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## Supplementary Tables

**Supplementary Table 1** Soil analysis of the three sites (I, II, and III) of the experiment.

Variable	Unit	Sites		
		I	II	III
Clay content	%	65	46	51
Silt content	%	23	14	14
Sand content	%	12	40	35
pH H <sub>2</sub> O	-	5.2	4.6	6.1
pH SMP	-	5.5	5.4	6.4
Organic matter	%	3.4	3.3	2.9
Phosphorus	mg/dm <sup>3</sup>	36.5	>51	36
Potassium	mg/dm <sup>3</sup>	334	254	298
Calcium	mg/dm <sup>3</sup>	1615	749	1729
Magnesium	mg/dm <sup>3</sup>	221	152	287
Aluminum	mg/dm <sup>3</sup>	18	81	0
Potential acidity	cmol <sub>c</sub> /dm <sup>3</sup>	7.7	8.7	2.8
Cation exchange capacity	cmol <sub>c</sub> /dm <sup>3</sup>	18.4	14.3	14.6
Base saturation	%	58	39	80
Aluminum saturation	%	2	14	0
Potassium saturation	%	4.6	4.5	5.2
Sulfur	mg/dm <sup>3</sup>	21.1	9	9.5
Boron	mg/dm <sup>3</sup>	0.6	0.6	0.5
Zinc	mg/dm <sup>3</sup>	2.45	3.86	1.98
Copper	mg/dm <sup>3</sup>	6.08	2.28	1.62
Manganese	mg/dm <sup>3</sup>	43.7	35	4.6

**Supplementary Table 2.** Experimental results.

Treatment	Site	Replication	Grain mass (g)	EDAS (days)	Total root length (cm)	Very thin roots (cm)	Thin roots (cm)	Thick roots (cm)	Volume (cm <sup>3</sup> )	Tips	Forks
1	1	1	70.35	6	261.31	120.80	84.99	55.46	6.65	684	1101
1	1	2	44.23	6	191.07	80.10	77.79	33.18	4.80	786	638
1	1	3	41.23	6	235.95	112.99	69.44	53.30	5.15	1337	1156
1	1	4	40.55	5	424.32	262.11	120.23	41.97	2.87	3941	1374
1	1	5	40.08	5	328.46	187.90	80.37	60.05	7.60	4326	2386
1	1	6	39.35	8	248.30	139.47	79.58	29.20	3.43	1258	1171
1	1	7	39.10	5	490.26	314.19	132.34	43.32	3.88	4838	2481
1	1	8	39.05	6	339.35	151.41	124.25	63.64	6.01	1707	1982
1	1	9	38.66	5	320.78	177.48	92.84	50.26	3.87	1224	1813
1	1	10	37.98	5	290.66	148.53	85.61	56.51	4.67	3311	830
1	1	11	37.49	8	285.58	157.49	82.74	45.12	4.77	2294	1271
1	1	12	37.08	6	196.54	91.33	83.50	21.56	2.80	1244	791
1	1	13	36.18	6	248.96	161.46	56.89	30.37	3.39	2866	1889
1	1	14	35.93	6	335.94	172.25	125.20	38.49	3.44	2665	887
1	1	15	35.86	6	239.81	112.32	67.19	60.30	6.04	902	1008
1	1	16	35.49	6	316.15	183.34	82.81	49.78	4.39	1296	1572
1	1	17	35.28	5	505.33	333.52	129.47	42.08	3.86	2454	2879
1	1	18	35.21	6	140.21	63.99	46.07	30.15	3.70	502	540
1	1	19	35.07	6	499.56	315.76	139.53	44.25	3.57	1951	2451
1	1	20	35.01	5	252.15	140.92	70.46	40.75	3.70	1819	1010
1	1	21	34.93	7	385.92	220.50	118.58	46.71	3.40	2543	1207
1	1	22	34.56	7	318.71	205.50	56.34	56.51	4.56	5052	3526
1	1	23	34.52	6	294.31	142.65	110.98	40.61	4.39	790	1845
1	1	24	34.23	5	153.25	54.66	59.56	38.83	4.59	408	524
1	1	25	34.23	9	166.26	103.11	27.59	35.57	8.55	2403	1827
1	1	26	34.21	6	169.43	62.73	73.56	33.14	4.54	827	846
1	1	27	34.04	6	230.21	130.33	65.55	34.28	2.78	1932	582
1	1	28	33.25	5	298.76	155.72	111.62	31.43	4.29	748	1743
1	1	29	33.02	8	310.27	177.97	86.06	46.22	4.27	2587	1368
1	1	30	32.94	6	150.55	83.53	30.93	36.03	3.21	557	731

1	1	31	32.94	6	107.89	49.35	32.32	26.21	3.94	554	544
1	1	32	32.89	6	268.61	154.28	94.53	19.76	2.63	2506	921
1	1	33	32.69	5	166.99	72.33	65.37	29.29	3.21	484	606
1	1	34	32.63	6	206.73	112.32	64.63	29.76	2.20	1549	615
1	1	35	32.61	6	127.00	64.67	39.14	23.19	2.18	930	489
1	1	36	32.50	7	325.06	162.38	112.98	49.68	5.44	2146	1505
1	1	37	32.35	7	178.02	65.99	76.73	35.28	3.66	402	511
1	1	38	32.06	6	316.84	190.12	89.09	37.55	4.34	2785	2319
1	1	39	31.81	6	230.86	100.46	90.17	40.16	3.99	826	709
1	1	40	31.78	6	170.84	89.24	53.37	28.21	4.50	1286	890
2	1	1	31.59	7	337.56	225.31	75.13	36.68	2.88	5193	1986
2	1	2	31.51	6	129.61	32.16	68.59	28.86	4.71	703	214
2	1	3	31.50	8	234.77	121.79	92.65	20.31	2.38	1614	922
2	1	4	31.48	6	389.13	194.95	143.39	50.80	4.05	1050	1766
2	1	5	31.41	6	309.11	166.54	104.48	38.03	3.90	2193	1634
2	1	6	31.41	8	228.82	93.89	73.99	60.85	6.97	2140	1470
2	1	7	31.18	7	385.63	225.30	102.92	56.99	6.62	4815	3363
2	1	8	31.15	7	307.57	164.25	102.44	40.80	3.89	1798	1416
2	1	9	31.01	8	199.21	91.00	77.83	30.39	3.47	517	882
2	1	10	30.65	6	285.15	140.06	108.98	35.95	3.50	2299	1409
2	1	11	30.64	6	341.82	238.08	69.22	34.30	2.60	3346	1754
2	1	12	30.48	7	214.33	100.43	78.41	35.50	2.96	1278	804
2	1	13	30.47	7	269.51	137.90	89.62	41.96	5.04	1570	1476
2	1	14	30.43	6	368.07	194.76	127.49	45.82	4.00	2363	1739
2	1	15	30.17	8	300.15	163.52	93.76	42.72	3.61	2252	1889
2	1	16	29.80	8	311.36	215.70	71.29	24.23	1.75	4142	1262
2	1	17	29.63	6	124.88	41.02	53.27	30.59	3.87	324	360
2	1	18	29.51	5	121.59	50.23	42.72	28.54	3.69	772	368
2	1	19	29.41	6	172.73	108.26	50.92	13.54	1.23	1207	604
2	1	20	29.35	5	241.51	119.39	94.76	27.19	3.41	2529	1099
2	1	21	28.99	5	224.89	81.41	102.09	41.39	4.11	736	751
2	1	22	28.96	8	292.51	186.17	72.38	33.83	2.58	2312	1707

