SUPPLEMENTARY DATA: REVERSE ENGINEERING OF BIOCHAR

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A.I META-LIBRARY

Table A.1: Meta-library of physical, chemical and elemental characteristics of biochar samples produced under a variety of pyrolysis conditions.

	Biomass	Feedstock	Temp	BulkDensity	SSA(N_2)	SSA(CO_2)	Yield	EC	CEC	pH$_w$	Ash	MatVol	C	N	C:N	FixedC	P	S	Ca	K	Mg	Na	Fe	Mn	Zn	Reference
			[°C]	[Mg m^{-3}]	[m^2 g^{-1}]	[m^2 g^{-1}]	[%]	[mS m^{-1}]	[Av (mmol$_c$ kg^{-1})]	[-]	[%]	[%]	[mg g^{-1}]	[mg g^{-1}]	[-]	[%]	[Total (mg kg^{-1})]									
1	Bull manure	animal	300	-	-	-	47.15	-	335.50	-	7.70	55.50	606.00	13.00	46.62	36.80	3014.00	1102	9412	20017	3952	2712	376	137	162	(1)
2	Bull manure	animal	350	-	-	-	37.50	-	-	-	8.30	58.70	663.00	13.00	51.00	33.00	2644.00	857	10518	24389	4277	3062	322	150	133	(1)
3	Bull manure	animal	400	-	-	-	30.40		367.30	-	9.40	37.00	685.00	12.00	57.08	53.70	3119.00	859	10088	28939	4841	3089	256	141	165	(1)
4	Bull manure	animal	450	-	-	-	27.80	-	-		9.30	46.20	715.00	11.00	65.00	44.50	2508.00	917	8450	30405	4314	2927	176	121	138	(1)
5	Bull manure	animal	500	-	-	-	26.80		264.40	-	10.40	30.50	741.00	11.00	67.36	59.20	3115.00	928	9432	33477	4925	3518	267	146	167	(1)
6	Bull manure	animal	550	-	-	-	28.40	-	-	-	10.90	39.00	743.00	11.00	67.55	50.10	3064.00	1019	11109	32808	5218	3156	417	178	320	(1)
7	Bull manure	animal	600	-	-	-	24.70	-	335.50	-	10.60	30.00	760.00	8.00	95.00	59.40	2952.00	1023	9386	35820	5071	2937	311	165	193	(1)
8	Corn	plant	350	-	-	-	37.00	-	-	-	11.40	48.90	652.00	12.00	54.33	39.80	1889.00	731	6136	21486	6307	854	558	129	66	(1)
9	Corn	plant	450	-	-	-	30.00	-	-	-	12.50	42.70	683.00	11.00	62.09	44.90	2148.00	790	7317	25707	8031	1112	815	176	64	(1)
10	Corn	plant	550	-	-	-	27.00	-	-	-	14.00	37.30	722.00	10.00	72.20	48.70	2093.00	731	9804	23929	8891	778	845	208	82	(1)
11	Corn	plant	300	0.12	4.70	141.00	46.00	947	708.00	7.33	10.70	51.87	595.00	11.60	51.00	37.43	1369.00	697	6480	17052	5883	492	963	142	132	(2)
12	Corn	plant	400	0.10	3.90	282.00	33.00	885	796.00	9.17	12.90	44.73	626.00	11.00	58.00	42.37	1812.00	712	7254	20234	6583	904	897	160	49	(2)
13	Corn	plant	500	0.10	3.20	494.00	30.00	1014	517.00	9.92	17.60	31.08	687.00	11.10	62.00	51.32	1852.00	739	11699	24817	9510	1384	1063	199	72	(2)
14	Corn	plant	600	0.11	3.40	531.00	28.00	980	385.00	9.95	16.72	23.49	698.00	10.10	70.00	59.80	2114.00	801	9383	24616	8582	1539	1362	226	70	(2)
15	Dairy manure	animal	300	-	-	-	41.60	-	-		10.10	45.40	615.00	16.00	38.44	44.50	1152.00	1799	11094	8986	3934	3270	208	52	90	(1)
16	Dairy manure	animal	350	-	-	-	33.60	-	-	-	10.20	58.40	641.00	18.00	35.61	31.40	1810.00	1601	10859	10074	4278	3698	317	56	98	(1)
17	Dairy manure	animal	400	-	-	-	29.90	-	-	-	11.50	39.10	671.00	14.00	47.93	49.50	1466.00	1484	12808	10345	4258	3569	305	53	87	(1)
18	Dairy manure	animal	450	-	-	-	28.00	-	-	-	11.70	42.10	701.00	15.00	46.73	46.20	2001.00	1608	13473	11756	5068	4009	349	78	121	(1)
19	Dairy manure	animal	500	-	-	-	27.10	-	-	-	12.40	33.90	725.00	14.00	51.79	53.70	1754.00	1438	12569	9630	4610	2223	396	79	80	(1)
20	Dairy manure	animal	550	-	-	-	25.70	-	-	-	13.40	41.80	723.00	15.00	48.20	44.70	2358.00	1793	25702	13388	6357	4424	754	113	142	(1)
21	Dairy manure	animal	600	-	-	-	25.60	-	-	-	12.60	30.70	752.00	13.00	57.85	56.60	2433.00	1630	13997	13236	5366	4538	398	98	114	(1)
22	Digested dairy manure	animal	350	-	-	-	33.60	-	-	-	12.70	55.60	577.00	24.00	24.04	31.70	-	-	-	-	-	-	-	-	-	(1)
23	Digested dairy manure	animal	450	-	-	-	28.00	-	-	-	17.80	41.50	604.00	25.00	24.16	40.80	-	-	-	-	-	-	-	-	-	(1)
24	Digested dairy manure	animal	550	-	-	-	25.70	-	-	-	17.30	41.80	609.00	22.00	27.68	41.00	-	-	-	-	-	-	-	-	-	(1)
25	Digested dairy manure	animal	300	0.17	-	-	41.60	1054	444.00	8.92	39.23	50.48	561.00	26.60	21.00	10.29	5391.00	2948	20185	14954	8757	3808	1710	128	129	(2)
26	Digested dairy manure	animal	400	0.17	-	-	29.90	1004	297.00	9.22	14.50	58.58	638.00	24.20	26.00	26.91	6446.00	2720	22552	16604	9733	4405	1656	145	131	(2)
27	Digested dairy manure	animal	500	0.12	-	-	27.10	1087	478.00	9.36	14.74	42.67	594.00	25.80	23.00	42.59	3945.00	1880	18505	14937	8498	3861	2371	162	224	(2)
28	Digested dairy manure	animal	600	0.12	-	-	25.60	1171	151.00	9.94	18.84	39.43	628.00	22.50	28.00	41.73	8269.00	2863	26518	20852	11744	5051	2356	191	200	(2)
29	Food waste	combo	300	0.43	-	-	48.00	2325	104.00	7.52	23.30	45.42	653.00	58.80	11.00	31.28	5874.00	1016	28177	13018	3337	9852	2258	74	49	(2)
30	Food waste	combo	400	0.50	-	-	45.00	2115	98.00	8.27	45.96	35.72	524.00	36.50	14.00	18.32	5007.00	832	51745	14557	5341	9008	4431	179	39	(2)
31	Food waste	combo	500	0.46	-	-	47.00	2865	88.00	9.67	52.70	33.71	367.00	25.60	14.00	13.59	7524.00	1042	53779	21340	4461	13708	2427	118	64	(2)
32	Food waste	combo	600	0.47	-	-	37.00	3225	34.00	10.53	51.95	34.48	232.00	10.30	23.00	13.56	8150.00	1210	73534	27949	6567	14503	5063	201	64	(2)
33	Grass (*Tall fescue*)	plant	300	-	-	-	75.80	-	-	-	9.40	54.40	597.00	10.20	58.53	36.20	-	-	-	-	-	-	-	-	-	(3)
34	Grass (*Tall fescue*)	plant	400	-	-	-	37.20	-	-	-	16.30	26.80	773.00	12.40	62.34	56.90	-	-	-	-	-	-	-	-	-	(3)
35	Grass (*Tall fescue*)	plant	500	-	-	-	31.40	-	-	-	15.40	20.30	822.00	10.90	75.41	64.30	-	-	-	-	-	-	-	-	-	(3)
36	Grass (*Tall fescue*)	plant	600	-	-	-	29.80	-	-	-	18.90	13.50	890.00	9.90	89.90	67.60	-	-	-	-	-	-	-	-	-	(3)
37	Grass (*Tripsacum floridanum*)	plant	250	-	-	221.00	-	-	-	4.55	6.80	62.50	-	-	-	-	-	-	-	-	-	-	-	-	-	(4)
38	Grass (*Tripsacum floridanum*)	plant	400	-	-	164.00	-	-	-	7.87	13.20	51.40	-	-	-	-	-	-	-	-	-	-	-	-	-	(4)
39	Grass (*Tripsacum floridanum*)	plant	650	-	-	427.00	-	-	-	10.11	15.90	33.00	-	-	-	-	-	-	-	-	-	-	-	-	-	(4)
40	Hazelnut	plant	350	-	-	-	39.00	-	-	-	1.20	56.10	731.00	5.00	146.20	42.70	279.00	136	2580	4142	496	311	57	30	13	(1)
41	Hazelnut	plant	450	-	-	-	33.00	-	-	-	1.30	47.00	794.00	5.00	158.80	51.70	277.00	568	2598	4748	490	244	35	26	5	(1)
42	Hazelnut	plant	550	-	-	-	30.00	-	-	-	1.40	41.70	846.00	5.00	169.20	56.90	348.00	128	2823	5121	563	386	51	29	12	(1)
43	Hazelnut	plant	300	0.34	1.30	224.00	45.00	190	59.00	6.35	1.98	48.79	699.00	5.40	159.00	49.23	397.00	263	3726	5166	790	471	92	20	14	(2)
44	Hazelnut	plant	400	0.41	1.60	493.00	34.00	71	102.00	7.66	1.69	43.48	758.00	5.10	158.00	54.83	298.00	162	2821	4285	554	488	29	13	10	(2)
45	Hazelnut	plant	500	0.46	3.80	521.00	32.00	53	118.00	8.60	1.94	37.19	801.00	5.10	177.00	60.88	275.00	152	2693	4297	494	447	28	15	13	(2)

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Biomass	Feedstock	Temp	BulkDensity	SSA(N_2)	SSA(CO_2)	Yield	EC	CEC	pH$_w$	Ash	MatVol	C	N	C:N	FixedC	P	S	Ca	K	Mg	Na	Fe	Mn	Zn	Reference
		[°C]	[Mg m^{-3}]	[m^2 g^{-1}]	[m^2 g^{-1}]	[%]	[mS m^{-1}]	[Av (mmol$_c$ kg^{-1})]	[-]	[%]	[%]	[mg g^{-1}]	[mg g^{-1}]	[-]	[%]	[Total (mg kg^{-1})]									
46 Hazelnut	plant	600	0.45	0.90	632.00	29.00	94	56.00	8.85	2.18	29.63	841.00	5.20	181.00	68.19	329.00	173	3262	5162	587	407	42	21	20	(2)
47 Oak (*Quercus rotundifolia*)	plant	300	-	-	-	-	-	-	-	1.50	65.10	588.00	3.00	196.00	33.40	-	-	-	-	-	-	-	-	-	(5)
48 Oak (*Quercus rotundifolia*)	plant	350	-	-	-	-	-	-	-	1.30	43.40	757.00	6.00	126.17	55.30	-	-	-	-	-	-	-	-	-	(5)
49 Oak (*Quercus rotundifolia*)	plant	400	-	-	-	-	-	-	-	1.30	34.50	769.00	4.00	192.25	64.20	-	-	-	-	-	-	-	-	-	(5)
50 Oak (*Quercus rotundifolia*)	plant	450	-	-	-	-	-	-	-	1.80	21.80	812.00	4.00	203.00	76.40	-	-	-	-	-	-	-	-	-	(5)
51 Oak (*Quercus rotundifolia*)	plant	500	-	-	-	-	-	-	-	2.80	17.50	83.00	6.00	13.83	79.70	-	-	-	-	-	-	-	-	-	(5)
52 Oak (*Quercus rotundifolia*)	plant	550	-	-	-	-	-	-	-	3.10	14.70	871.00	5.00	174.20	82.20	-	-	-	-	-	-	-	-	-	(5)
53 Oak (*Quercus rotundifolia*)	plant	600	-	-	-	-	-	-	-	3.20	13.20	894.00	4.00	223.50	83.60	-	-	-	-	-	-	-	-	-	(5)
54 Oak (*Quercus lobata*)	plant	250	-	-	331.00	-	-	-	3.57	1.40	66.00	-	-	-	-	-	-	-	-	-	-	-	-	-	(4)
55 Oak (*Quercus lobata*)	plant	400	-	-	252.00	-	-	-	6.75	2.60	51.90	-	-	-	-	-	-	-	-	-	-	-	-	-	(4)
56 Oak (*Quercus lobata*)	plant	650	-	-	528.00	-	-	-	9.13	3.70	36.40	-	-	-	-	-	-	-	-	-	-	-	-	-	(4)
57 Oak	plant	350	-	-	-	37.00	-	-	-	1.10	60.80	749.00	2.00	374.50	38.10	11.00	182	1097	1147	41	339	1453	23	100	(1)
58 Oak	plant	450	-	-	-	28.00	-	-	-	0.60	44.40	851.00	2.00	425.50	55.00	43.00	74	1023	1664	25	229	162	24	23	(1)
59 Oak	plant	550	-	-	-	26.00	-	-	-	0.60	38.50	879.00	2.00	439.50	60.90	29.00	100	1609	1274	41	277	323	27	15	(1)
60 Oak	plant	300	0.26		163.00	45.00	58	414.00	4.25	0.35	61.13	639.00	1.30	520.00	38.52	6.00	78	752	725	46	297	5	12	5	(2)
61 Oak	plant	400	0.24	3.50	450.00	29.00	38	261.00	4.58	0.78	40.93	788.00	1.70	468.00	58.30	5.00	86	1061	1462	61	321	169	15	33	(2)
62 Oak	plant	500	0.20	1.50	600.00	25.00	24	147.00	5.78	3.72	30.70	839.00	1.80	474.00	65.58	5.00	100	1538	1171	57	330	16	22	11	(2)
63 Oak	plant	600	0.21	0.70	635.00	22.00	24	126.00	6.38	1.31	27.53	876.00	1.70	510.00	71.16	0.01	137	1210	2061	100	52	158	23	23	(2)
64 Paper waste	plant	300	0.23	-	-	67.00	358	83.00	7.44	50.35	49.65	212.00	0.90	234.00	0.00	827.00	312	258128	2783	2428	256	2474	136	26	(2)
65 Paper waste	plant	400	0.27	-	-	61.00	315	62.00	8.18	54.58	44.20	200.00	1.10	185.00	1.23	830.00	280	266234	3279	2831	453	4925	148	31	(2)
66 Paper waste	plant	500	0.32	-	-	60.00	126	29.00	9.28	57.45	42.52	192.00	0.70	158.00	0.03	818.00	227	289226	3339	2739	295	4794	152	34	(2)
67 Paper waste	plant	600	0.35	-	-	63.00	358	34.00	11.14	59.05	39.95	192.00	0.80	250.00	0.00	937.00	321	311232	3848	2940	370	6037	160	51	(2)
68 Pine (*Pinus halepensis*)	plant	300	-	-	-	-	-	-	-	0.60	68.10	578.00	2.00	289.00	31.30	-	-	-	-	-	-	-	-	-	(5)
69 Pine (*Pinus halepensis*)	plant	350	-	-	-	-	-	-	-	1.20	49.50	721.00	2.00	360.50	49.40	-	-	-	-	-	-	-	-	-	(5)
70 Pine (*Pinus halepensis*)	plant	400	-	-	-	-	-	-	-	1.30	36.50	747.00	2.00	373.50	62.20	-	-	-	-	-	-	-	-	-	(5)
71 Pine (*Pinus halepensis*)	plant	450	-	-	-	-	-	-	-	1.40	27.40	783.00	2.00	391.50	71.20	-	-	-	-	-	-	-	-	-	(5)
72 Pine (*Pinus halepensis*)	plant	500	-	-	-	-	-	-	-	1.70	20.20	818.00	2.00	409.00	78.10	-	-	-	-	-	-	-	-	-	(5)
73 Pine (*Pinus halepensis*)	plant	550	-	-	-	-	-	-	-	1.70	18.10	861.00	2.00	430.50	80.20	-	-	-	-	-	-	-	-	-	(5)
74 Pine (*Pinus halepensis*)	plant	600	-	-	-	-	-	-	-	1.70	13.40	874.00	3.00	291.33	84.90	-	-	-	-	-	-	-	-	-	(5)
75 Pine (*Pinus ponderosa*)	plant	300	-	-	-	62.20	-	-	-	1.50	70.30	548.00	0.50	1096.00	28.20	-	-	-	-	-	-	-	-	-	(3)
76 Pine (*Pinus ponderosa*)	plant	400	-	-	-	35.30	-	-	-	1.40	36.40	741.00	0.60	1235.00	62.20	-	-	-	-	-	-	-	-	-	(3)
77 Pine (*Pinus ponderosa*)	plant	500	-	-	-	28.40	-	-	-	2.10	25.20	819.00	0.80	1023.75	72.70	-	-	-	-	-	-	-	-	-	(3)
78 Pine (*Pinus ponderosa*)	plant	600	-	-	-	23.90	-	-	-	3.70	11.10	890.00	0.60	1483.33	85.20	-	-	-	-	-	-	-	-	-	(3)
79 Pine (*Pinus taeda*)	plant	400	-	-	-	-	-	-	7.55	-	-	739.00	-	-	-	-	-	-	-	600	-	-	274	15	(6)
80 Pine (*Pinus taeda*)	plant	500	-	-	-	-	-	-	8.30	-	-	817.00	-	-	-	-	-	-	-	590	-	-	258	18	(6)
81 Pine (*Pinus taeda*)	plant	250	-	-	373.00	-	-	-	3.07	0.30	61.00	-	-	-	-	-	-	-	-	-	-	-	-	-	(4)
82 Pine (*Pinus taeda*)	plant	400	-	-	361.00	-	-	-	5.12	0.50	58.60	-	-	-	-	-	-	-	-	-	-	-	-	-	(4)
83 Pine (*Pinus taeda*)	plant	650	-	-	643.00	-	-	-	6.86	1.10	25.20	-	-	-	-	-	-	-	-	-	-	-	-	-	(4)
84 Pine	plant	350	-	-	-	36.00	-	-	-	0.60	56.30	707.00	1.00	707.00	43.20	49.00	48	1940	387	389	134	50	131	21	(1)
85 Pine	plant	450	-	-	-	26.00	-	-	-	1.50	48.80	805.00	1.00	805.00	49.70		1692	2194	996	667	93	418	297	45	(1)
86 Pine	plant	550	-	-	-	20.00	-	-	-	0.80	40.20	868.00	1.00	868.00	59.00		237	2255	734	707	232	110	298	38	(1)
87 Pine	plant	300	0.14		157.00	58.00	96	289.00	6.74	1.48	55.32	621.00	1.00	676.00	43.20	255.00	114	2927	692	680	327	149	142	23	(2)
88 Pine	plant	400	0.17	1.40	413.00	30.00	54	304.00	4.57	1.05	45.47	744.00	0.90	900.00	53.48	35.00	103	2247	373	482	351	1166	258	66	(2)
89 Pine	plant	500	0.14	4.70	524.00	25.00	23	240.00	5.62	1.00	36.95	834.00	1.00	896.00	62.05	1.00	81	2741	682	796	332	69	259	44	(2)
90 Pine	plant	600	0.16	1.80	611.00	23.00	19	153.00	5.97	1.07	27.70	870.00	1.30	725.00	71.22	14.00	231	2167	775	604	320	820	349	60	(2)
91 Poultry	animal	350	-	-	-	69.00	-	-	-	51.20	47.20	306.00	20.00	15.30	1.60	21256.00	3556	215648	31751	7309	4218	1464	426	394	(1)
92 Poultry	animal	450	-	-	-	63.00	-	-	-	53.60	46.20	354.00	12.00	29.50	0.20	17329.00	2898	267804	27400	6388	3695	1069	364	311	(1)
93 Poultry	animal	550	-	-	-	64.00	-	-	-	54.90	44.60	281.00	11.00	25.55	0.60	20147.00	3231	252608	32126	7277	4048	1513	431	451	(1)
94 Poultry	animal	400	-	-	-	-	-	-	10.10	-	-	392.00	-	-	-	-	-	-	-	10700	-	-	596	628	(6)
95 Poultry	animal	500	-	-	-	-	-	-	9.74	-	-	392.00	-	-	-	-	-	-	-	12900	-	-	725	752	(6)

