

Supplementary Information

Table S1. Number of individual tree crown images of each dataset, which segmented from orthomosaic photo.

Class	training and validation	validation 1		validation2		test
		training	validation	training	validation	
1	961	675	286	654	307	139
2	1619	1143	476	1213	406	17
3	1115	772	343	810	305	122
4	373	264	109	264	109	3
5	205	155	50	125	80	11
6	16	14	2	8	8	0
7	12	10	2	8	4	0
8	18	8	10	12	6	0
9	24	15	9	16	8	0
10	202	133	69	150	52	0
11	46	36	10	32	14	5
12	28	21	7	22	6	0
13	54	37	17	36	18	0
14	349	230	119	229	120	23
15	20	13	7	15	5	0
16	16	28	-12	11	5	0
17	168	123	45	112	59	31
18	236	169	67	157	79	0
19	70	55	15	35	35	0
20	138	103	35	120	18	0
21	12	9	3	8	4	0
22	10	7	3	5	5	0
23	1624	1142	482	1112	512	333
24	1297	895	402	988	309	157
25	182	137	45	106	76	0
26	200	140	60	160	40	0
27	165	121	44	103	62	0
28	87	61	26	62	25	25
29	330	252	78	246	84	15
30	650	455	195	444	206	97

31	248	166	82	178	70	21
32	8	7	1	4	4	1
33	30	18	12	12	18	3
34	12	9	3	6	6	0
35	260	182	78	192	68	0
36	30	19	11	24	6	0
37	28	25	3	24	4	0
38	18	14	4	12	6	0
39	36	23	13	24	12	0
40	6	5	1	6	0	3
41	6	6	0	6	0	0
42	6	5	1	6	0	0
43	24	15	9	16	8	4
44	42	29	13	34	8	9
45	12	9	3	6	6	0
46	20	15	5	20	0	0
47	18	11	7	12	6	0
48	177	118	59	131	46	25
49	6	3	3	6	0	0
50	10	4	6	5	5	2
51	17	11	6	11	6	1
52	18	8	10	6	12	0
53	102	65	37	90	12	3
54	144	100	44	88	56	6
55	65	44	21	45	20	0
56	60	47	13	48	12	0
57	73	49	24	64	9	18
58	759	520	239	495	264	401

Table S2. Details on classification accuracy of the model that was trained from the same time or same trees. The slash means no denominator data.

class	precision	recall	class	precision	Recall
1	0.98	0.97	30	0.98	0.96
2	1.00	1.00	31	0.99	1.00
3	0.99	1.00	32	1.00	1.00
4	1.00	1.00	33	1.00	1.00
5	1.00	1.00	34	0.75	1.00
6	1.00	1.00	35	0.95	0.95
7	0.67	1.00	36	1.00	1.00
8	1.00	0.80	37	0.20	0.33
9	1.00	0.56	38	1.00	1.00
10	0.99	0.96	39	0.87	1.00
11	1.00	0.70	40	1.00	1.00
12	1.00	0.71	41	/	/
13	1.00	1.00	42	1.00	1.00
14	0.97	0.96	43	1.00	0.78
15	1.00	1.00	44	1.00	1.00
16	1.00	1.00	45	1.00	1.00
17	0.94	1.00	46	1.00	1.00
18	0.99	0.99	47	1.00	1.00
19	1.00	1.00	48	0.97	0.98
20	0.97	1.00	49	1.00	1.00
21	1.00	1.00	50	1.00	0.17
22	1.00	1.00	51	1.00	1.00
23	0.97	0.98	52	1.00	0.90
24	1.00	0.99	53	1.00	1.00
25	1.00	1.00	54	0.88	0.95
26	0.97	1.00	55	1.00	1.00
27	0.98	1.00	56	1.00	1.00
28	1.00	0.92	57	0.96	1.00
29	1.00	1.00	58	0.98	0.99

Table S3. Details on classification accuracy of the model which trained from same time and different site. The slash indicates no denominator data.