2	1	23	28.88	7	279.89	167.60	76.55	35.62	3.17	2761	1108
2	1	24	28.61	6	193.87	118.11	52.94	22.78	3.11	1668	1206
2	1	25	28.59	6	234.55	132.66	67.59	34.20	2.84	1697	946
2	1	26	28.48	6	287.91	142.54	86.97	58.32	5.17	2373	1596
2	1	27	28.38	5	245.91	150.51	63.09	32.21	2.12	2439	701
2	1	28	28.34	6	195.45	78.80	73.70	42.82	5.35	1285	892
2	1	29	28.13	7	209.80	116.35	60.45	32.87	3.74	1223	1460
2	1	30	28.04	6	159.05	70.80	55.90	32.32	4.29	863	1020
2	1	31	27.94	7	206.49	109.94	53.23	43.32	5.92	2226	1691
2	1	32	27.93	9	145.12	71.75	44.04	29.24	3.44	1468	697
2	1	33	27.93	5	153.76	61.82	64.56	27.39	2.98	981	325
2	1	34	27.69	8	186.20	73.33	83.49	29.33	3.36	1515	493
2	1	35	27.64	6	113.44	66.47	23.25	23.72	2.15	1575	354
2	1	36	27.40	7	307.06	182.56	91.11	33.05	2.66	2225	1326
2	1	37	27.31	6	348.72	205.99	95.25	47.10	3.82	4673	1528
2	1	38	27.26	5	274.54	131.74	82.44	60.36	5.07	1912	1196
2	1	39	27.25	9	89.33	48.63	25.38	15.23	1.69	874	192
2	1	40	27.05	7	357.35	213.22	113.10	30.84	2.91	2262	1682
3	1	1	27.04	6	237.39	146.73	69.15	21.45	1.59	2535	731
3	1	2	27.04	6	354.02	207.00	95.96	51.07	3.48	1218	2019
3	1	3	27.03	9	124.29	57.32	40.16	26.82	2.76	305	486
3	1	4	26.98	8	328.77	181.46	113.82	32.86	2.85	1815	1312
3	1	5	26.88	8	128.83	75.75	29.48	23.53	2.21	579	358
3	1	6	26.82	5	100.93	40.09	26.84	33.97	3.72	585	290
3	1	7	26.81	6	245.17	137.07	80.78	27.32	2.46	488	845
3	1	8	26.74	8	591.90	356.40	158.60	76.90	5.16	3182	2159
3	1	9	26.63	9	371.63	241.98	86.50	43.08	2.39	5353	961
3	1	10	26.58	6	255.90	139.76	87.25	28.88	3.77	2123	1321
3	1	11	26.54	8	292.75	171.73	79.62	41.38	3.65	1685	1771
3	1	12	26.40	8	239.71	153.32	64.74	21.50	2.50	2737	1711
3	1	13	26.35	8	145.98	58.56	68.19	19.23	2.48	427	492
3	1	14	26.30	8	101.24	46.01	35.82	19.39	2.99	499	505

3	1	15	26.21	7	175.90	79.53	73.32	23.01	2.80	987	441
3	1	16	26.20	6	308.35	167.06	103.36	37.68	3.23	2166	1312
3	1	17	26.10	7	147.06	85.54	44.22	17.29	1.96	1851	377
3	1	18	26.06	6	153.26	75.45	52.46	25.35	3.25	1321	627
3	1	19	25.86	7	85.11	38.38	14.22	32.37	4.25	943	538
3	1	20	25.86	7	95.68	49.97	22.36	23.24	2.02	252	427
3	1	21	25.80	6	176.54	104.60	51.13	20.81	1.98	1567	498
3	1	22	25.63	9	414.28	229.18	132.87	52.01	4.44	2424	2799
3	1	23	25.56	5	283.45	163.30	70.70	49.42	3.51	1751	1342
3	1	24	25.48	8	425.86	265.26	101.10	59.41	4.30	2572	1511
3	1	25	25.47	8	232.15	115.50	81.65	35.01	3.81	604	1037
3	1	26	25.47	8	219.34	116.75	72.30	30.24	2.73	1821	1026
3	1	27	25.30	6	105.41	43.97	38.16	23.28	3.30	952	356
3	1	28	25.30	7	102.07	50.15	36.34	15.48	2.32	595	423
3	1	29	25.25	8	199.51	87.24	83.97	28.31	3.66	471	728
3	1	30	25.13	5	151.14	81.27	38.70	31.15	3.15	766	836
3	1	31	25.11	6	345.48	196.93	99.49	49.05	4.64	934	1942
3	1	32	24.95	8	249.58	117.35	89.81	42.43	3.82	724	783
3	1	33	24.91	6	287.81	145.08	102.86	39.82	3.52	1102	1277
3	1	34	24.90	6	113.86	46.92	42.23	24.67	2.54	847	321
3	1	35	24.87	9	248.56	150.94	65.63	32.01	2.54	1310	1420
3	1	36	24.84	5	264.31	181.29	55.13	27.89	2.93	1737	1808
3	1	37	24.54	9	288.61	169.09	94.91	24.59	2.19	1838	1122
3	1	38	24.43	7	323.40	171.58	110.00	41.82	4.06	1384	1129
3	1	39	24.37	6	278.78	149.74	75.70	53.24	5.69	2775	2441
3	1	40	24.36	7	228.49	117.07	76.45	34.93	3.02	927	1146
4	1	1	24.36	6	360.65	242.54	84.10	33.63	2.59	5412	1682
4	1	2	24.34	8	193.48	103.35	63.90	26.12	2.63	1963	600
4	1	3	24.29	6	177.40	109.98	43.71	23.58	2.57	1492	771
4	1	4	24.17	7	409.22	248.73	124.69	35.57	3.33	1915	2561
4	1	5	24.14	6	135.70	69.28	43.92	22.50	2.89	397	522
4	1	6	24.05	8	248.36	151.67	58.83	37.73	3.05	1209	1663