Continued on next page

	Biomass	Feedstock	Temp	BulkDensity	SSA(N_2)	SSA(CO_2)	Yield	EC	CEC	pH_w	Ash	MatVol	C	N	C:N	FixedC	P	S	Ca	K	Mg	Na	Fe	Mn	Zn	Reference
			[°C]	[Mg m^{-3}]	[m^2 g^{-1}]	[m^2 g^{-1}]	[%]	[mS m^{-1}]	[Av ($mmol_c$ kg^{-1})]	[-]	[%]	[%]	[mg g^{-1}]	[mg g^{-1}]	[-]	[%]	[Total (mg kg^{-1})]									
96	Poultry	animal	300	0.52	1.20	55.00	75.00	2475	362.00	8.12	46.71	46.76	259.00	21.50	13.00	6.54	26414.00	4714	157531	40013	8914	3868	1779	450	515	(2)
97	Poultry	animal	400	0.63	4.00	47.00	68.00	1665	166.00	9.85	51.74	43.79	268.00	12.40	46.00	4.47	17957.00	2983	265729	28109	7164	3209	1276	397	352	(2)
98	Poultry	animal	500	0.55	4.70	88.00	67.00	2095	78.00	10.57	52.62	43.22	254.00	14.10	18.00	4.16	30555.00	4593	204205	48616	10436	4537	2034	566	601	(2)
99	Poultry	animal	600	0.65	6.70	93.00	65.00	1885	59.00	10.65	55.80	44.20	236.00	9.40	28.00	0.00	23596.00	3429	242788	36775	8769	3457	1522	466	595	(2)
100	Rapeseed	plant	400	0.10	-	-	39.36	-	-	-	12.20	27.10	713.40	14.30	49.89	60.70	-	-	-	-	-	-	-	-	-	(7)
101	Rapeseed	plant	500	0.10	-	-	35.61	-	-	-	12.90	17.49	750.30	14.10	53.21	69.60	-	-	-	-	-	-	-	-	-	(7)
102	Rapeseed	plant	600	0.11	-	-	32.24	-	-	-	13.90	11.50	784.80	15.30	51.29	74.70	-	-	-	-	-	-	-	-	-	(7)

A.II GLM DIAGNOSTIC CRITERIA AND PLOTS

Ash

Table A.2: Quantitative diagnostic summary for GLM candidates describing Ash. Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test	
B + B:T	-	identity	508.00	0.000	2.48 (0.705)	
B + T	Log	identity	13.40	0.000	1.76 (0.012)	
B + T	Box-Cox	identity	-26.10	0.000	1.67 (0.004)	*

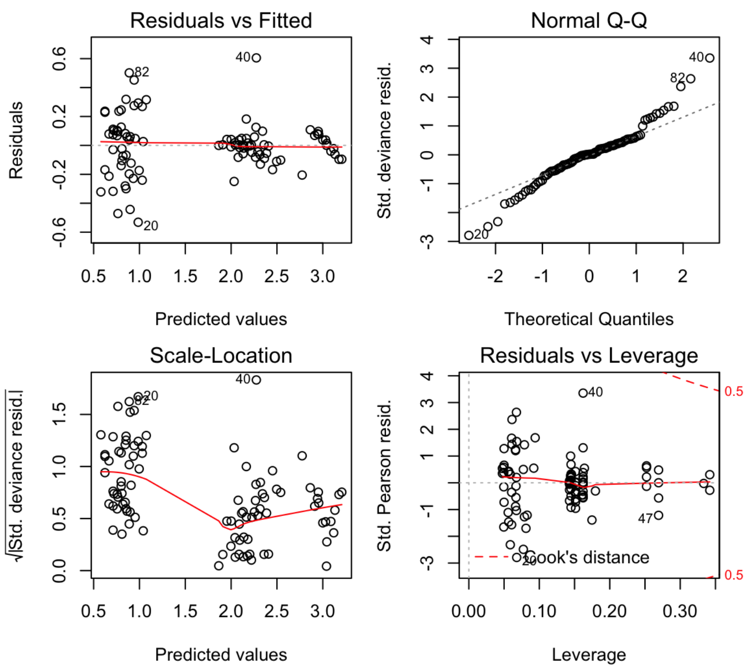

Figure A.1: Diagnostic plots of the "best" GLM describing Ash: Box Cox-tranformation.

Bulk Density

Table A.3: Quantitative diagnostic summary for GLM candidates describing BulkD. Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The “best” model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B + B:T	-	identity	-139.00	0.002	3.32 (0.972)	
B + B:T	Log	identity	-165.00	0.003	3.30 (0.964)	
B + B:T	Box-Cox	identity	-227.00	0.006	3.29 (0.953)	*

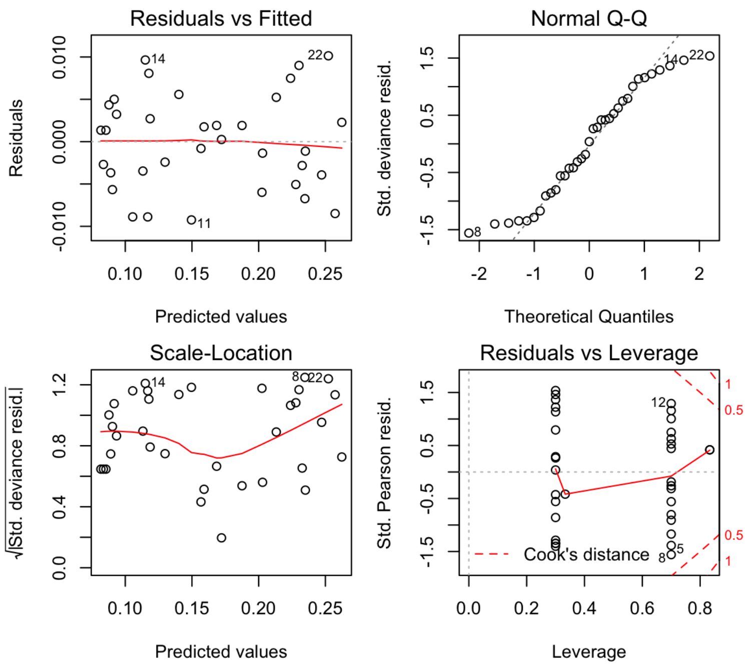

Figure A.2: Diagnostic plots of the “best” GLM describing BulkD: Box Cox-tranformation.

C

Table A.4: Quantitative diagnostic summary for GLM candidates describing C (outliers removed). Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B + B:T	-	identity	931.00	0.000	1.76 (0.001)	*
B + B:T	Log	identity	-184.00	0.000	1.74 (0.001)	
B + B:T	Box-Cox	identity	2450.00	0.001	1.97 (0.016)	

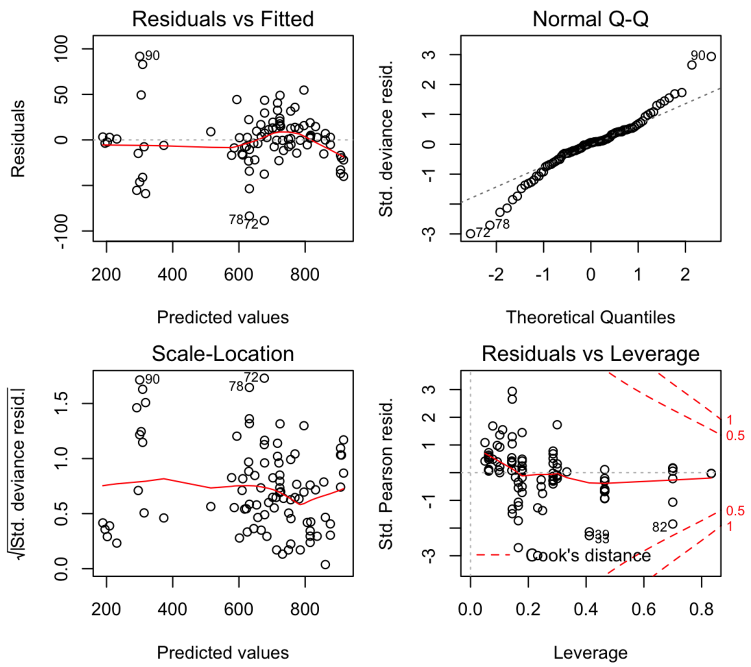

Figure A.3: Diagnostic plots of the "best" GLM describing C: no-tranformation.

Ca

Table A.5: Quantitative diagnostic summary for GLM candidates describing Ca. Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B + B:T	-	identity	1350.00	0.000	2.01 (0.004)	
B + B:T	Log	identity	-28.90	0.000	2.82 (0.832)	*
B + B:T	Box-Cox	identity	-211.00	0.013	2.89 (0.903)	

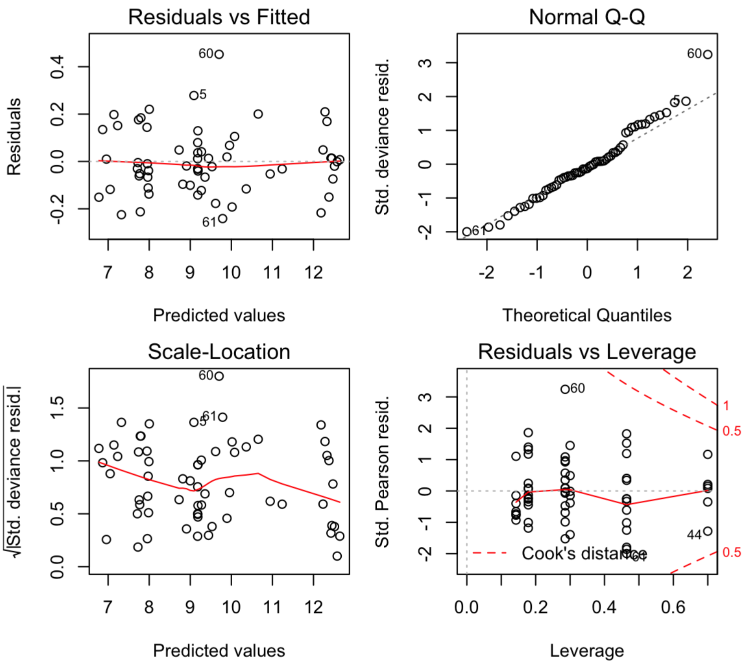

Figure A.4: Diagnostic plots of the "best" GLM describing Ca: Log-tranformation.

CEC

Table A.6: Quantitative diagnostic summary for GLM candidates describing CEC. Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B + B:T	-	identity	423.00	0.001	3.00 (0.558)	
B + B:T	Log	log	26.00	0.246	2.77 (0.156)	*
B + B:T	Box-Cox	log	76.40	0.330	2.81 (0.206)	

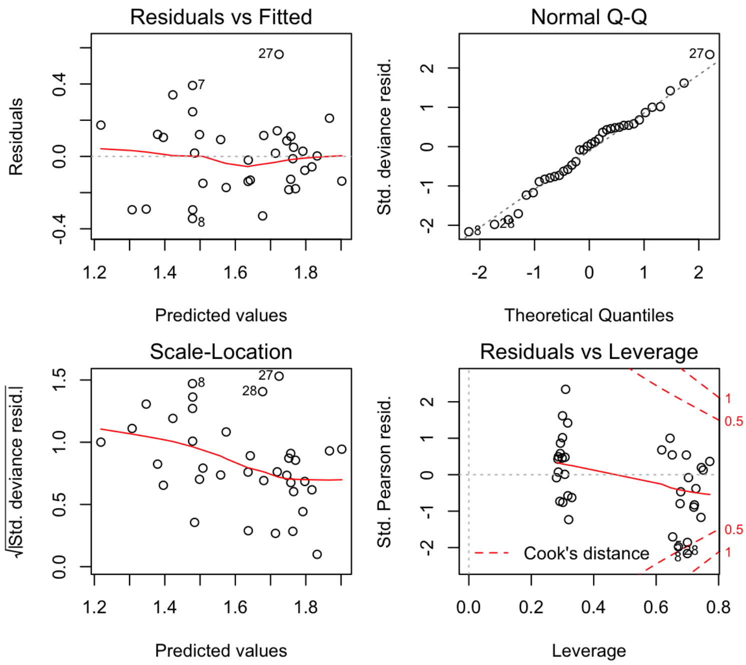

Figure A.5: Diagnostic plots of the "best" GLM describing CEC: Log-tranformation.