Class	precision	recall	class	precision	recall
1	0.76	0.79	30	0.67	0.85
2	0.84	0.92	31	0.91	0.70
3	0.91	1.00	32	0.00	/
4	0.93	0.98	33	0.33	0.06
5	0.79	0.75	34	0.00	/
6	0.75	0.38	35	0.73	0.40
7	0.00	/	36	0.00	0.00
8	0.00	/	37	0.00	0.00
9	0.00	0.00	38	0.00	0.00
10	0.75	0.40	39	0.50	0.92
11	0.00	0.00	40	/	/
12	0.00	0.00	41	/	/
13	0.57	0.67	42	/	/
14	0.37	0.33	43	0.00	0.00
15	0.17	0.20	44	0.29	0.25
16	0.00	0.00	45	1.00	0.17
17	0.13	0.05	46	0.00	0.00
18	0.49	0.27	47	1.00	1.00
19	0.82	0.51	48	0.91	0.85
20	0.53	0.94	49	/	/
21	0.00	/	50	0.00	/
22	0.00	/	51	1.00	0.33
23	0.82	0.92	52	0.00	0.00
24	0.56	0.76	53	0.20	0.75
25	0.60	0.24	54	0.74	0.55
26	0.95	0.88	55	0.66	0.95
27	0.54	0.21	56	0.58	0.92
28	0.63	0.20	57	0.50	1.00
29	0.46	0.45	58	0.90	0.93

Table S4. Details on classification accuracy of the model which was trained from different times and different sites. The slash indicates no denominator data.

class	precision	recall	class	precision	recall
1	0.90	0.88	30	0.55	0.19
2	0.20	0.59	31	0.07	0.14
3	0.90	0.89	32	0.00	0.00
4	0.12	1.00	33	0.00	0.00
5	0.43	0.27	34	0.00	/
6	0.00	/	35	0.00	/
7	/	/	36	0.00	/
8	0.00	/	37	0.00	/
9	/	/	38	/	/
10	0.00	/	39	0.00	/
11	0.00	0.00	40	0.00	0.00
12	/	/	41	/	/
13	0.00	/	42	/	/
14	0.11	0.09	43	0.00	0.00
15	0.00	/	44	0.25	0.22
16	0.00	/	45	/	/
17	0.43	0.10	46	0.00	/
18	0.00	/	47	0.00	/
19	0.00	/	48	0.02	0.04
20	0.00	/	49	0.00	/
21	0.00	/	50	0.00	0.00
22	0.00	/	51	0.00	0.00
23	0.77	0.26	52	/	/
24	0.50	0.43	53	0.00	0.00
25	0.00	/	54	0.00	0.00
26	0.00	/	55	0.00	/
27	0.00	/	56	0.00	/
28	0.00	0.00	57	0.36	0.44
29	0.00	0.00	58	0.83	0.89

Table S5. Details on classification accuracy of inventory tuning. The slash indicates no denominator data.

class	precision	recall	class	precision	recall
1	0.97	0.97	30	0.86	0.52
2	0.20	0.94	31	0.11	0.33
3	0.79	0.92	32	0.00	0.00
4	0.75	1.00	33	0.00	0.00
5	0.50	0.36	34	/	/
6	/	/	35	/	/
7	/	/	36	/	/
8	/	/	37	/	/
9	/	/	38	/	/
10	/	/	39	/	/
11	0.00	0.00	40	0.00	0.00
12	/	/	41	/	/
13	/	/	42	/	/
14	0.17	0.17	43	0.00	0.00
15	/	/	44	0.40	0.22
16	/	/	45	/	/
17	0.70	0.23	46	/	/
18	/	/	47	/	/
19	/	/	48	0.13	0.04
20	/	/	49	/	/
21	/	/	50	0.00	0.00
22	/	/	51	0.00	0.00
23	0.81	0.51	52	/	/
24	0.82	0.62	53	0.00	0.00
25	/	/	54	0.00	0.00
26	/	/	55	/	/
27	/	/	56	/	/
28	0.00	0.00	57	0.36	0.50
29	0.00	0.00	58	0.73	0.95