4	1	7	24.03	6	275.74	140.02	106.22	29.50	2.49	1396	752
4	1	8	23.87	8	340.60	207.60	99.13	33.86	2.81	1284	2258
4	1	9	23.87	6	207.38	106.57	75.29	25.43	2.66	1139	858
4	1	10	23.76	6	271.83	138.08	101.53	32.16	2.89	1861	1269
4	1	11	23.72	9	167.81	65.46	76.71	25.64	3.29	538	590
4	1	12	23.72	8	211.04	113.97	61.31	35.76	4.09	806	1405
4	1	13	23.60	6	213.91	113.79	65.30	34.72	3.78	1101	993
4	1	14	23.58	9	353.21	210.89	104.69	37.56	2.78	2063	1684
4	1	15	23.57	6	218.35	116.90	73.03	28.34	2.80	1237	1190
4	1	16	23.49	6	205.54	121.34	56.85	27.29	3.62	2742	2042
4	1	17	23.49	9	262.68	147.33	82.13	33.15	3.56	1598	1731
4	1	18	23.49	8	225.60	133.87	66.84	24.75	2.17	1010	851
4	1	19	23.37	6	61.40	32.51	11.36	17.51	2.42	901	236
4	1	20	23.33	8	252.38	176.81	51.45	24.04	2.09	1471	1330
4	1	21	23.31	7	252.60	127.69	87.89	36.70	3.54	1939	1215
4	1	22	23.17	9	174.25	83.63	50.38	39.97	3.16	586	718
4	1	23	23.16	8	186.64	89.45	74.64	22.51	2.89	1980	927
4	1	24	23.12	8	179.57	108.62	36.65	34.28	3.33	1805	715
4	1	25	23.07	7	320.27	179.48	106.39	34.22	3.00	1722	1419
4	1	26	22.80	8	317.41	204.59	89.75	23.01	2.28	1194	1759
4	1	27	22.75	7	110.28	34.53	49.34	26.40	3.75	414	257
4	1	28	22.73	6	306.96	146.91	120.28	39.78	3.75	919	1166
4	1	29	22.47	9	194.47	125.65	40.19	28.53	2.81	810	1242
4	1	30	22.39	9	260.46	136.33	85.57	38.56	3.95	792	1728
4	1	31	22.39	7	111.39	45.65	43.01	22.66	2.72	367	461
4	1	32	22.33	9	182.60	102.31	52.70	27.59	2.94	983	966
4	1	33	22.32	6	172.14	63.64	74.38	34.09	3.39	555	509
4	1	34	22.03	6	296.74	188.04	69.57	38.99	2.64	1570	1647
4	1	35	21.88	8	209.86	161.29	33.43	15.10	0.93	3067	751
4	1	36	21.86	8	331.56	207.87	97.45	26.17	2.58	1549	1722
4	1	37	21.71	9	397.27	267.32	84.07	45.78	2.44	2770	1728
4	1	38	21.61	6	4.17	3.34	0.83	0.00	0.01	95	42

4	1	39	21.52	6	223.04	119.61	81.56	21.85	2.50	2662	912
4	1	40	21.41	6	124.58	34.98	64.62	24.98	3.46	449	318
5	1	1	21.35	6	267.17	152.12	78.45	36.37	3.14	2782	1030
5	1	2	21.34	9	156.60	97.03	31.78	27.57	2.62	1882	915
5	1	3	21.33	6	217.93	108.32	64.57	44.93	3.99	1532	771
5	1	4	21.29	6	68.55	36.55	22.22	9.78	2.16	689	178
5	1	5	21.22	8	223.51	136.24	67.72	19.35	1.61	726	1265
5	1	6	20.75	8	283.08	152.36	101.29	29.44	2.78	1088	1416
5	1	7	20.40	10	277.09	141.14	99.87	36.06	3.74	1405	1420
5	1	8	20.31	6	272.65	149.10	96.11	27.44	2.61	1080	1241
5	1	9	20.19	8	172.41	96.26	58.34	17.80	1.84	1310	632
5	1	10	20.04	8	210.00	100.80	82.46	26.74	2.41	1036	862
5	1	11	19.65	9	366.54	236.30	83.63	46.34	2.86	2499	2410
5	1	12	19.62	9	293.68	173.07	85.52	35.02	3.05	1241	1113
5	1	13	19.50	6	274.10	181.74	64.66	27.32	2.52	966	995
5	1	14	19.29	9	369.50	206.44	123.93	38.72	2.98	1881	1886
5	1	15	19.26	8	104.64	44.22	44.41	16.01	2.48	577	231
5	1	16	19.02	6	179.60	93.23	50.28	35.92	3.88	890	1668
5	1	17	18.93	8	278.12	185.29	65.36	27.39	2.10	2725	1521
5	1	18	18.62	9	168.14	83.63	57.57	26.92	2.65	1595	859
5	1	19	18.49	6	189.12	106.19	62.18	20.74	2.78	2162	1303
5	1	20	18.35	10	199.04	93.32	84.55	21.02	2.28	1313	668
5	1	21	18.31	8	218.32	115.92	70.72	31.67	3.09	956	851
5	1	22	18.30	9	254.93	142.60	88.41	23.82	2.19	1647	1065
5	1	23	18.11	8	64.43	28.32	21.46	14.65	2.74	167	219
5	1	24	18.08	10	357.65	206.12	121.11	30.43	2.43	1364	1801
5	1	25	17.15	7	442.16	289.72	100.45	51.49	4.22	4705	3540
5	1	26	16.86	8	175.49	109.97	43.08	22.34	2.69	2465	832
5	1	27	16.70	9	123.34	48.46	48.03	26.85	2.75	216	323
5	1	28	16.65	8	150.85	77.24	57.91	15.54	2.88	1014	873
5	1	29	16.46	8	103.35	54.55	34.44	14.35	3.25	706	760
5	1	30	15.91	11	217.28	99.07	91.06	27.16	2.97	808	970