C:N

Table A.7: Quantitative diagnostic summary for GLM candidates describing C:N (outliers removed). Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B	-	identity	1170.00	0.000	0.70 (2.41e-16)	
B + T	Log	identity	75.50	0.008	0.85 (6.42e-13)	
B + T	Box-Cox	identity	-16.70	0.015	0.98 (1.31e-10)	*

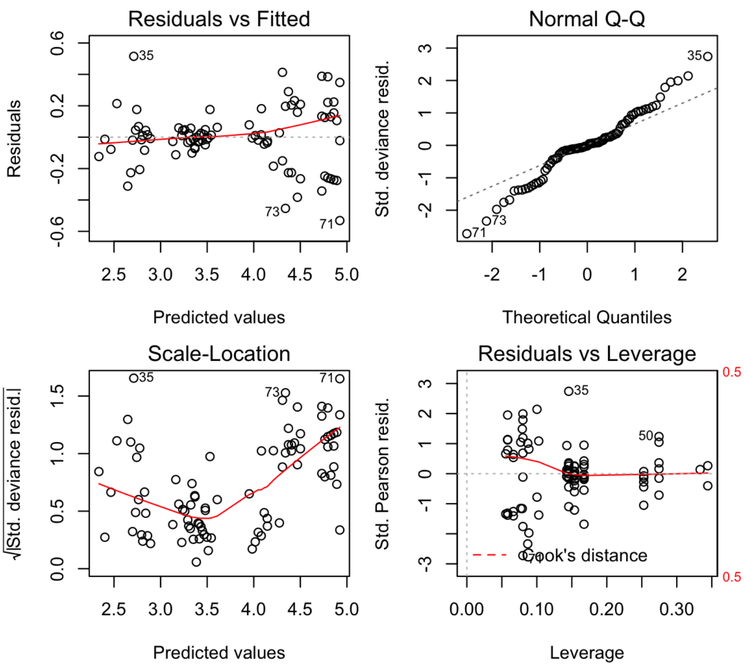

Figure A.6: Diagnostic plots of the "best" GLM describing C:N: Box Cox-tranformation.

EC

Table A.8: Quantitative diagnostic summary for GLM candidates describing EC. Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B + B:T	-	identity	433.00	0.000	2.95 (0.458)	
B:T	Log	log	26.50	0.005	2.28 (0.308)	
B + B:T	Box-Cox	log	76.70	0.009	2.69 (0.100)	*

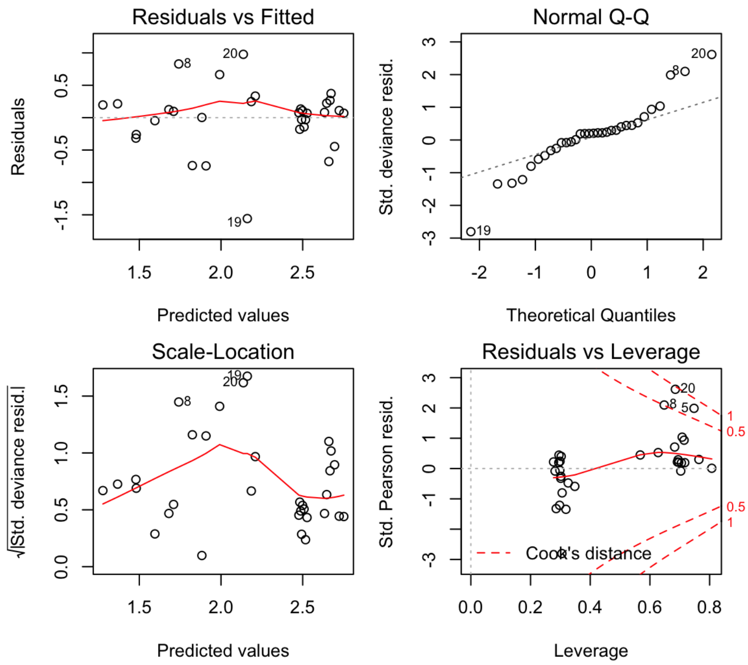

Figure A.7: Diagnostic plots of the "best" GLM describing EC: Box Cox-tranformation.

Fe

Table A.9: Quantitative diagnostic summary for GLM candidates describing Fe. Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B:T	-	identity	926.00	0.000	3.03 (0.999)	
B + T	Log	log	158.00	0.080	2.58 (0.868)	*
B + T	Box-Cox	log	252.00	0.460	2.56 (0.856)	

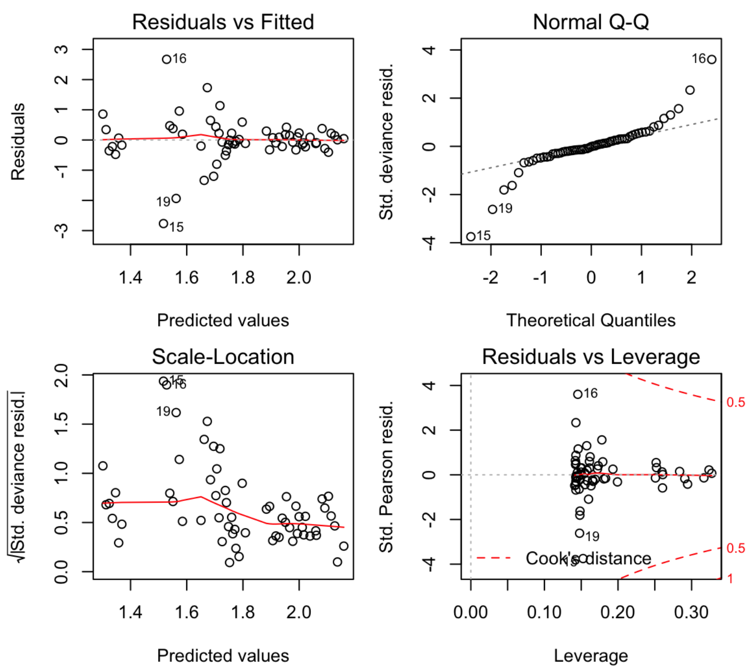

Figure A.8: Diagnostic plots of the "best" GLM describing Fe: Log-tranformation.

FixedC

Table A.10: Quantitative diagnostic summary for GLM candidates describing FixedC. Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B:T	-	identity	622.00	0.001	1.71 (0.005)	*
B + B:T	Log	identity	32.60	0.000	2.82 (0.973)	
B:T	Box-Cox	identity	616.00	0.001	1.71 (0.005)	

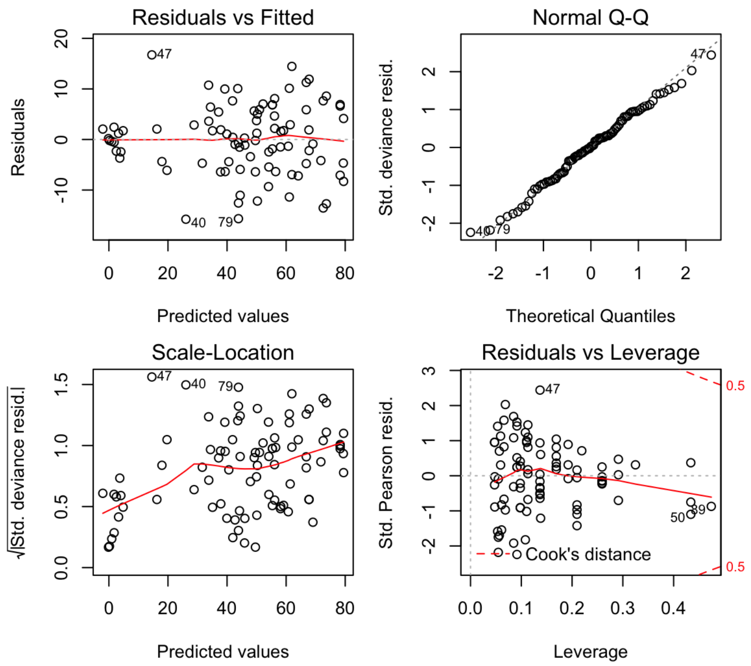

Figure A.9: Diagnostic plots of the "best" GLM describing FixedC: no-tranformation.

K

Table A.11: Quantitative diagnostic summary for GLM candidates describing K. Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B + B:T	-	identity	1170.00	0.000	2.57 (0.422)	
B + T	Log	identity	-19.60	0.000	2.20 (0.336)	
B + B:T	Box-Cox	identity	322.00	0.003	2.48 (0.281)	*

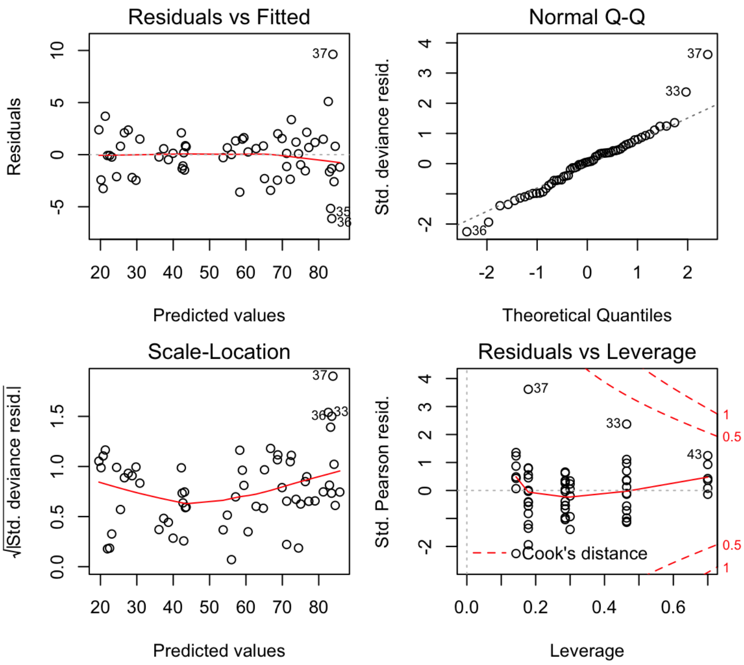

Figure A.10: Diagnostic plots of the "best" GLM describing K: Box Cox-tranformation.

MatVol

Table A.12: Quantitative diagnostic summary for GLM candidates describing MatVol. Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
F + F:T	-	identity	713.00	0.281	1.17(3.57e-06)	*
B:T	Log	identity	26.00	0.000	1.20(1.29e-07)	
F + F:T	Box-Cox	identity	781.00	0.359	1.21(8.21e-06)	

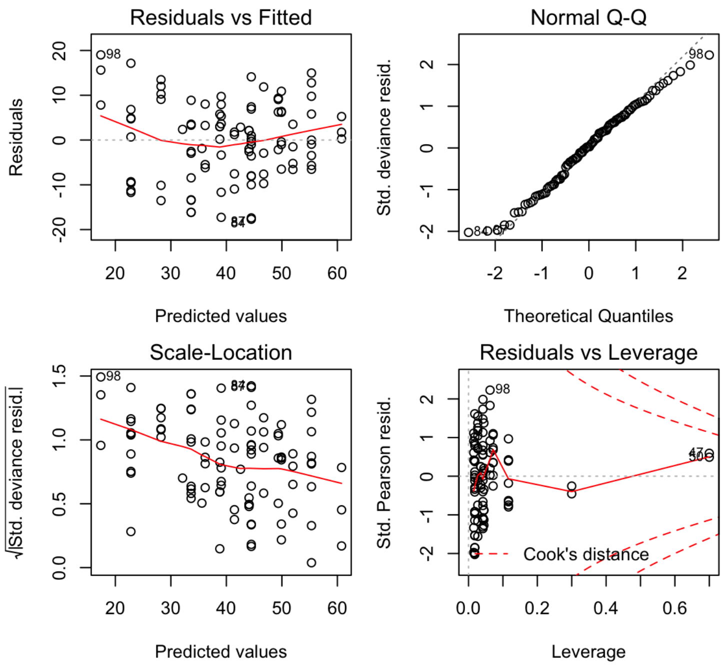

Figure A.11: Diagnostic plots of the "best" GLM describing MatVol: no-tranformation.

Mg

Table A.13: Quantitative diagnostic summary for GLM candidates describing Mg. Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B + T	-	identity	1100.00	0.000	1.73 (0.012)	
B + T	Log	identity	-9.45	0.000	2.28 (0.504)	*
B + T	Box-Cox	identity	401.00	0.000	1.88 (0.052)	

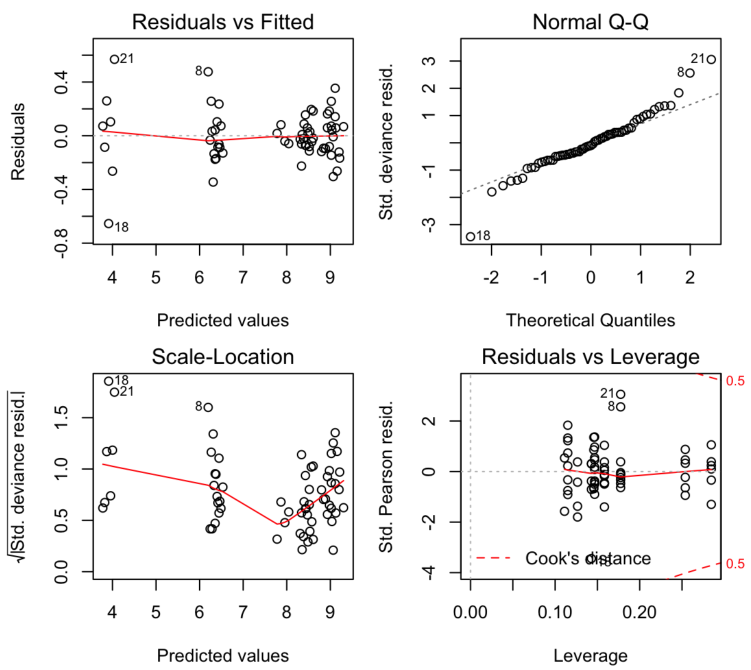

Figure A.12: Diagnostic plots of the "best" GLM describing Mg: Log-tranformation.

Mn

Table A.14: Quantitative diagnostic summary for GLM candidates describing Mn. Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B + T	-	identity	709.00	0.000	1.31 (2.46e-05)	
B + T	Log	identity	-3.09	0.001	2.16 (0.312)	*
B + B:T	Box-Cox	identity	158.00	0.036	2.12 (0.037)	

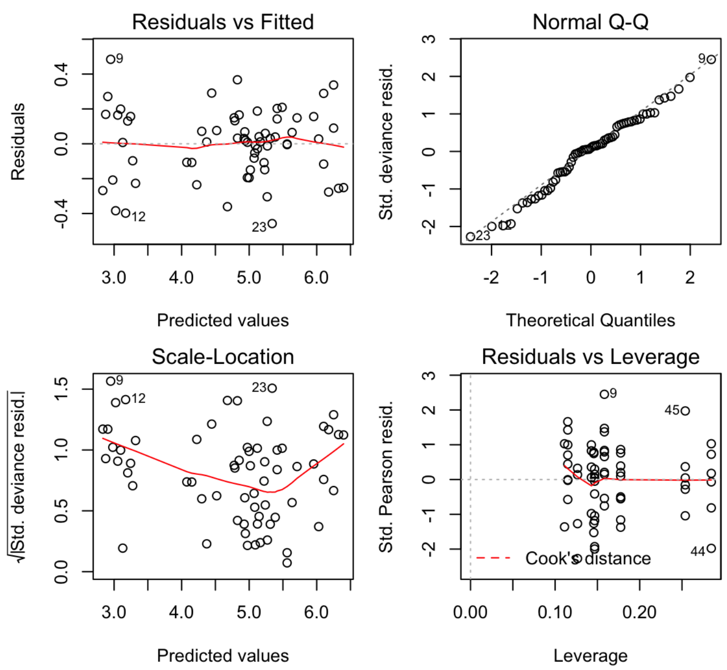

Figure A.13: Diagnostic plots of the "best" GLM describing Mn: Log-tranformation.

N

Table A.15: Quantitative diagnostic summary for GLM candidates describing N. Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B + B:T	-	identity	330.00	0.000	1.87 (0.003)	*
B + B:T	Log	identity	14.80	0.000	0.74 (2.13e-16)	
B + B:T	Box-Cox	identity	32.70	0.001	0.77 (9.59e-16)	

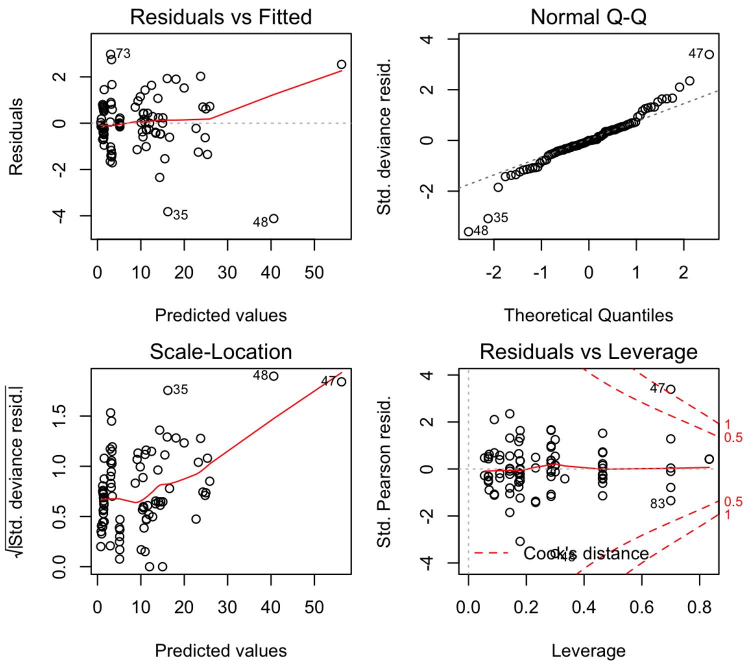

Figure A.14: Diagnostic plots of the "best" GLM describing N: no-tranformation.

