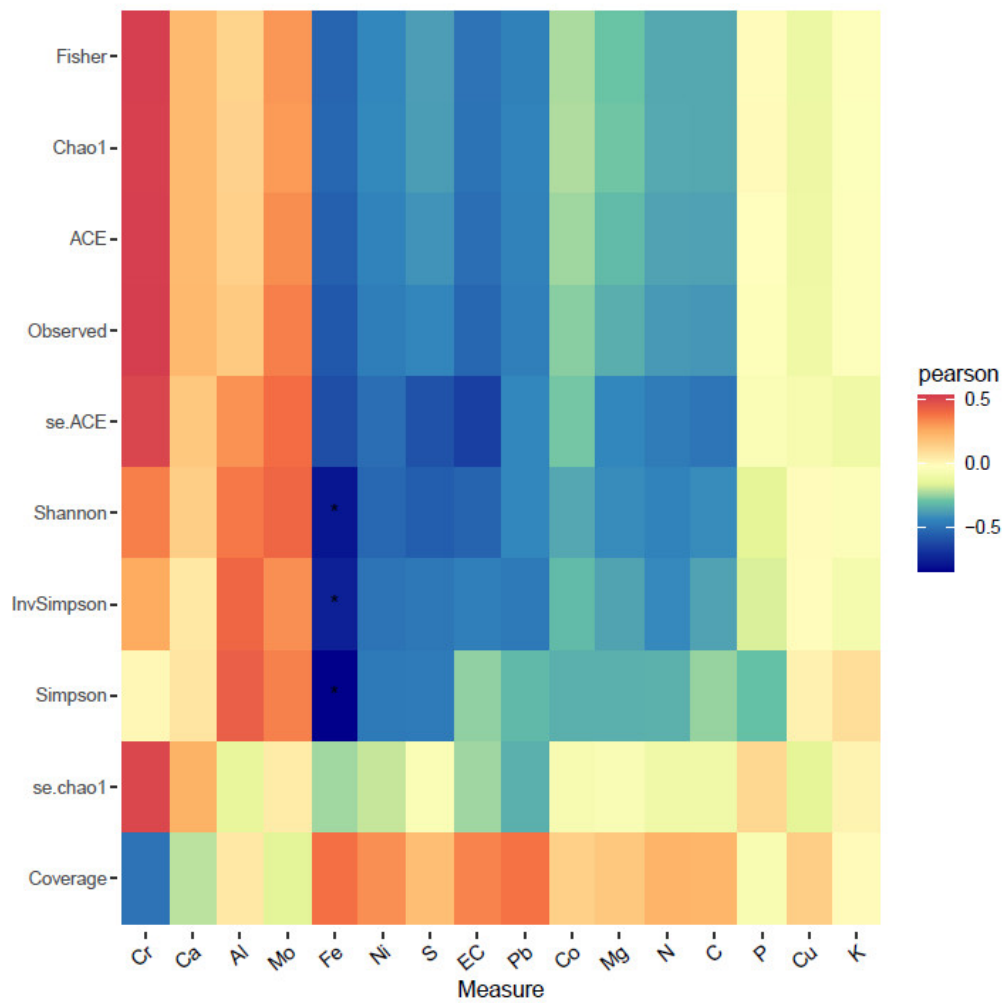


Figure S6. Mineral profile influence on alpha diversity measures. Blue colours indicate a negative correlation of mineral concentration with the particular diversity measure, and red indicates a positive Pearson correlation, as shown in the legend. Statistical significance is marked with an asterisk (*= P<0.05).