5	1	31	14.53	10	142.39	70.19	44.62	27.41	3.52	638	768
5	1	32	12.58	10	191.43	98.94	73.80	18.60	1.87	521	693
5	1	33	12.50	11	151.10	78.17	51.48	21.45	1.85	1233	678
5	1	34	12.36	8	237.82	170.18	54.15	13.48	1.00	2176	991
5	1	35	11.72	11	93.97	48.51	30.76	14.69	1.26	342	429
5	1	36	8.68	9	94.75	49.98	29.23	15.55	1.31	473	442
5	1	37	7.83	11	187.64	120.27	50.49	16.68	1.26	1579	1724
5	1	38	7.78	9	226.76	136.55	63.62	26.56	2.39	544	900
5	1	39	6.48	11	181.38	115.88	45.89	19.41	1.31	1010	1009
5	1	40	5.28	11	104.86	66.60	30.18	8.06	0.69	614	642
1	2	1	47.66	7	81.03	32.13	28.27	20.63	3.00	325	157
1	2	2	47.30	7	129.29	59.84	39.98	29.42	4.14	1036	325
1	2	3	41.10	7	61.46	21.51	16.49	23.47	4.80	196	183
1	2	4	40.43	7	57.72	16.12	28.88	12.71	3.89	187	143
1	2	5	39.00	7	57.58	13.75	13.29	30.50	5.75	244	77
1	2	6	36.85	7	129.85	62.27	28.49	39.08	4.58	1281	505
1	2	7	36.18	7	186.69	102.19	54.35	30.11	3.51	1230	660
1	2	8	35.60	7	64.70	24.01	23.84	16.83	4.68	571	289
1	2	9	35.37	8	199.44	115.76	46.81	36.41	3.79	2824	1605
1	2	10	34.45	7	64.25	21.64	28.76	13.85	2.87	276	190
1	2	11	32.90	7	50.13	18.24	14.05	17.84	3.27	348	134
1	2	12	32.75	7	79.64	35.82	30.85	12.97	2.52	409	352
1	2	13	32.53	7	317.61	153.23	113.98	50.25	4.12	1975	1406
1	2	14	32.28	7	133.78	54.17	54.45	25.16	3.03	612	490
1	2	15	32.28	8	144.71	71.15	46.72	26.84	3.47	1111	588
1	2	16	31.68	8	104.45	42.81	35.04	26.60	3.68	313	354
1	2	17	31.58	7	134.88	49.90	53.73	31.07	3.87	658	456
1	2	18	31.30	8	66.40	25.75	24.02	16.64	1.91	324	252
1	2	19	31.05	7	130.99	64.66	40.68	25.65	3.95	551	615
1	2	20	30.99	7	71.56	26.70	17.82	27.04	5.36	488	114
1	2	21	30.89	7	38.76	9.43	11.06	18.27	3.88	194	144
1	2	22	30.52	7	34.91	9.44	15.16	10.31	3.26	93	94



1	2	23	30.37	9	48.98	24.45	8.90	15.58	3.17	259	138
1	2	24	30.30	7	183.00	91.14	66.90	24.85	2.84	943	711
1	2	25	30.29	7	60.96	19.27	19.68	22.00	4.03	192	144
1	2	26	30.17	7	66.34	15.13	22.05	29.16	4.60	314	114
1	2	27	29.83	7	94.89	36.96	26.06	31.75	4.46	797	374
1	2	28	29.81	8	284.75	116.96	125.87	41.92	4.27	1315	1052
1	2	29	29.75	7	186.54	103.87	49.42	33.16	2.82	1860	1027
1	2	30	29.68	8	86.37	40.80	24.99	20.48	3.18	660	235
1	2	31	29.55	8	110.76	52.94	40.86	16.96	2.65	693	286
1	2	32	29.55	7	55.23	18.71	15.86	20.66	3.77	497	110
1	2	33	29.44	8	204.68	88.25	88.66	27.46	3.15	1763	623
1	2	34	28.98	7	57.54	15.53	25.70	16.32	3.26	210	221
1	2	35	28.67	8	77.75	27.83	30.08	19.84	3.39	210	189
1	2	36	28.66	9	146.16	67.74	57.37	20.81	2.90	1504	523
1	2	37	28.66	7	103.35	35.95	35.66	31.74	4.67	611	192
1	2	38	28.58	7	117.20	38.73	41.31	37.16	5.42	268	412
1	2	39	28.51	7	38.92	10.58	8.93	19.42	4.22	266	52
1	2	40	28.42	8	22.28	6.09	2.46	13.73	4.72	79	61
2	2	1	28.37	7	33.61	9.65	10.65	13.31	3.57	208	63
2	2	2	28.29	10	106.01	50.73	34.46	20.83	2.50	891	392
2	2	3	28.19	7	78.90	28.10	36.12	14.69	2.58	305	310
2	2	4	28.06	7	67.23	30.26	17.68	19.29	3.04	533	137
2	2	5	28.02	8	134.55	51.97	47.07	35.48	3.77	779	498
2	2	6	27.94	8	91.07	43.31	25.52	22.24	3.43	953	565
2	2	7	27.93	9	118.86	40.34	50.98	27.34	3.34	770	371
2	2	8	27.71	7	85.99	53.40	20.22	12.36	2.49	660	373
2	2	9	27.68	7	72.18	22.98	26.08	23.12	3.67	336	174
2	2	10	27.64	7	138.46	69.03	42.93	26.45	3.54	431	569
2	2	11	27.62	7	138.11	47.30	57.89	32.92	3.06	337	344
2	2	12	27.24	7	198.27	90.08	69.75	38.43	5.25	1311	777
2	2	13	27.18	7	89.78	34.82	27.22	27.69	4.32	904	405
2	2	14	27.17	7	77.21	24.38	25.32	27.49	3.99	593	205