Na

Table A.16: Quantitative diagnostic summary for GLM candidates describing Na (outliers removed). Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B + B:T	-	identity	939.00	0.000	2.93 (0.927)	
B + T	Log	log	3.59	0.000	2.91 (0.995)	*
B + T	Box-Cox	log	38.60	0.000	2.89 (0.994)	

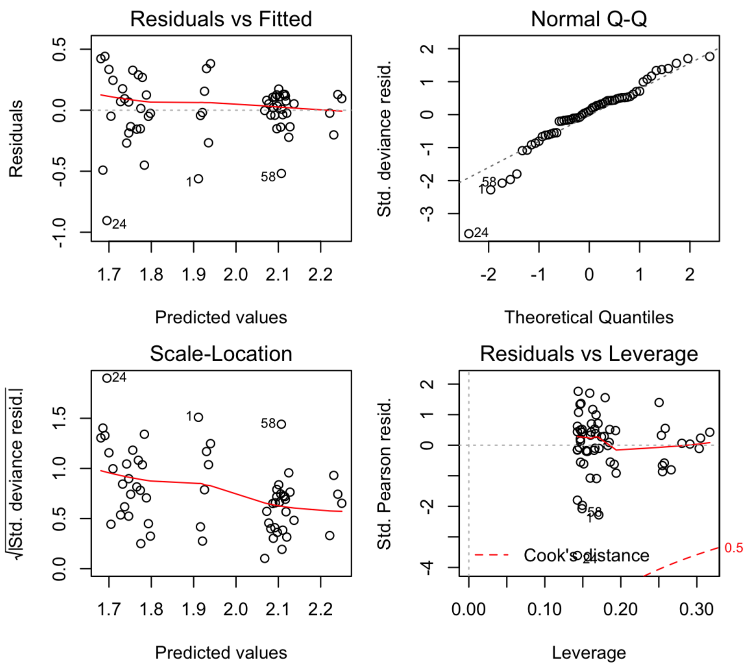

Figure A.15: Diagnostic plots of the "best" GLM describing Na: Log-tranformation.

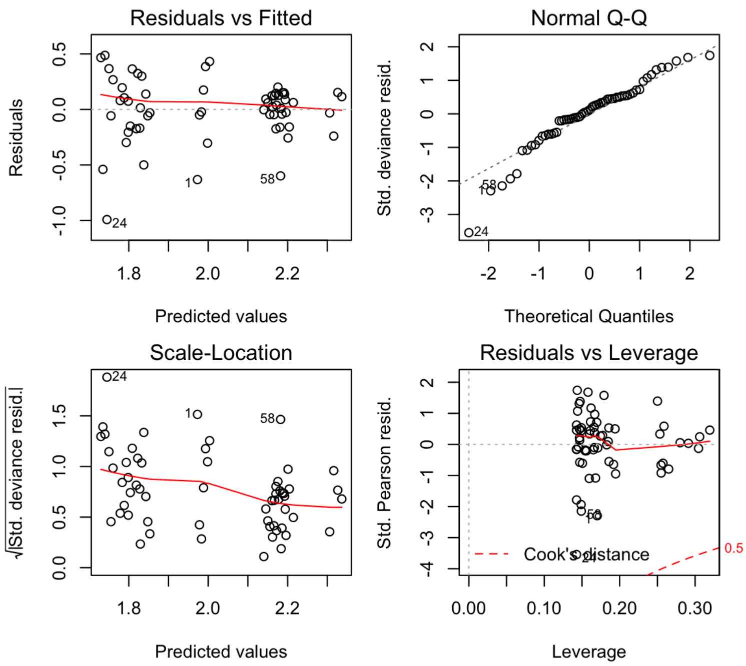

Figure A.16: Reference diagnostic plots of the candidate model describing Na: Box Cox-transformation.

P

Table A.17: Quantitative diagnostic summary for GLM candidates describing P. Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B	-	identity	1060.00	0.000	2.59 (0.880)	
B + B:T	Log	log	124.00	0.000	3.12 (0.992)	
B + B:T	Box-Cox	log	198.00	0.111	3.02 (0.970)	*

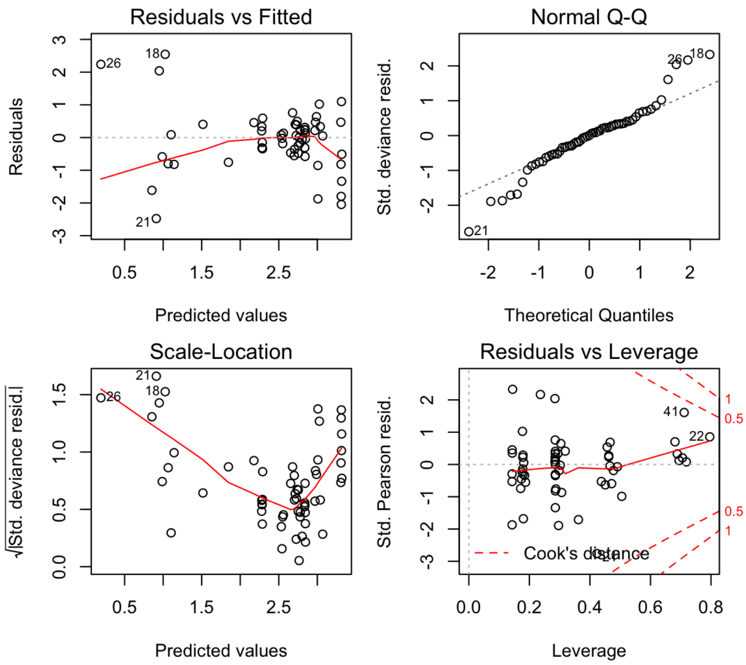

Figure A.17: Diagnostic plots of the "best" GLM describing P: Box Cox-tranformation.

pH_w

Table A.18: Quantitative diagnostic summary for GLM candidates describing pH_w. Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B + T	-	identity	134.00	0.052	1.57 (0.006)	*
B + T	Log	identity	-42.10	0.002	1.68 (0.017)	
B + T	Box-Cox	identity	298.00	0.196	1.53 (0.004)	

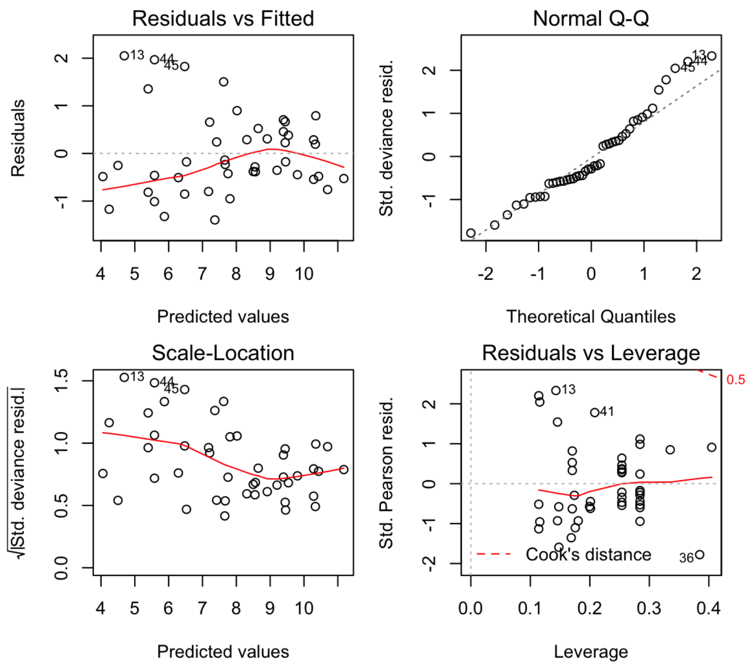

Figure A.18: Diagnostic plots of the "best" GLM describing pH_w: no-tranformation.

S

Table A.19: Quantitative diagnostic summary for GLM candidates describing S (outliers removed). Model details include: formula, type of data transformation used, link function, AIC, *p*-value for the Shapiro-Wilk test, and *d* value (*p*-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B	-	identity	865.00	0.000	2.38 (0.629)	
B	Log	identity	40.00	0.009	2.03 (0.145)	*
B	Box-Cox	identity	112.00	0.016	2.06 (0.169)	

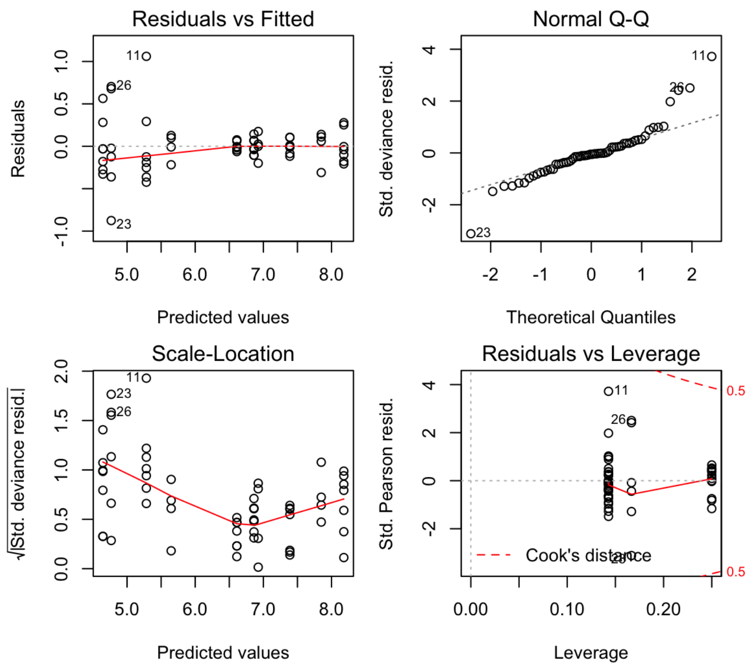

Figure A.19: Diagnostic plots of the "best" GLM describing S: Log-tranformation.

SSA(CO_2)

Table A.20: Quantitative diagnostic summary for GLM candidates describing SSA(CO_2). Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B:T	-	identity	347.00	0.053	2.12 (0.318)	*
B + T	Log	log	20.30	0.003	2.38 (0.573)	
B:T	Box-Cox	identity	271.00	0.052	2.10 (0.303)	

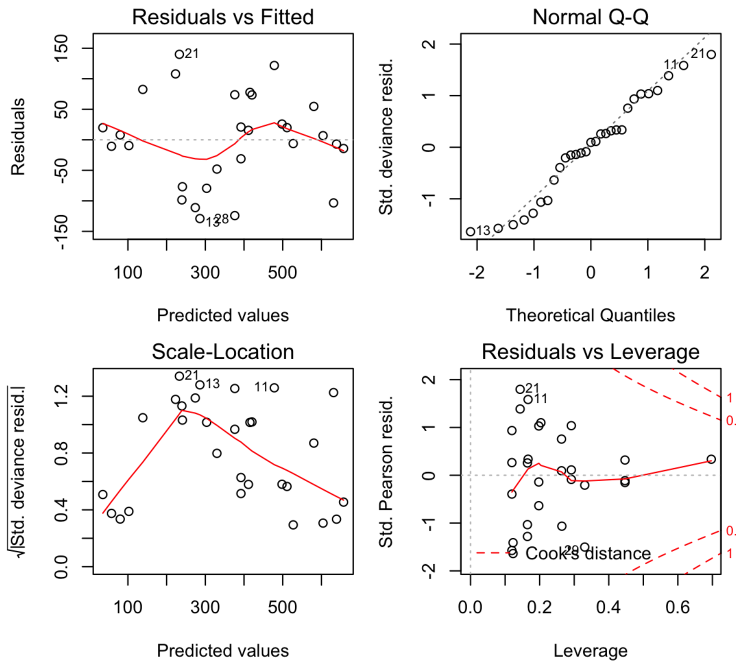

Figure A.20: Diagnostic plots of the "best" GLM describing SSA(CO_2): no-tranformation.

SSA(N_2)

Table A.21: Quantitative diagnostic summary for GLM candidates describing SSA(N_2). Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B + B:T	-	identity	66.80	0.117	3.20 (0.739)	*
B + B:T	Log	identity	21.40	0.144	3.05 (0.517)	
B + B:T	Box-Cox	identity	30.10	0.158	3.08 (0.563)	

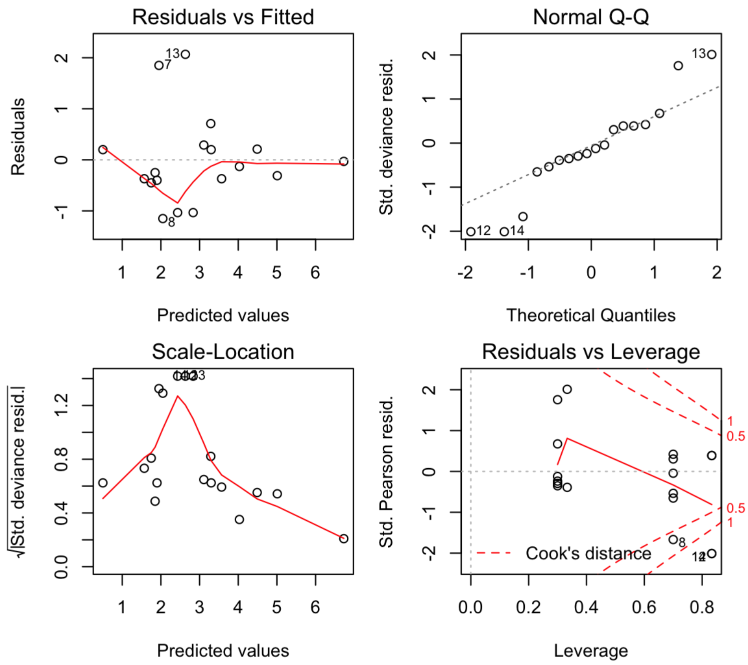

Figure A.21: Diagnostic plots of the "best" GLM describing SSA(N_2): no-tranformation.

Yield

Table A.22: Quantitative diagnostic summary for GLM candidates describing Yield (outliers removed). Model details include: formula, type of data transformation used, link function, AIC, p-value for the Shapiro-Wilk test, and d value (p-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B + B:T	-	identity	447.00	0.000	1.60 (7.28e-06)	
B + B:T	Log	log	-122.00	0.000	1.52 (1.54e-06)	*
B + B:T	Box-Cox	log	-767.00	0.024	1.61 (9.07e-06)	

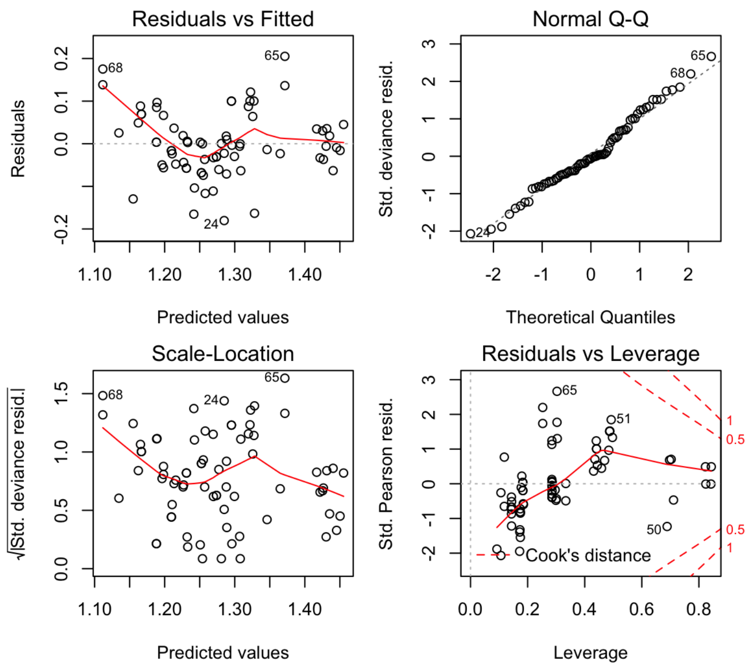

Figure A.22: Diagnostic plots of the "best" GLM describing Yield: Log-tranformation.

Zn

Table A.23: Quantitative diagnostic summary for GLM candidates describing Zn. Model details include: formula, type of data transformation used, link function, AIC, *p*-value for the Shapiro-Wilk test, and *d* value (*p*-value) for the Durbin-Watson test. The "best" model is noted by a star.