Table S1: Biomarker Discovery – Genus Level	Random Forest		Metastats		LefSe	
Taxa	MDG	P-value	q-value	P-value	P-value	LD A
Proteobacteria Alphaproteobacteria Rhizobiales Xanthobacteraceae Bradyrhizobium	1.00	2.45E-09	9.99E-04	1.20E-03	2.45E-09	3.48
Actinobacteriota RubroRubrobacterales Rubrobacteriaceae Rubrobacter	0.67	5.28E-11	2.00E-03	6.44E-03	5.28E-11	4.19
Actinobacteriota MB-A2-108 MB-A2-108 MB-A2-108 MB-A2-108	0.51	7.72E-11	1.50E-02	2.79E-03	7.72E-11	3.73
Actinobacteriota ActinoStreptosporangiales Thermomonosporaceae Actinoallomurus	0.45	2.45E-09	1.80E-02	9.15E-04	2.45E-09	3.20
Actinobacteriota Thermoleophilia Solirubrobacterales 67-14 67-14	0.45	5.27E-11	5.99E-03	3.66E-03	5.27E-11	3.89
Acidobacteriota Acidobacteriae Solibacterales Solibacteraceae Candidatus_Solibacter	0.43	7.78E-09	3.90E-02	1.24E-03	7.78E-09	3.24
Actinobacteriota ActinoPseudonocardiales Pseudonocardiaceae Pseudonocardia	0.36	7.74E-10	1.45E-01	2.20E-03	7.74E-10	3.33
Entotheonellaeota Entotheonellia Entotheonellales Entotheonellaceae Entotheonellaceae	0.34	1.61E-10	4.40E-02	4.34E-04	1.61E-10	2.83
Actinobacteriota Thermoleophilia Gaiellales Gaiellaceae Gaiella	0.33	7.73E-11	1.31E-01	3.02E-03	7.73E-11	3.42
Acidobacteriota Blastocatellia Pyrinomodales Pyrinomodaceae RB41	0.31	5.25E-10	2.26E-01	1.43E-03	5.25E-10	3.00
Actinobacteriota ActinoStreptomycetales Streptomyetaceae Streptomyces	0.28	1.13E-10	4.80E-02	1.65E-03	1.13E-10	3.26
Acidobacteriota Acidobacteriae Bryobacterales Bryobacteraceae Bryobacter	0.27	5.26E-09	4.00E-02	8.32E-04	5.26E-09	3.10
Chloroflexi Chloroflexia Thermomicrobiales Thermomicrobiaceae Sphaerobacter	0.27	1.03E-03	1.38E-01	1.57E-04	1.03E-03	2.40
Actinobacteriota ActinoCorynebacterales Mycobacteriaceae Mycobacterium	0.26	7.64E-11	9.49E-02	1.57E-03	7.64E-11	3.13
Chloroflexi TK10 TK10 TK10 TK10	0.25	7.73E-11	1.77E-01	2.21E-03	7.73E-11	3.32
Actinobacteriota ActinoFrankiales Frankiaceae Jatrophihabitans	0.25	5.27E-10	2.71E-01	2.44E-03	5.27E-10	3.17
Actinobacteriota ActinoStreptosporangiales Streptosporangiaceae Microbispora	0.24	2.63E-06	3.40E-02	7.13E-04	2.63E-06	2.95
Actinobacteriota ActinoMicromonosporales Micromonosporaceae Micromonospora	0.24	1.14E-10	1.87E-01	3.45E-03	1.14E-10	3.41
Firmicutes Bacilli Bacillales Bacillaceae Bacillus	0.24	1.67E-10	2.00E-01	1.13E-02	1.67E-10	3.92
Firmicutes Bacilli Paenibacillales Paenibacillaceae Cohnella	0.23	4.09E-05	3.20E-02	3.43E-04	4.09E-05	2.73
Actinobacteriota ActinoPseudonocardiales Pseudonocardiaceae Amycolatopsis	0.23	1.28E-05	7.69E-02	7.11E-04	1.28E-05	2.87
Methylomirabilota Methylomirabilia Rokubacterales Rokubacterales Rokubacteriales	0.22	7.55E-10	5.35E-01	6.13E-04	7.55E-10	2.48
ProteoGammaproteoBurkholderiales SC-I-84 SC-I-84	0.21	7.95E-07	3.30E-02	5.07E-04	7.95E-07	2.82
Actinobacteriota Thermoleophilia Solirubrobacterales Solirubrobacteraceae Solirubrobacter	0.20	3.60E-10	8.22E-01	2.37E-03	3.60E-10	2.96

Chloroflexi Chloroflexia Thermomicrobiales JG30-KF-CM45 JG30-KF-CM45	0.20	1.15E-08	1.12E-01	1.80E-03	1.15E-08	3.32
Actinobacteriota ActinoFrankiales Geodermatophilaceae Geodermatophilus	0.19	1.68E-09	7.67E-01	2.96E-03	1.68E-09	3.12
Verrucomicrobiota Verrucomicrobiae Chthoniobacterales Chthoniobacteraceae Candidatus Udaeobacter	0.19	3.60E-10	7.59E-01	2.40E-03	3.60E-10	3.06
Actinobacteriota ActinoMicromonosporales Micromonosporaceae Luedemannella	0.18	6.31E-05	4.90E-02	3.34E-04	6.31E-05	2.75
Actinobacteriota Thermoleophilia Solirubrobacterales Solirubrobacteraceae Candidatus Thermoautotrophicum	0.18	7.74E-11	4.65E-01	2.80E-03	7.74E-11	3.15