2	2	15	27.17	7	130.49	70.79	35.66	23.55	2.17	761	352
2	2	16	27.12	9	47.09	19.64	8.61	18.84	4.05	311	130
2	2	17	27.07	7	106.53	39.21	41.58	25.73	3.79	760	256
2	2	18	27.01	7	178.08	69.95	85.05	23.06	2.91	828	525
2	2	19	26.96	7	88.41	28.42	34.66	25.21	4.30	649	152
2	2	20	26.94	7	84.68	36.03	26.24	22.41	3.58	834	361
2	2	21	26.80	7	84.61	30.98	31.55	22.07	4.42	391	201
2	2	22	26.60	7	100.41	46.22	34.28	19.87	3.39	459	310
2	2	23	26.59	7	66.96	28.68	12.32	25.96	3.88	696	127
2	2	24	26.57	7	51.38	21.46	11.69	18.23	4.55	470	144
2	2	25	26.51	8	73.58	23.71	20.05	29.82	3.97	321	193
2	2	26	26.44	7	132.09	66.93	31.64	33.52	3.46	1609	370
2	2	27	26.38	7	37.98	14.75	3.61	19.62	6.76	366	92
2	2	28	26.14	7	105.15	52.08	26.17	26.91	3.77	676	343
2	2	29	26.13	8	54.44	18.19	18.39	17.86	4.95	598	464
2	2	30	26.12	7	184.59	98.60	47.90	38.08	3.65	1703	777
2	2	31	25.93	7	112.69	39.90	52.45	20.35	3.60	263	371
2	2	32	25.87	7	95.30	41.72	31.33	22.24	3.67	680	286
2	2	33	25.69	9	85.70	28.86	36.33	20.51	2.40	762	147
2	2	34	25.67	7	65.06	36.26	12.43	16.38	2.76	345	218
2	2	35	25.64	7	44.98	9.68	16.27	19.03	4.28	88	61
2	2	36	25.48	7	61.72	18.91	15.84	26.95	5.08	315	165
2	2	37	25.39	7	110.28	33.64	55.11	21.53	2.82	481	230
2	2	38	25.32	7	77.01	37.26	27.40	12.36	1.60	567	257
2	2	39	25.32	8	53.01	10.13	18.27	24.60	4.71	85	147
3	2	40	25.06	7	66.97	25.07	16.95	24.94	3.12	536	274
3	2	1	25.05	8	60.26	22.26	20.44	17.56	3.78	446	167
3	2	2	25.03	9	110.73	33.67	60.73	16.32	2.70	390	263
3	2	3	25.03	7	100.39	38.62	38.74	23.03	3.18	494	342
3	2	4	25.02	7	95.32	36.31	34.33	24.68	3.60	593	401
3	2	5	24.94	7	62.38	28.04	15.09	19.26	4.42	371	221
3	2	6	24.86	8	74.61	37.35	10.92	26.34	4.64	754	300

3	2	7	24.83	7	98.57	41.58	40.09	16.88	3.12	758	291
3	2	8	24.83	7	108.59	53.47	32.95	22.13	3.30	1056	608
3	2	9	24.79	7	101.56	45.15	26.68	29.74	4.71	975	281
3	2	10	24.79	7	271.88	129.14	103.24	39.46	3.59	1607	779
3	2	11	24.76	8	64.16	28.54	20.98	14.64	1.79	586	211
3	2	12	24.74	7	85.40	40.85	23.20	21.30	3.29	725	335
3	2	13	24.70	9	56.22	18.71	17.26	20.26	4.03	138	131
3	2	14	24.66	9	129.14	61.65	43.40	24.09	2.72	569	362
3	2	15	24.64	8	59.28	30.35	17.23	11.70	3.23	374	222
3	2	16	24.54	7	59.46	20.65	15.49	23.33	2.86	247	130
3	2	17	24.49	7	109.56	53.43	29.87	26.26	3.46	1130	383
3	2	18	24.47	7	185.22	82.20	73.75	29.26	3.20	959	764
3	2	19	24.45	8	103.97	51.87	31.13	20.97	3.05	847	342
3	2	20	24.42	8	105.71	51.22	34.34	20.15	2.68	497	259
3	2	21	24.34	8	65.63	18.69	21.69	25.26	4.62	336	134
3	2	22	24.28	8	120.70	62.34	40.01	18.33	2.45	944	405
3	2	23	24.25	8	159.18	73.25	53.32	32.53	4.34	576	915
3	2	24	24.22	7	148.54	62.86	68.65	17.03	2.56	1405	354
3	2	25	24.11	7	70.90	40.64	16.24	13.96	2.00	391	230
3	2	26	24.05	8	38.41	15.65	9.16	13.60	2.41	329	76
3	2	27	23.84	8	87.05	29.44	37.75	19.86	2.45	588	173
3	2	28	23.76	7	87.52	37.36	29.24	20.92	2.78	790	205
3	2	29	23.59	8	36.64	11.21	7.00	18.34	5.09	318	84
3	2	30	23.50	9	169.24	93.19	58.79	17.19	1.96	1094	866
3	2	31	23.46	8	31.08	12.42	8.45	10.21	2.61	112	87
3	2	32	23.37	9	154.93	60.64	66.40	27.89	2.98	640	469
3	2	33	23.35	8	205.34	98.67	71.82	34.85	3.55	1354	840
3	2	34	23.29	7	9.79	0.00	1.84	7.95	19.35	218	330
3	2	35	23.19	9	174.55	87.35	64.56	22.64	2.41	445	636
3	2	36	23.13	9	22.22	10.20	4.23	7.78	1.32	200	70
3	2	37	22.97	7	69.90	35.57	21.28	13.05	1.57	117	281
3	2	38	22.79	8	127.25	72.58	36.21	18.46	2.41	567	621