Formula	Transf	Link	AIC	SW test	DW test (p-value)	
B + T	-	identity	733.00	0.000	1.60 (0.003)	
B + T	Log	log	84.90	0.464	2.10 (0.229)	*
B + T	Box-Cox	identity	76.10	0.478	2.11 (0.240)	

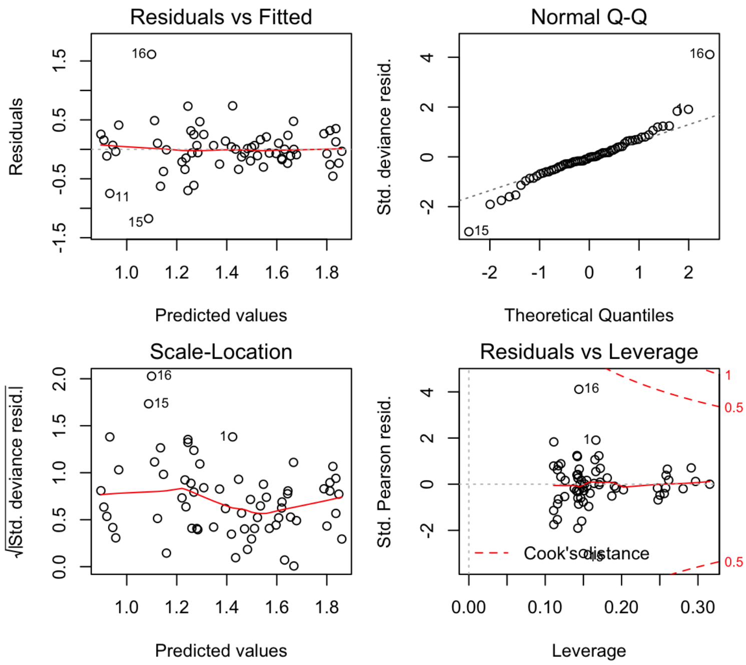

Figure A.23: Diagnostic plots of the "best" GLM describing Zn: Log-tranformation.

A.III MAXIMUM LIKELIHOOD ESTIMAES OF β VARIABLES

Table A.24: MLE of β variables for Ash model (n=98, df=17)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	1.60	0.11	14.42	0.00
BCorn	0.23	0.11	2.17	0.03
BDDManure	0.41	0.11	3.89	0.00
BDManure	0.14	0.11	1.28	0.20
BFoodW	0.91	0.12	7.36	0.00
BGrass	0.21	0.11	2.01	0.05
BHazelnut	-1.09	0.11	-10.33	0.00
BOak	-1.10	0.09	-12.42	0.00
BPine	-1.24	0.09	-14.43	0.00
BPaperW	1.08	0.12	8.71	0.00
BPoultry	1.05	0.11	9.93	0.00
BRapeseed	0.16	0.14	1.18	0.24
T	0.00	0.00	4.84	0.00

Table A.25: MLE of β variables for Bulk density model (n=35, df=19)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.10	0.02	5.84	0.00
BDDManure	0.07	0.02	3.05	0.01
BFoodW	0.13	0.02	5.41	0.00
BHazelnut	0.07	0.02	3.23	0.00
BOak	0.10	0.02	4.38	0.00
BPine	0.01	0.02	0.53	0.60
BPaperW	0.01	0.02	0.65	0.53
BPoultry	0.14	0.02	5.90	0.00
BRapeseed	-0.02	0.03	-0.66	0.52
BCorn:T	-0.00	0.00	-0.37	0.72
BDDManure:T	-0.00	0.00	-3.44	0.00
BFoodW:T	0.00	0.00	0.68	0.51
BHazelnut:T	0.00	0.00	3.04	0.01
BOak:T	-0.00	0.00	-2.68	0.02
BPine:T	0.00	0.00	0.51	0.62
BPaperW:T	0.00	0.00	4.36	0.00
BPoultry:T	0.00	0.00	1.43	0.17
BRapeseed:T	0.00	0.00	0.34	0.74

Table A.26: MLE of β variables for C model (n=93, df=17)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	483.93	59.28	8.16	0.00
BCorn	18.29	83.83	0.22	0.83
BDDManure	46.61	83.83	0.56	0.58
BDManure	3.61	83.83	0.04	0.97
BFoodW	599.07	92.14	6.50	0.00
BGrass	-131.03	92.14	-1.42	0.16
BHazelnut	72.82	83.83	0.87	0.39
BOak	-48.44	73.30	-0.66	0.51
BPine	-127.76	69.09	-1.85	0.07
BPaperW	-254.33	92.14	-2.76	0.01
BPoultry	-139.36	82.26	-1.69	0.09
BRapeseed	87.07	135.52	0.64	0.52
BBManure:T	0.48	0.13	3.77	0.00
BCorn:T	0.36	0.13	2.83	0.01
BDDManure:T	0.16	0.13	1.23	0.22
BDManure:T	0.45	0.13	3.49	0.00
BFoodW:T	-1.42	0.15	-9.33	0.00
BGrass:T	0.93	0.15	6.10	0.00
BHazelnut:T	0.50	0.13	3.88	0.00
BOak:T	0.80	0.10	8.36	0.00
BPine:T	0.92	0.08	11.92	0.00
BPaperW:T	-0.07	0.15	-0.45	0.66
BPoultry:T	-0.09	0.12	-0.71	0.48
BRapeseed:T	0.36	0.24	1.48	0.14

Table A.27: MLE of β variables for Ca model (n=61, df=21)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	9.17	0.29	31.90	0.00
BCorn	-0.99	0.41	-2.42	0.02
BDDManure	0.53	0.45	1.20	0.24
BDManure	-0.41	0.41	-1.02	0.31
BFoodW	0.31	0.45	0.70	0.49
BHazelnut	-1.11	0.41	-2.74	0.01
BOak	-2.95	0.41	-7.25	0.00
BPine	-1.29	0.41	-3.17	0.00
BPaperW	3.08	0.45	6.89	0.00
BPoultry	2.72	0.41	6.69	0.00
BBManure:T	0.00	0.00	0.04	0.97
BCorn:T	0.00	0.00	2.89	0.01
BDDManure:T	0.00	0.00	0.84	0.41
BDManure:T	0.00	0.00	2.75	0.01
BFoodW:T	0.00	0.00	3.95	0.00
BHazelnut:T	-0.00	0.00	-0.30	0.76
BOak:T	0.00	0.00	2.93	0.01
BPine:T	-0.00	0.00	-0.46	0.65
BPaperW:T	0.00	0.00	0.87	0.39
BPoultry:T	0.00	0.00	1.55	0.13

Table A.28: MLE of β variables for CEC model (n=36, df=19)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	1.78	0.10	17.19	0.00
BCorn	0.23	0.14	1.63	0.12
BDDManure	0.18	0.15	1.22	0.24
BFoodW	0.02	0.17	0.12	0.91
BHazelnut	-0.30	0.17	-1.75	0.10
BOak	0.24	0.15	1.63	0.12
BPine	0.09	0.15	0.61	0.55
BPaperW	-0.03	0.18	-0.17	0.87
BPoultry	0.37	0.16	2.37	0.03
BBManure:T	-0.00	0.00	-0.25	0.80
BCorn:T	-0.00	0.00	-1.72	0.10
BDDManure:T	-0.00	0.00	-2.06	0.05
BFoodW:T	-0.00	0.00	-2.51	0.02
BHazelnut:T	-0.00	0.00	-0.01	0.99
BOak:T	-0.00	0.00	-3.20	0.01
BPine:T	-0.00	0.00	-1.62	0.12
BPaperW:T	-0.00	0.00	-2.63	0.02
BPoultry:T	-0.00	0.00	-4.75	0.00

Table A.29: MLE of β variables for C:N model (n=89, df=17)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	3.14	0.12	25.65	0.00
BCorn	-0.02	0.11	-0.17	0.87
BDDManure	-0.64	0.11	-5.87	0.00
BDManure	-0.21	0.11	-1.90	0.06
BFoodW	-1.00	0.13	-7.84	0.00
BGrass	0.08	0.13	0.61	0.54
BHazelnut	0.61	0.11	5.65	0.00
BOak	0.97	0.10	10.19	0.00
BPine	1.39	0.09	15.39	0.00
BPaperW	0.75	0.13	5.85	0.00
BPoultry	-0.69	0.11	-6.35	0.00
BRapeseed	-0.16	0.14	-1.16	0.25
T	0.00	0.00	3.03	0.00

Table A.30: MLE of β variables for EC model (n=32, df=10)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	2.46	0.12	21.30	0.00
BDDManure	0.01	0.16	0.07	0.94
BFoodW	0.12	0.15	0.83	0.42
BHazelnut	-0.22	0.24	-0.93	0.37
BOak	-0.41	0.30	-1.34	0.20
BPine	0.03	0.28	0.10	0.92
BPaperW	-0.18	0.19	-0.91	0.37
BPoultry	0.25	0.15	1.69	0.11
BCorn:T	0.00	0.00	0.22	0.83
BDDManure:T	0.00	0.00	0.38	0.71
BFoodW:T	0.00	0.00	1.42	0.17
BHazelnut:T	-0.00	0.00	-1.80	0.09
BOak:T	-0.00	0.00	-1.77	0.10
BPine:T	-0.00	0.00	-3.23	0.01
BPaperW:T	-0.00	0.00	-0.72	0.48
BPoultry:T	-0.00	0.00	-0.64	0.53

Table A.31: MLE of β variables for Fe model (n=61, df=12)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	1.64	0.09	18.34	0.00
BCorn	0.18	0.07	2.59	0.01
BDDManure	0.29	0.07	3.87	0.00
BDManure	0.04	0.07	0.51	0.61
BFoodW	0.36	0.07	4.89	0.00
BHazelnut	-0.40	0.10	-4.19	0.00
BOak	-0.19	0.08	-2.23	0.03
BPine	-0.05	0.08	-0.68	0.50
BPaperW	0.39	0.07	5.41	0.00
BPoultry	0.25	0.07	3.72	0.00
T	0.00	0.00	1.43	0.16

Table A.32: MLE of β variables for Fixed carbon model (n=89, df=31)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	9.43	3.56	2.65	0.01
BBManure:T	0.09	0.01	8.85	0.00
BCorn:T	0.08	0.01	8.41	0.00
BDDManure:T	0.06	0.01	5.74	0.00
BDManure:T	0.08	0.01	8.39	0.00
BFoodW:T	0.02	0.01	1.56	0.12
BGrass:T	0.10	0.01	9.53	0.00
BHazelnut:T	0.10	0.01	10.28	0.00
BOak:T	0.12	0.01	13.47	0.00
BPine:T	0.11	0.01	13.65	0.00
BPaperW:T	-0.02	0.01	-1.76	0.08
BPoultry:T	-0.02	0.01	-1.59	0.12
BRapeseed:T	0.12	0.01	10.69	0.00

Table A.33: MLE of β variables for K model (n=61, df=12)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	58.55	5.12	11.43	0.00
BCorn	2.43	7.24	0.34	0.74
BDDManure	-1.75	7.96	-0.22	0.83
BDManure	-11.66	7.24	-1.61	0.12
BFoodW	-17.80	7.96	-2.24	0.03
BHazelnut	-17.64	7.24	-2.44	0.02
BOak	-40.50	7.24	-5.59	0.00
BPine	-42.51	7.24	-5.87	0.00
BPaperW	-26.33	7.96	-3.31	0.00
BPoultry	22.19	7.24	3.06	0.00
BBManure:T	0.05	0.01	4.09	0.00
BCorn:T	0.03	0.01	2.30	0.03
BDDManure:T	0.02	0.01	1.52	0.14
BDManure:T	0.02	0.01	2.05	0.05
BFoodW:T	0.06	0.01	4.63	0.00
BHazelnut:T	0.00	0.01	0.40	0.69
BOak:T	0.02	0.01	1.92	0.06
BPine:T	0.01	0.01	1.06	0.30
BPaperW:T	0.01	0.01	0.98	0.33
BPoultry:T	0.01	0.01	0.57	0.57

Table A.34: MLE of β variables for Mg model (n=65, df=12)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	8.04	0.14	58.12	0.00
BCorn	0.49	0.11	4.47	0.00
BDDManure	0.73	0.13	5.66	0.00
BDManure	0.03	0.11	0.28	0.78
BFoodW	0.03	0.13	0.24	0.81
BHazelnut	-2.11	0.11	-19.24	0.00
BOak	-4.53	0.11	-41.29	0.00
BPine	-2.04	0.10	-19.74	0.00
BPaperW	-0.53	0.13	-4.12	0.00
BPoultry	0.62	0.10	6.04	0.00
T	0.00	0.00	3.50	0.00

Table A.35: MLE of β variables for Mn model (n=65, df=12)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	4.34	0.15	29.84	0.00
BCorn	0.17	0.12	1.44	0.16
BDDManure	0.05	0.14	0.37	0.72
BDManure	-0.70	0.12	-6.09	0.00
BFoodW	-0.10	0.14	-0.74	0.46
BHazelnut	-1.90	0.12	-16.51	0.00
BOak	-1.94	0.12	-16.88	0.00
BPine	0.49	0.11	4.50	0.00
BPaperW	0.01	0.14	0.07	0.94
BPoultry	1.18	0.11	10.84	0.00
T	0.00	0.00	5.52	0.00

Table A.36: MLE of β variables for N model (n=89, df=31)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	17.71	2.38	7.43	0.00
BCorn	-4.04	3.37	-1.20	0.23
BDDManure	11.31	3.37	3.36	0.00
BDManure	2.11	3.37	0.63	0.53
BFoodW	85.47	3.70	23.07	0.00
BGrass	-5.78	3.70	-1.56	0.12
BHazelnut	-12.41	3.37	-3.68	0.00
BOak	-15.23	2.92	-5.22	0.00
BPine	-16.87	2.79	-6.05	0.00
BPaperW	-16.52	3.70	-4.46	0.00
BPoultry	13.54	3.37	4.02	0.00
BRapeseed	-5.65	5.45	-1.04	0.30
BBManure:T	-0.01	0.01	-2.76	0.01
BCorn:T	-0.01	0.01	-1.16	0.25
BDDManure:T	-0.01	0.01	-2.03	0.05
BDManure:T	-0.01	0.01	-2.07	0.04
BFoodW:T	-0.16	0.01	-25.57	0.00
BGrass:T	-0.00	0.01	-0.39	0.70
BHazelnut:T	-0.00	0.01	-0.08	0.93
BOak:T	0.00	0.00	0.42	0.68
BPine:T	0.00	0.00	0.38	0.71
BPaperW:T	-0.00	0.01	-0.11	0.91
BPoultry:T	-0.04	0.01	-7.27	0.00
BRapeseed:T	0.01	0.01	0.52	0.61

Table A.37: MLE of β variables for Na model (n=61, df=21)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	2.03	0.02	82.63	0.00
BCorn	-0.16	0.02	-8.14	0.00
BDDManure	0.04	0.02	2.01	0.05
BDManure	0.02	0.02	1.16	0.25
BFoodW	0.15	0.02	8.12	0.00
BHazelnut	-0.30	0.02	-14.24	0.00
BOak	-0.34	0.02	-14.93	0.00
BPine	-0.40	0.02	-16.89	0.00
BPaperW	-0.32	0.03	-12.36	0.00
BPoultry	0.03	0.02	1.62	0.11
T	0.00	0.00	2.29	0.03

Table A.38: MLE of β variables for P model (n=59, df=21)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	2.82	0.11	25.85	0.00
BCorn	-0.20	0.16	-1.21	0.23
BDDManure	0.09	0.16	0.57	0.57
BDManure	-0.32	0.17	-1.92	0.06
BFoodW	0.06	0.16	0.38	0.71
BHazelnut	-0.52	0.22	-2.37	0.02
BOak	-1.45	0.66	-2.21	0.03
BPine	1.34	0.56	2.38	0.02
BPaperW	-0.32	0.21	-1.54	0.13
BPoultry	0.46	0.13	3.51	0.00
BBManure:T	0.00	0.00	0.16	0.87
BCorn:T	0.00	0.00	0.96	0.34
BDDManure:T	0.00	0.00	0.79	0.43
BDManure:T	0.00	0.00	1.87	0.07
BFoodW:T	0.00	0.00	1.33	0.19
BHazelnut:T	-0.00	0.00	-0.10	0.92
BOak:T	-0.00	0.00	-0.53	0.60
BPine:T	-0.01	0.00	-4.11	0.00
BPaperW:T	0.00	0.00	0.24	0.81
BPoultry:T	0.00	0.00	0.09	0.93

Table A.39: MLE of β variables for pH_w model (n=45, df=11)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	5.08	0.71	7.15	0.00
BDDManure	0.27	0.67	0.40	0.69
BFoodW	-0.10	0.67	-0.14	0.89
BGrass	-1.43	0.73	-1.98	0.06
BHazelnut	-1.23	0.67	-1.83	0.08
BOak	-3.25	0.60	-5.46	0.00
BPine	-3.07	0.57	-5.37	0.00
BPaperW	-0.08	0.67	-0.12	0.90
BPoultry	0.75	0.61	1.22	0.23
T	0.01	0.00	7.61	0.00

Table A.40: MLE of β variables for S model (n=61, df=11)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	6.86	0.12	59.35	0.00
BCorn	-0.25	0.16	-1.53	0.13
BDDManure	0.99	0.19	5.15	0.00
BDManure	0.53	0.16	3.22	0.00
BFoodW	0.06	0.19	0.33	0.74
BHazelnut	-1.58	0.16	-9.65	0.00
BOak	-2.22	0.16	-13.55	0.00
BPine	-2.02	0.18	-11.29	0.00
BPaperW	-1.21	0.19	-6.34	0.00
BPoultry	1.32	0.16	8.06	0.00

Table A.41: MLE of β variables for SSA(CO_2) model (n=29, df=8)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-32.16	55.40	-0.58	0.57
BCorn:T	0.91	0.15	6.15	0.00
BGrass:T	0.68	0.15	4.46	0.00
BHazelnut:T	1.12	0.15	7.60	0.00
BOak:T	1.02	0.13	7.67	0.00
BPine:T	1.06	0.13	7.97	0.00
BPoultry:T	0.22	0.15	1.52	0.14

Table A.42: MLE of β variables for SSA(N_2) model (n=18, df=11)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	5.87	2.61	2.25	0.05
BHazelnut	-4.42	3.69	-1.20	0.27
BOak	3.03	5.21	0.58	0.58
BPine	-4.24	5.21	-0.81	0.44
BPoultry	-9.46	3.69	-2.56	0.03
BCorn:T	-0.00	0.01	-0.82	0.44
BHazelnut:T	0.00	0.01	0.18	0.86
BOak:T	-0.01	0.01	-1.57	0.15
BPine:T	0.00	0.01	0.22	0.83
BPoultry:T	0.02	0.01	3.06	0.02

Table A.43: MLE of β variables for Volatile matter model (n=98, df=31)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	67.79	7.68	8.83	0.00
Fcombo	-14.78	19.83	-0.75	0.46
Fplant	20.07	8.88	2.26	0.03
Fanimal:T	-0.05	0.02	-3.16	0.00
Fcombo:T	-0.03	0.04	-0.88	0.38
Fplant:T	-0.11	0.01	-11.31	0.00

Table A.44: MLE of β variables for Yield model (n=75, df=27)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	1.48	0.05	32.45	0.00
BCorn	-0.03	0.06	-0.43	0.67
BDDManure	-0.06	0.07	-0.91	0.37
BDManure	-0.06	0.07	-0.91	0.37
BFoodW	-0.06	0.07	-0.91	0.37
BGrass	-0.16	0.21	-0.76	0.45
BHazelnut	-0.04	0.06	-0.70	0.49
BOak	0.02	0.07	0.33	0.74
BPine	0.15	0.06	2.60	0.01
BPaperW	-0.04	0.07	-0.57	0.57
BPoultry	0.00	0.06	0.04	0.97
BRapeseed	-0.07	0.10	-0.65	0.52
BBManure:T	-0.00	0.00	-5.26	0.00
BCorn:T	-0.00	0.00	-4.44	0.00
BDDManure:T	-0.00	0.00	-4.18	0.00
BDManure:T	-0.00	0.00	-4.18	0.00
BFoodW:T	-0.00	0.00	-1.72	0.09
BGrass:T	-0.00	0.00	-0.39	0.70
BHazelnut:T	-0.00	0.00	-3.79	0.00
BOak:T	-0.00	0.00	-5.98	0.00
BPine:T	-0.00	0.00	-11.15	0.00
BPaperW:T	-0.00	0.00	-0.48	0.63
BPoultry:T	-0.00	0.00	-1.20	0.24
BRapeseed:T	-0.00	0.00	-1.48	0.15

Table A.45: MLE of β variables for Zn model (n=65, df=12)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	1.54	0.06	24.36	0.00
BCorn	-0.18	0.05	-3.80	0.00
BDDManure	-0.01	0.05	-0.20	0.84
BDManure	-0.11	0.05	-2.34	0.02
BFoodW	-0.26	0.06	-4.23	0.00
BHazelnut	-0.71	0.07	-10.12	0.00
BOak	-0.52	0.06	-8.58	0.00
BPine	-0.39	0.05	-7.61	0.00
BPaperW	-0.37	0.07	-5.54	0.00
BPoultry	0.18	0.04	4.71	0.00
T	0.00	0.00	1.97	0.05

A.IV MODEL PREDICTIONS

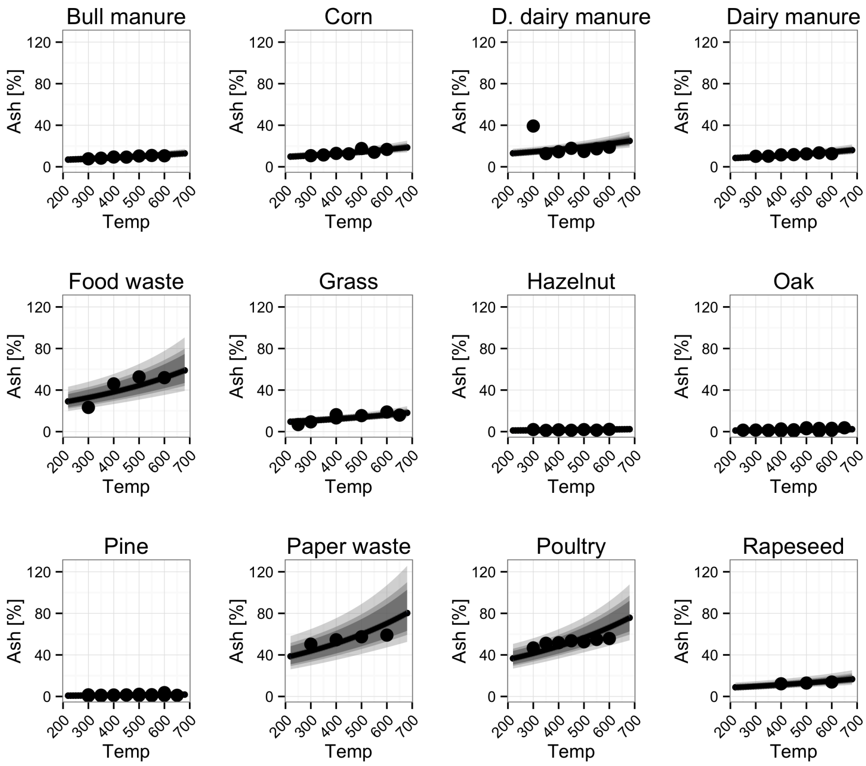

Figure A.24: Model predictions for Response = Ash, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

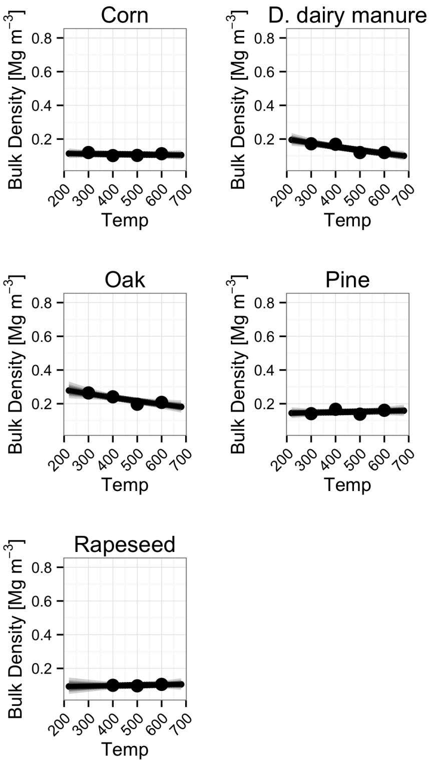

Figure A.25: Model predictions for Response = Bulk density, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

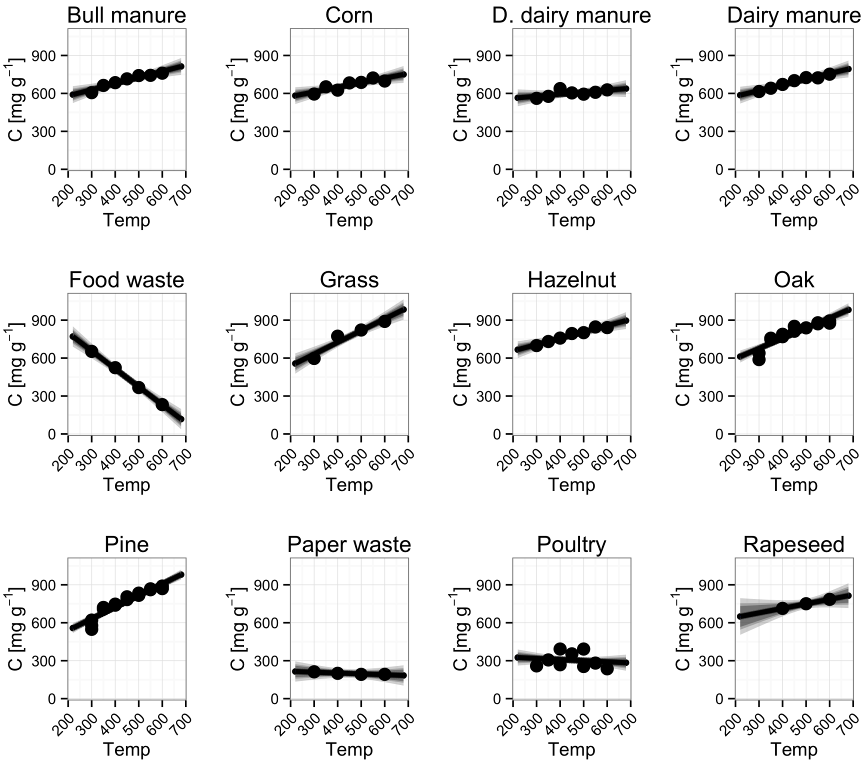

Figure A.26: Model predictions for Response = C, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

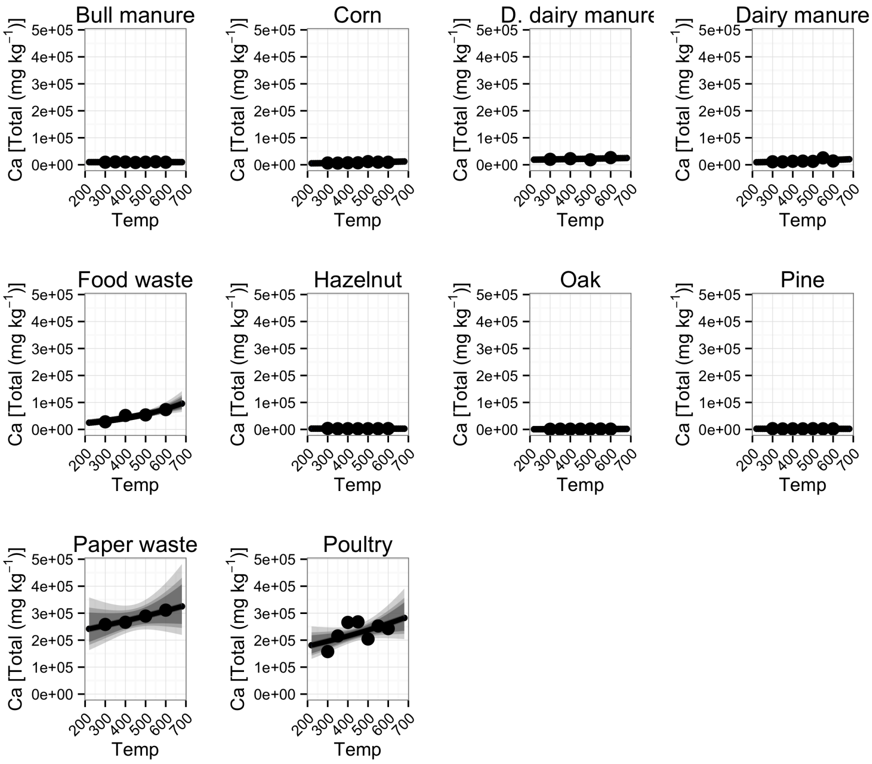

Figure A.27: Model predictions for Response = Ca, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

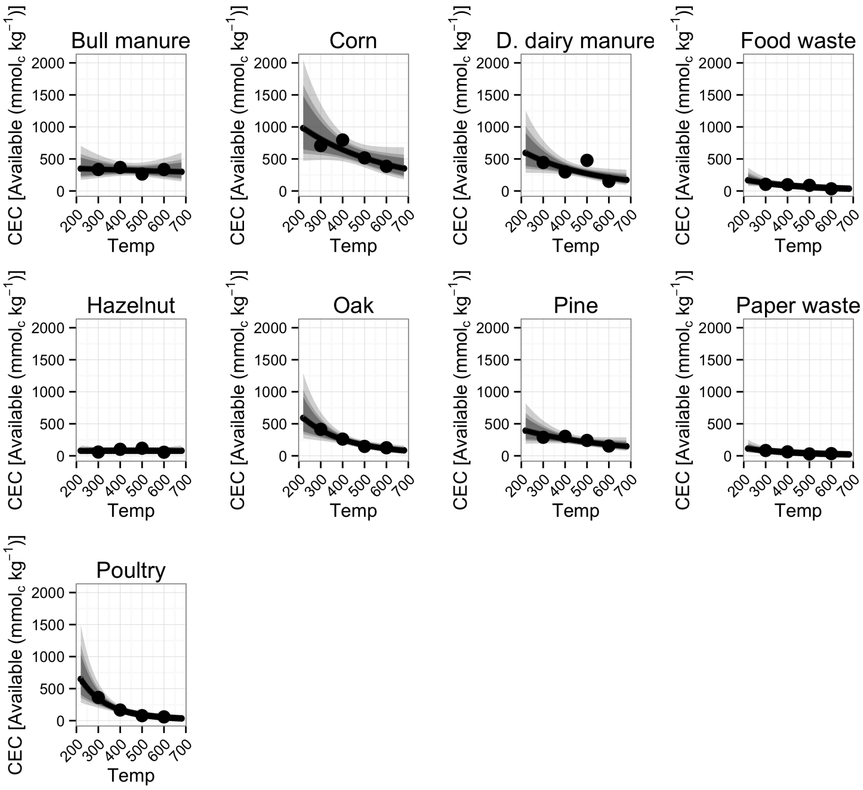

Figure A.28: Model predictions for Response = CEC, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

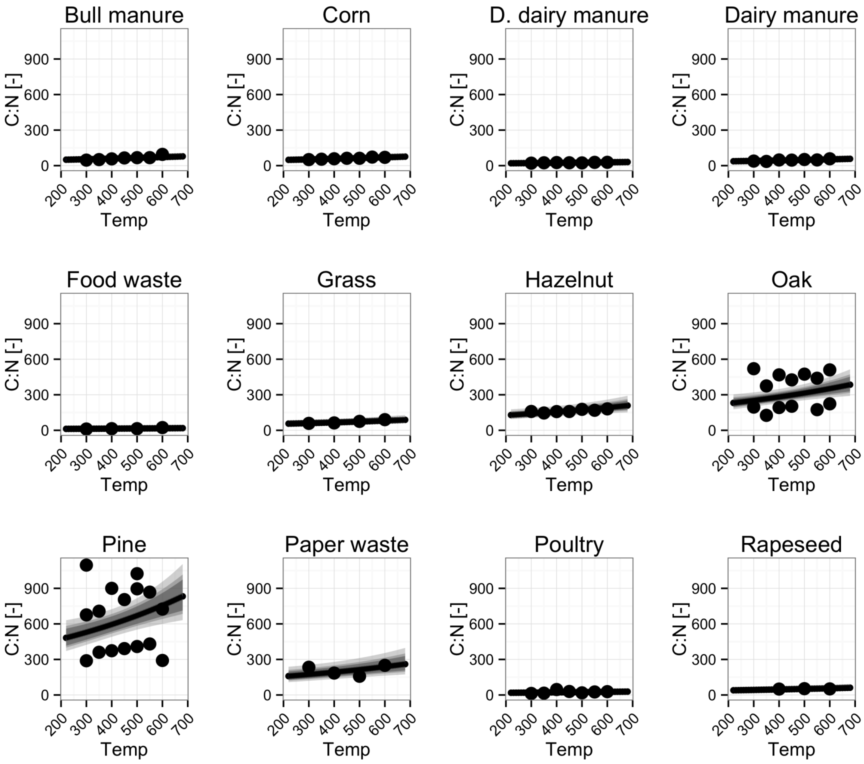

Figure A.29: Model predictions for Response = C:N, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