3	2	39	22.65	7	264.36	136.50	95.30	32.50	2.71	1282	1316
3	2	40	22.63	8	43.00	15.52	14.02	13.46	2.63	302	92
4	2	1	22.56	8	175.22	84.76	69.03	21.43	2.69	1067	589
4	2	2	22.55	7	122.66	59.55	45.50	17.62	2.06	1739	343
4	2	3	22.50	7	99.88	50.69	29.42	19.78	2.29	609	489
4	2	4	22.43	8	56.06	24.75	11.00	20.31	3.86	296	169
4	2	5	22.42	7	37.32	12.58	5.35	19.39	3.90	105	70
4	2	6	22.39	7	169.64	82.83	54.70	31.95	5.10	1449	1220
4	2	7	22.33	8	196.65	84.63	77.41	34.61	3.56	744	685
4	2	8	22.33	10	92.79	42.19	37.49	13.10	1.78	626	205
4	2	9	22.31	10	100.77	41.37	37.88	21.52	2.19	712	179
4	2	10	22.24	9	132.33	66.25	47.63	18.44	2.40	951	519
4	2	11	22.23	8	32.92	15.84	6.05	11.03	2.91	273	92
4	2	12	22.15	10	96.23	47.46	28.29	20.43	2.17	536	290
4	2	13	22.13	9	51.52	18.32	11.56	21.64	3.55	474	262
4	2	14	22.07	8	48.44	19.87	13.24	15.33	3.42	270	128
4	2	15	21.98	7	100.76	39.66	41.78	19.33	3.08	434	290
4	2	16	21.96	7	81.07	28.59	31.48	21.00	3.42	423	254
4	2	17	21.96	9	82.82	37.82	24.74	20.26	2.79	341	232
4	2	18	21.81	9	44.50	15.53	14.79	14.18	3.32	142	141
4	2	19	21.62	7	65.78	25.70	22.66	17.42	2.85	433	207
4	2	20	21.60	9	185.16	81.60	75.55	27.96	2.56	1452	674
4	2	21	21.53	8	62.81	30.13	13.43	19.25	2.53	591	166
4	2	22	21.52	7	67.38	30.33	21.27	15.78	2.43	674	197
4	2	23	21.42	7	57.98	18.59	20.26	18.86	2.77	446	148
4	2	24	21.42	7	136.77	71.28	44.31	21.19	2.86	632	526
4	2	25	21.37	11	153.82	84.61	54.35	14.87	1.85	583	503
4	2	26	21.14	8	53.54	11.55	23.95	18.04	3.94	199	124
4	2	27	20.77	7	57.03	15.67	20.46	20.91	3.69	209	127
4	2	28	20.74	7	67.23	28.10	19.06	20.08	3.05	536	362
4	2	29	20.63	7	61.94	24.18	13.69	24.01	3.30	490	160
4	2	30	20.43	8	69.22	23.60	32.96	12.66	3.89	161	149

4	2	31	20.33	9	208.97	106.37	71.53	30.93	3.12	849	1195
4	2	32	20.32	8	145.52	52.23	57.80	35.46	3.53	428	388
4	2	33	20.14	7	54.54	26.61	9.52	18.41	3.56	456	88
4	2	34	20.01	9	104.44	42.63	38.00	23.80	2.59	578	282
4	2	35	19.99	8	72.75	28.29	27.76	16.70	3.01	583	232
4	2	36	19.76	7	74.51	29.18	26.81	18.52	3.15	380	142
4	2	37	19.65	8	42.30	17.53	10.26	14.50	3.65	314	125
4	2	38	19.26	9	41.13	10.00	16.47	14.65	4.28	233	55
4	2	39	19.15	7	62.36	27.30	18.29	16.77	2.99	506	191
4	2	40	19.02	8	33.89	8.44	10.96	14.49	3.22	187	66
5	2	1	18.98	8	178.12	97.39	54.40	26.31	3.11	1783	977
5	2	2	18.96	7	327.01	145.01	144.74	37.27	3.94	1243	1299
5	2	3	18.89	8	38.84	14.50	16.10	8.24	1.96	375	113
5	2	4	18.63	8	35.71	12.22	10.03	13.47	2.65	327	84
5	2	5	18.62	9	125.47	70.44	29.55	25.49	3.36	917	471
5	2	6	18.53	9	165.13	57.92	86.70	20.40	2.61	867	438
5	2	7	18.48	8	59.40	24.73	16.12	18.56	2.17	182	193
5	2	8	18.44	8	130.97	66.93	37.80	25.95	2.30	1128	492
5	2	9	18.37	12	62.13	27.09	19.02	16.03	2.81	288	173
5	2	10	18.07	8	96.36	37.11	39.01	20.23	3.60	440	273
5	2	11	18.05	7	103.02	56.33	35.88	10.81	1.55	688	436
5	2	12	17.90	7	45.07	21.08	9.62	14.37	2.90	436	184
5	2	13	17.82	9	57.81	22.82	19.64	15.35	2.29	284	154
5	2	14	17.82	9	80.03	34.47	28.22	17.34	2.51	456	267
5	2	15	17.82	11	103.02	56.33	35.88	10.81	1.55	688	436
5	2	16	17.57	7	49.76	11.52	20.98	17.26	3.16	197	125
5	2	17	17.56	11	74.95	29.28	31.61	14.07	2.41	250	504
5	2	18	17.55	8	86.13	43.82	25.04	17.27	2.63	867	222
5	2	19	17.30	7	48.97	12.29	22.58	14.10	2.22	129	105
5	2	20	17.25	11	98.21	48.31	32.33	17.57	1.83	609	280
5	2	21	17.23	9	73.11	34.30	22.97	15.84	2.08	544	221
5	2	22	17.16	7	84.65	38.58	24.18	21.90	2.36	885	137