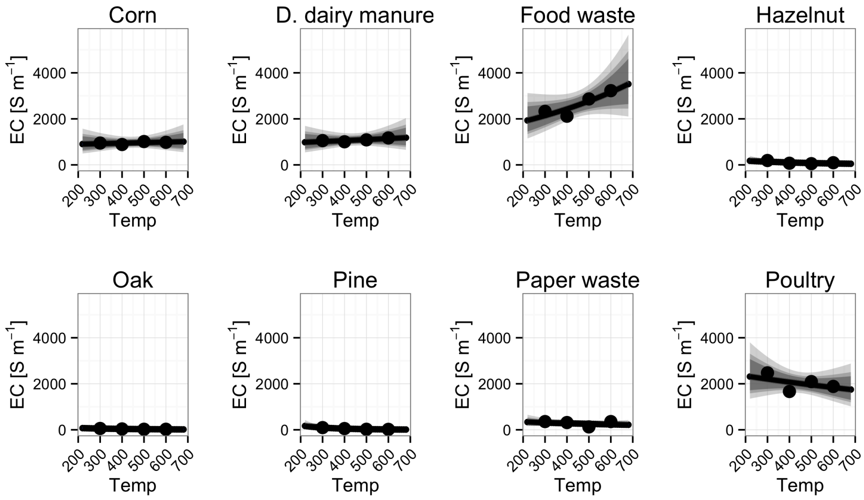

Figure A.30: Model predictions for Response = EC, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

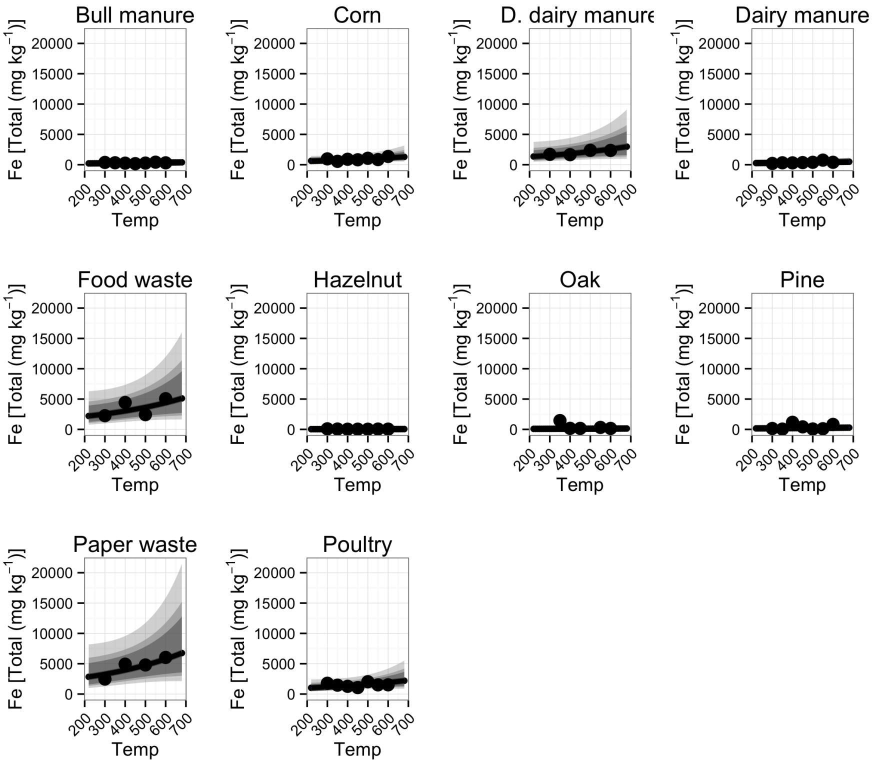

Figure A.31: Model predictions for Response = Fe, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

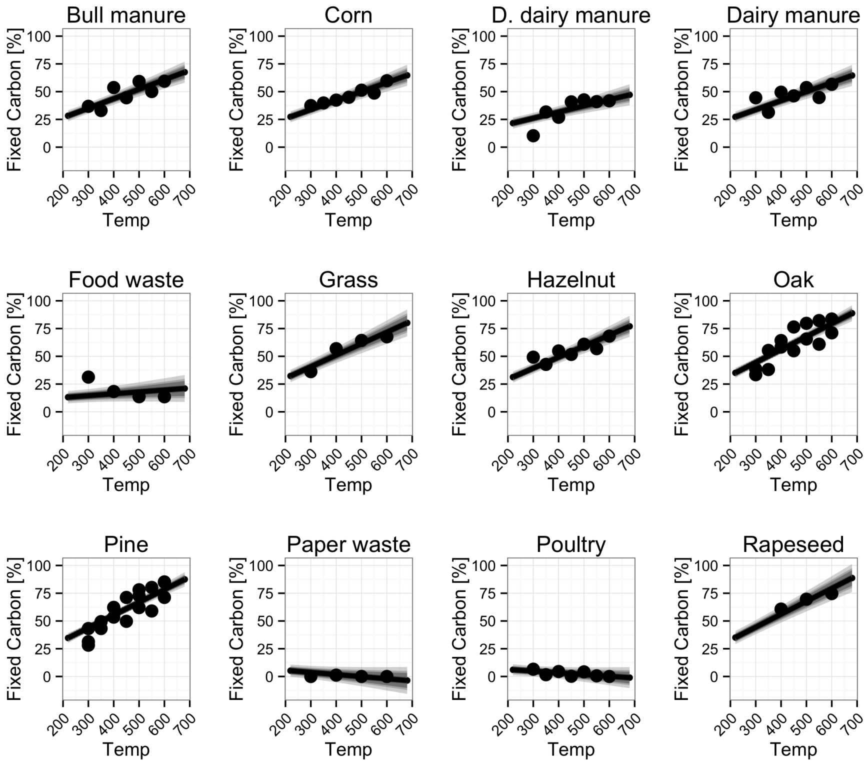

Figure A.32: Model predictions for Response = Fixed carbon, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

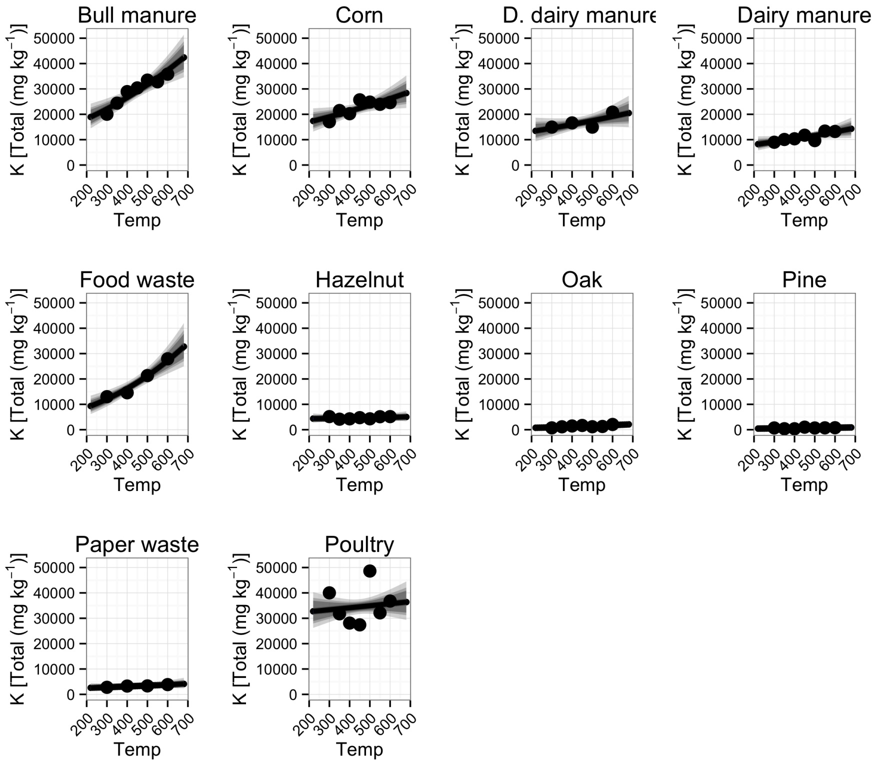

Figure A.33: Model predictions for Response = K, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (open circles).

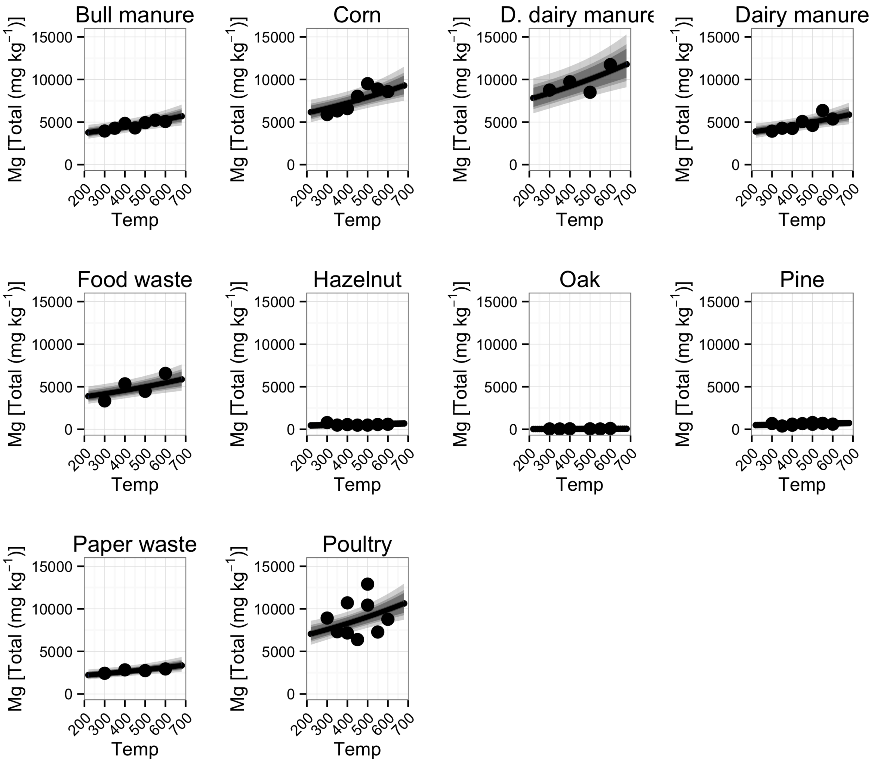

Figure A.34: Model predictions for Response = Mg, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

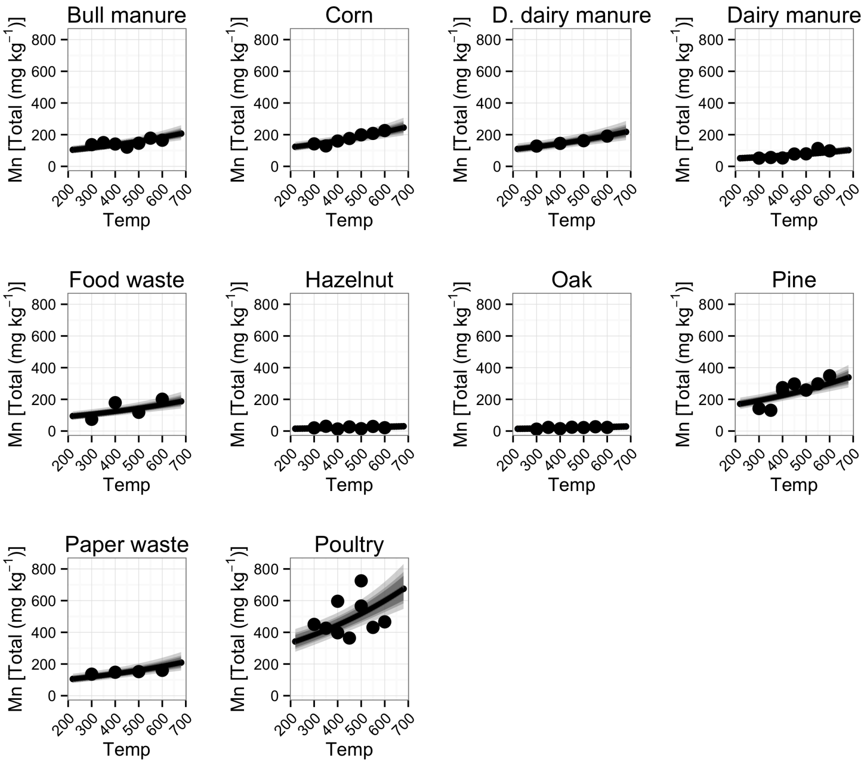

Figure A.35: Model predictions for Response = Mn, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

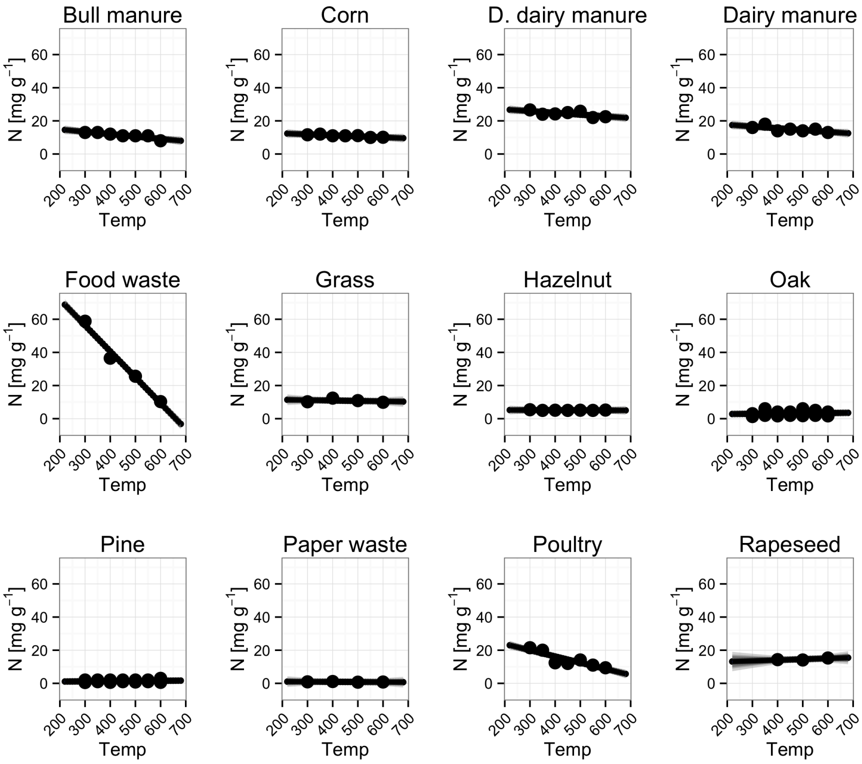

Figure A.36: Model predictions for Response = N, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

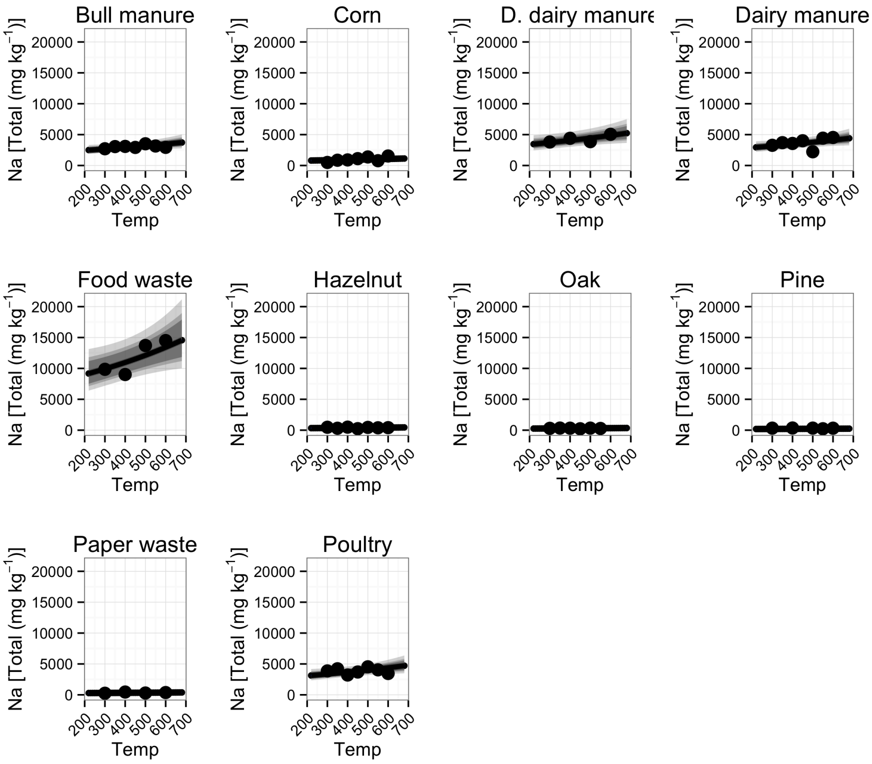

Figure A.37: Model predictions for Response = Na, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

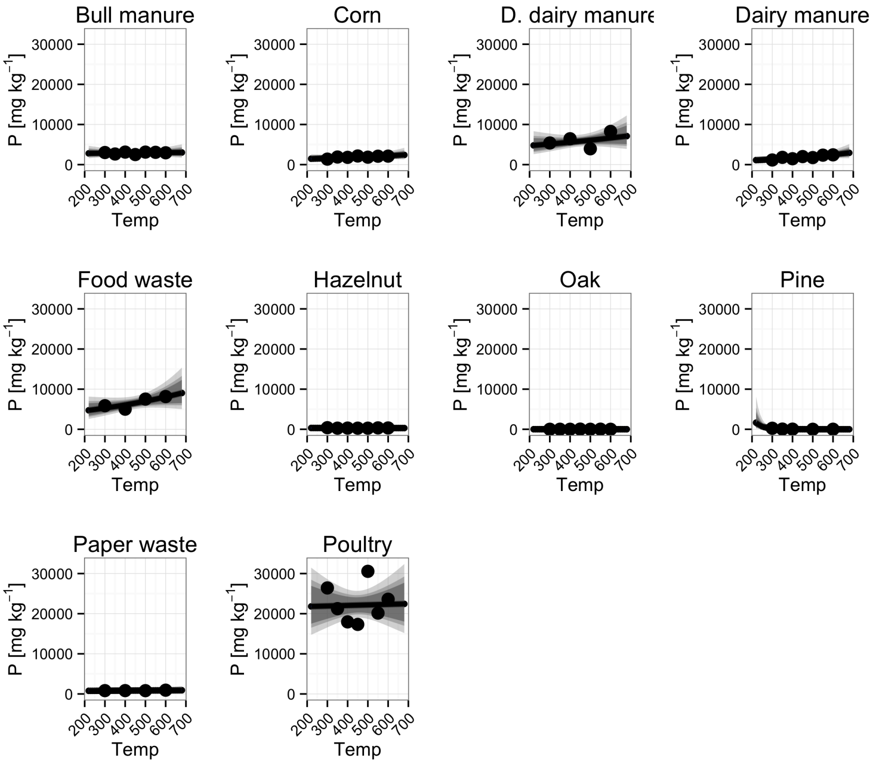

Figure A.38: Model predictions for Response = P, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

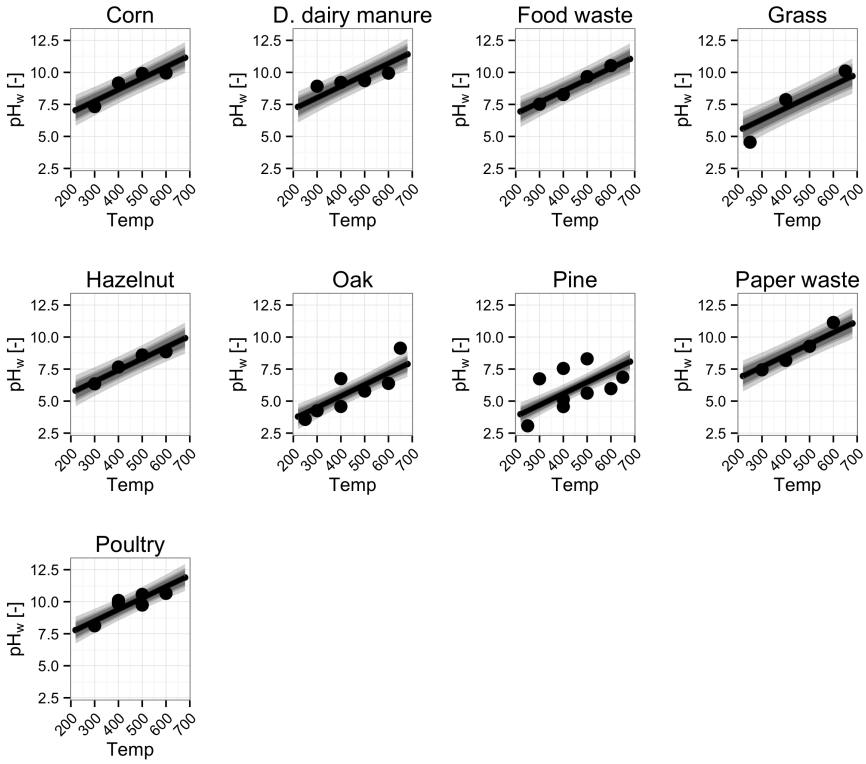

Figure A.39: Model predictions for Response = pH$_w$, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

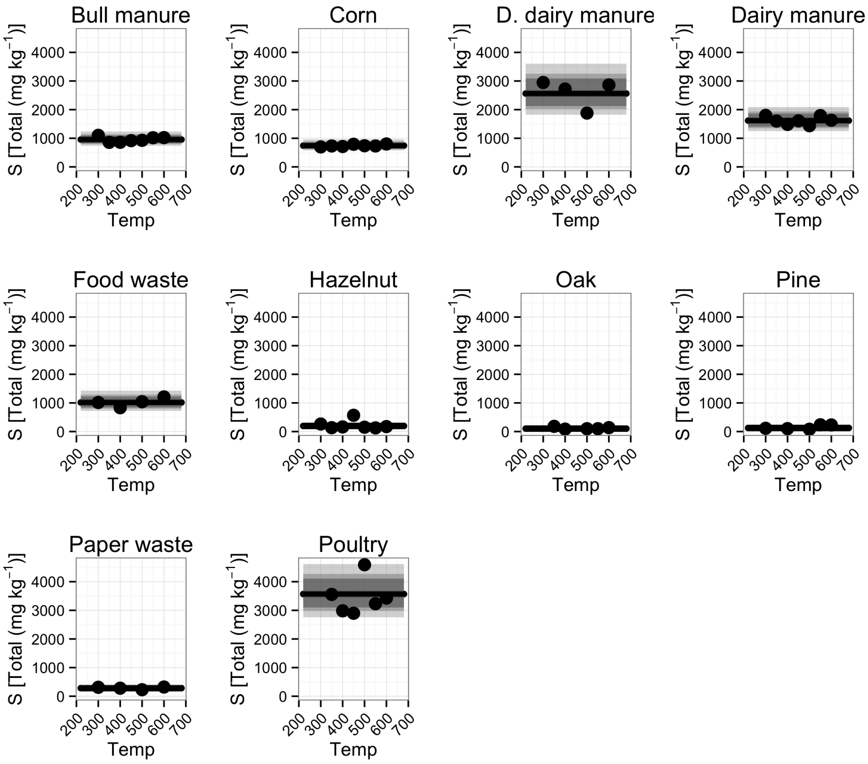

Figure A.40: Model predictions for Response = S, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

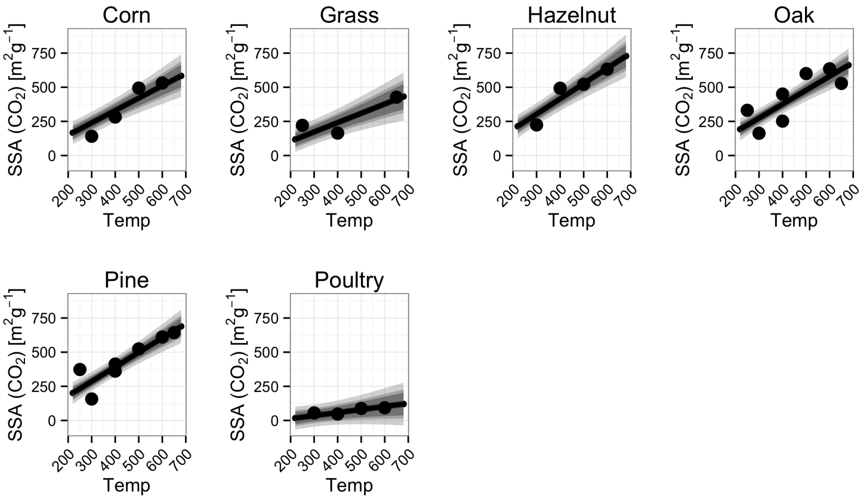

Figure A.41: Model predictions for Response = $SSA(CO_2)$, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

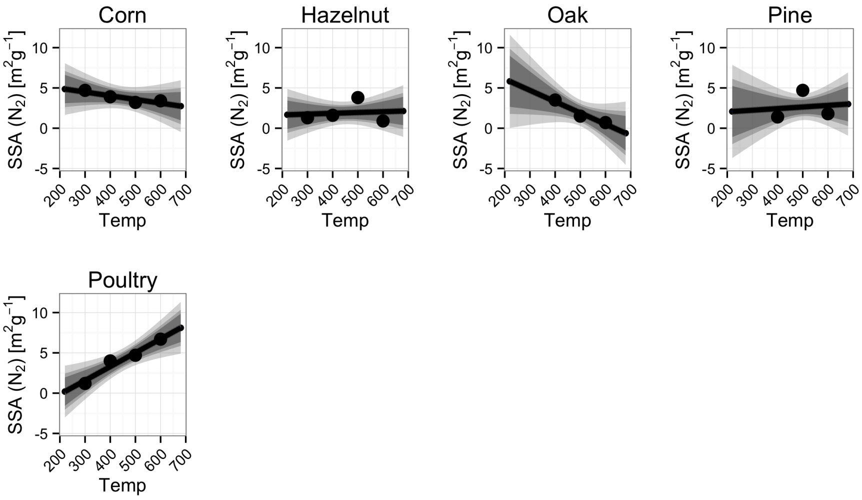

Figure A.42: Model predictions for Response = $SSA(N_2)$, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

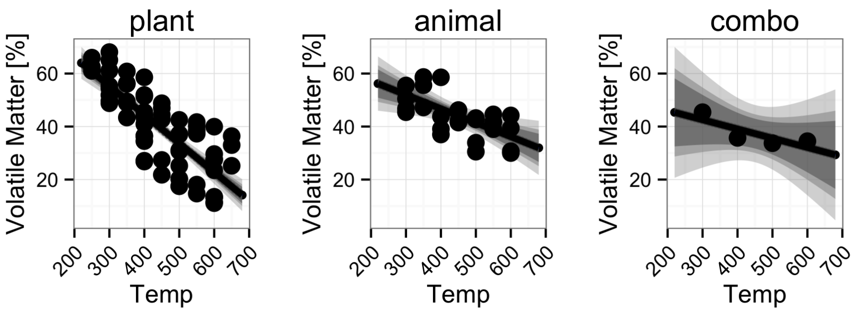

Figure A.43: Model predictions for Response = Volatile matter, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

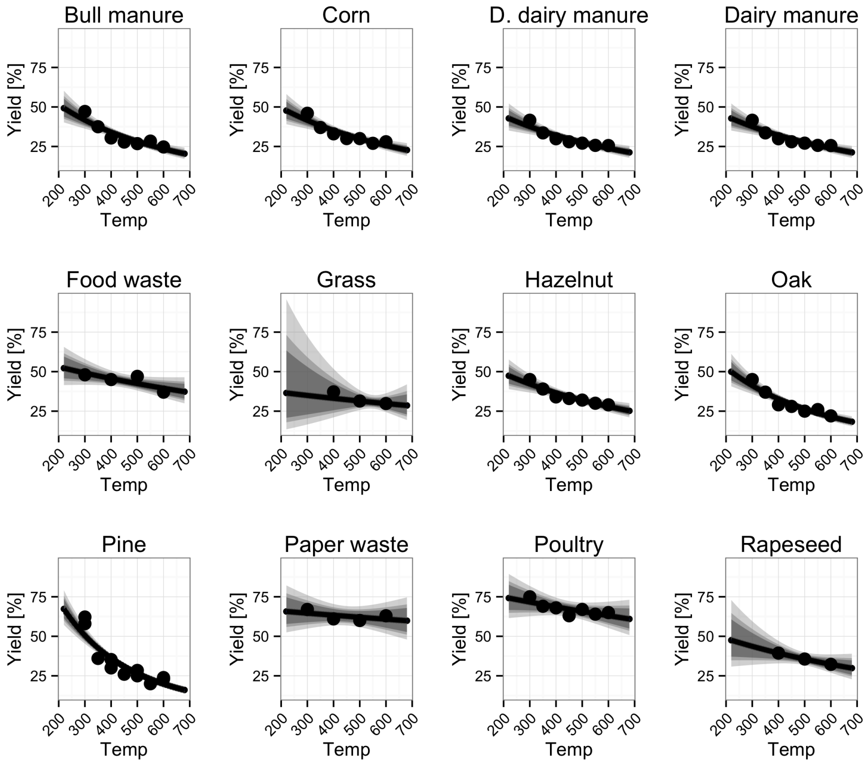

Figure A.44: Model predictions for Response = Yield, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

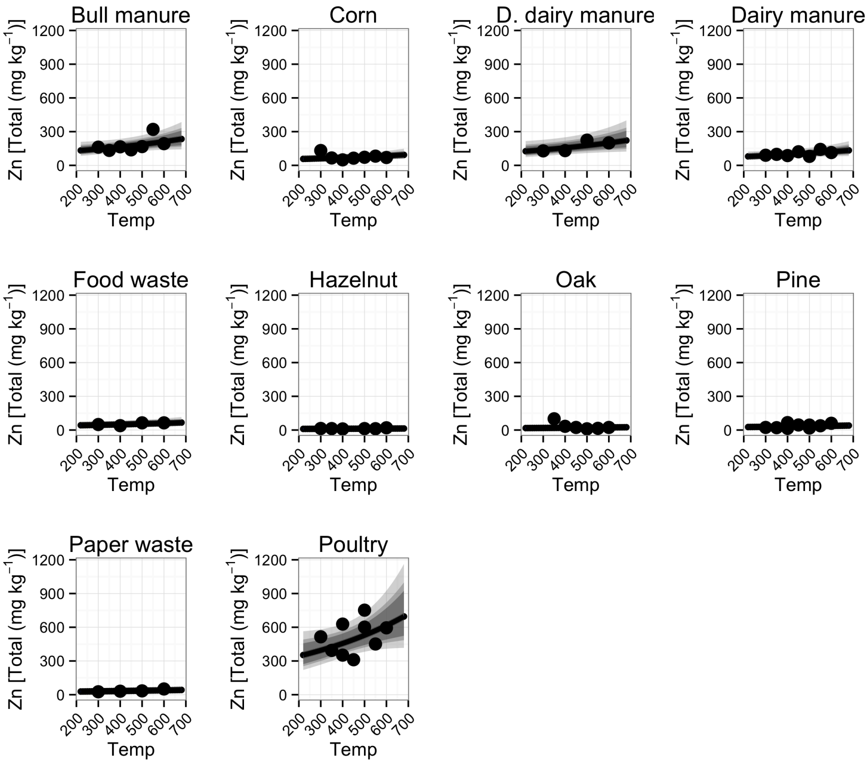

Figure A.45: Model predictions for Response = Zn, for each of starting organic material (solid line) with confidence intervals provided for 75, 85, and 95% (dark gray, gray, light gray shading, respectively), and overlaid data points from meta-library (solid circles).

A.V ANOVA RESULTS FOR β PARAMETERS

Table A.46: ANOVA results for β parameters for each "best" model.

Response	β Parameter	LR Chisq	df	Pr (>Chisq)	
Ash	B	1797.52	11	<2.22e-16	***
	T	23.47	1	1.271e-06	***
BulkD	B	2024.81	8	<2.22e-16	***
	B:T	50.26	9	9.64e-08	***
C	B	2436.89	11	<2.22e-16	***
	B:T	390.16	12	<2.22e-16	***
Ca	B	6690.9	9	<2.22e-16	***
	B:T	44.3	10	2.891e-06	***
CEC	B	253.82	8	<2.22e-16	***
	B:T	56.78	9	5.57e-09	***
C:N	B	1269.0	11	<2.22e-16	***
	T	9.2	1	0.0024	**
EC	B	1074.24	7	<2.22e-16	***
	B:T	20.29	8	0.0093	**
Fe	B	178.79	9	<2.22e-16	***
	T	2.04	1	0.15	
FixedC	B:T	794.3	12	<2.22e-16	***
K	B	3290.3	9	<2.22e-16	***
	B:T	56.2	10	1.86e-08	***
Mg	B	4149.47	9	<2.22e-16	***
	T	12.269	1	0.00046	***
Mn	B	1426.24	9	<2.22e-16	***
	T	30.42	1	3.48e-08	***
N	B	3410.9	11	<2.22e-16	***
	B:T	724.7	12	<2.22e-16	***
Na	B	1359.89	9	<2.22e-16	***
	T	5.25	1	0.02198	*
P	B	2582.47	9	<2.22e-16	***
	B:T	33.85	10	0.0002	***
pH_w	B	119.58	8	<2.22e-16	***
	T	57.92	1	2.729e-14	***
S	B	908.8	9	<2.22e-16	***
SSA(CO_2)	B:T	129.24	6	<2.22e-16	***
SSA(N_2)	B	10.519	4	0.032	*
	B:T	12.559	5	0.027	*
Volatile matter	F	6.879	2	0.03209	*
	F:T	138.640	3	<2.22e-16	***
Yield	B	597.33	11	<2.22e-16	***
	B:T	260.12	12	<2.22e-16	***
Zn	B	452.71	9	<2.22e-16	***
	T	3.84	1	0.0499	*

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