5	2	23	17.11	9	62.29	27.83	22.87	11.59	1.58	473	195
5	2	24	16.86	11	73.13	32.22	28.61	12.29	2.04	425	258
5	2	25	16.83	8	65.72	31.07	21.19	13.44	2.74	330	289
5	2	26	16.40	12	108.97	60.06	31.41	17.34	2.25	433	404
5	2	27	16.28	8	53.59	25.44	13.44	14.70	2.08	150	164
5	2	28	16.17	9	131.65	44.55	62.55	24.41	2.87	351	498
5	2	29	14.88	10	36.00	14.12	9.84	11.99	2.01	62	102
5	2	30	14.81	9	93.67	41.94	32.53	19.19	2.31	324	360
5	2	31	14.51	8	93.77	49.54	27.26	16.97	2.56	649	283
5	2	32	12.47	10	113.96	61.88	33.52	18.56	2.25	1067	387
5	2	33	12.33	9	156.83	74.96	63.91	17.97	1.91	958	490
5	2	34	11.31	10	41.58	28.48	8.22	4.85	0.79	388	142
5	2	35	10.81	12	70.20	32.42	22.48	15.29	2.63	534	237
5	2	36	10.70	9	17.22	10.45	2.12	4.65	1.16	215	24
5	2	37	9.49	11	68.00	37.25	16.45	14.31	1.59	276	232
5	2	38	9.45	9	171.33	102.48	53.43	15.29	1.35	695	720
5	2	39	9.23	8	114.77	65.54	38.08	11.14	1.25	719	327
5	2	40	8.06	9	49.96	30.51	9.05	10.40	1.29	362	199
1	3	1	66.63	7	58.37	25.53	16.88	15.96	3.95	315	184
1	3	2	58.56	9	33.11	9.30	8.31	15.50	4.04	361	116
1	3	3	55.25	7	58.62	14.28	15.42	28.92	6.38	192	85
1	3	4	47.56	7	53.48	25.10	11.84	16.54	4.10	201	90
1	3	5	45.65	7	60.41	23.80	23.82	12.79	4.18	447	148
1	3	6	45.48	7	58.09	33.97	5.42	18.69	6.22	1436	547
1	3	7	44.03	8	28.87	7.48	2.43	18.96	5.51	167	53
1	3	8	42.33	6	25.78	6.45	1.76	17.56	6.19	140	33
1	3	9	38.45	7	37.66	9.98	13.63	14.04	5.93	259	159
1	3	10	38.01	7	33.47	6.72	10.59	16.17	4.76	47	79
1	3	11	37.21	7	33.56	4.49	10.67	18.40	6.10	73	97
1	3	12	36.84	8	50.55	17.28	13.29	19.98	3.81	457	78
1	3	13	36.48	7	41.95	18.80	12.04	11.11	3.80	423	138
1	3	14	36.12	7	28.17	10.46	2.87	14.85	5.33	86	64

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1	3	16	35.19	7	46.85	13.65	10.69	22.51	5.09	74	82
1	3	17	35.01	6	53.98	19.91	12.89	21.17	4.82	456	95
1	3	18	34.28	6	40.07	11.08	9.42	19.58	5.76	264	114
1	3	19	33.93	7	29.98	5.38	6.07	18.53	4.78	95	94
1	3	20	33.28	8	24.11	8.39	3.84	11.89	3.81	232	28
1	3	21	32.70	7	51.68	14.72	17.75	19.22	3.27	297	123
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2	3	30	26.26	8	46.25	25.16	10.89	10.19	1.08	308	142
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2	3	33	26.05	7	24.36	4.95	2.66	16.75	5.30	95	27
2	3	34	26.04	7	32.40	10.92	5.59	15.89	4.94	289	88
2	3	35	26.02	8	24.93	5.63	4.30	14.99	6.31	104	42
2	3	36	25.98	8	77.60	27.07	22.67	27.86	3.77	499	222
2	3	37	25.87	7	42.98	12.92	15.30	14.76	2.92	403	109
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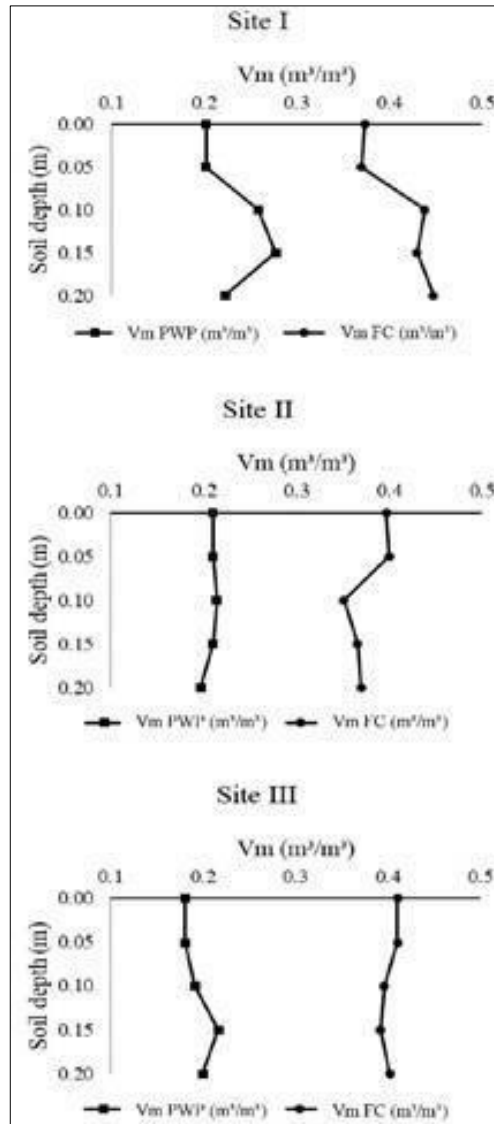
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3	3	25	23.45	7	51.76	19.33	11.98	20.45	4.01	462	206
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4	3	13	21.31	7	21.02	2.43	4.92	13.67	6.87	35	55
4	3	14	21.21	7	19.53	3.78	2.93	12.83	5.32	97	33
4	3	15	21.21	8	18.11	2.91	2.41	12.80	4.07	60	30
4	3	16	20.90	7	21.93	7.19	4.46	10.28	3.50	121	59
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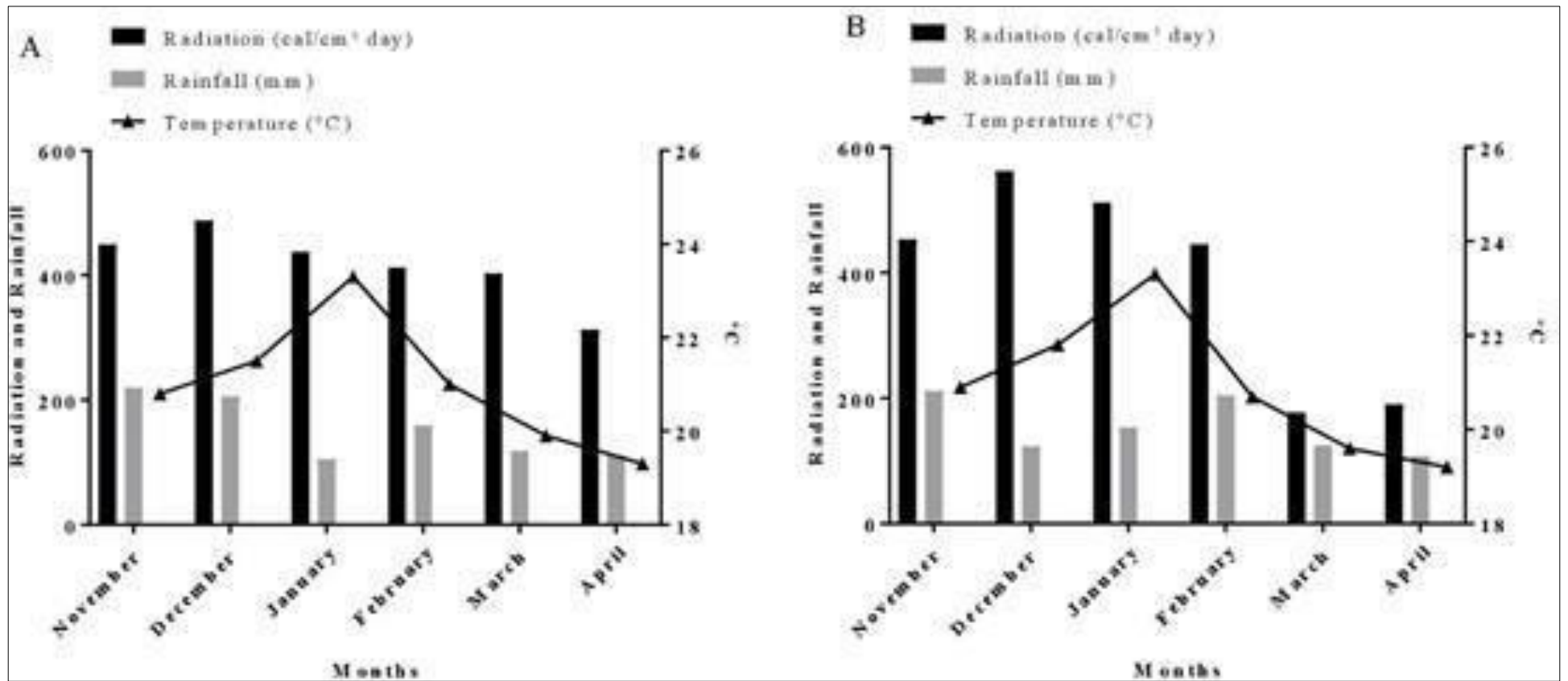
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4	3	37	19.16	7	43.16	12.04	11.90	19.22	3.77	193	80
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5	3	1	18.51	9	23.49	6.70	6.26	10.53	2.92	214	70
5	3	2	18.13	9	43.98	22.57	5.89	15.51	2.76	411	104
5	3	3	18.00	7	43.48	10.31	10.13	23.04	5.50	327	49
5	3	4	17.97	7	34.27	8.04	13.77	12.46	2.43	180	71
5	3	5	17.87	9	19.93	2.80	3.39	13.74	7.20	78	56
5	3	6	17.60	7	40.90	10.36	10.44	20.10	4.67	236	102
5	3	7	17.42	9	32.73	13.30	5.15	14.28	3.04	331	59
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5	3	9	17.01	7	22.74	6.54	3.76	12.44	5.43	104	69
5	3	10	16.96	7	22.98	8.60	5.07	9.31	2.55	129	35
5	3	11	16.88	7	25.03	5.80	2.66	16.57	8.67	107	54
5	3	12	16.83	7	35.93	11.87	10.51	13.55	3.06	92	65
5	3	13	16.73	10	26.37	9.95	4.89	11.53	2.70	293	110
5	3	14	16.65	11	81.91	35.81	25.76	20.28	2.73	974	298

5	3	15	16.62	9	14.43	0.91	0.45	13.07	5.01	11	7
5	3	16	16.55	9	27.67	5.96	6.15	15.56	3.05	69	63
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5	3	26	15.17	9	18.28	3.79	2.95	11.55	4.04	95	40
5	3	27	15.05	8	21.65	7.02	5.65	8.97	2.59	164	68
5	3	28	14.77	10	50.87	27.98	6.66	16.16	2.45	748	146
5	3	29	14.59	9	26.43	9.65	0.79	15.97	6.06	179	38
5	3	30	14.52	7	97.22	49.66	25.47	22.09	2.75	1361	363
5	3	31	14.29	9	18.25	5.83	4.09	8.32	2.60	56	56
5	3	32	14.19	11	20.58	2.38	3.61	14.59	4.86	26	26
5	3	33	13.35	10	27.03	9.23	10.11	7.70	1.94	218	61
5	3	34	13.14	12	20.61	5.86	3.75	10.97	1.39	45	52
5	3	35	13.04	11	16.06	6.76	1.09	8.20	2.36	147	26
5	3	36	12.83	8	101.11	53.21	24.53	23.37	3.58	462	349
5	3	37	9.68	8	23.50	3.75	7.59	12.17	4.33	48	24
5	3	38	8.43	14	32.58	13.61	8.85	10.12	1.34	87	83
5	3	39	7.20	8	33.83	14.38	5.37	14.08	1.31	254	120
5	3	40	6.38	9	23.06	3.20	4.70	15.15	2.95	39	72

**Supplementary Figures**



**Supplementary Figure 1.** Soil water content. Volume moisture ( $\text{m}^3/\text{m}^3$ ) at field capacity (Vm FC) and permanent wilting point (Vm PWP) in different soil depths (0.00–0.20 m) at three sites (I, II, and III).



**Supplementary Figure 2.** Climate data. Rainfall (mm), radiation (calories/cm<sup>2</sup>·day<sup>-1</sup>), and average temperature of air (°C) during the cycle of the crop (from November 2018 to April 2019.) in (A) site I, (B) site II and site III. *Source:* Embrapa Trigo.