

Supplemental Table 1. SSR and InDel markers used in this study

Locus name	Chromosome	Physical location (Mb)	Forward primer	Reverse primer
RM3740	1	2.80	cccgtcaccaactcacatagg	ctaagccacccttaccacatcc
Indel1-3	1	5.30	gggaaattgggaggaagac	cgagcaagctaccgaatta
RM1201	1	7.16	gtactgtacgagccctagttaccg	taccgcgccacatatacacaacc
RM243	1	7.97	gatctgcagactgcagttgc	agctgcaacgatgtgtcc
RM577	1	8.37	gcttccctctaaccctct	ggatgtaccgctgacatgaa
RM449	1	15.12	ttgggaggtgtgataaggc	accaccagegtctctctctc
Indel1-9	1	20.06	tcccctctccactgtcaac	tttttagtgcatagatcctcttc
Indel1-10	1	22.62	gttcaggcaattccatcggt	ctaattcgcaaacgaatct
RM5	1	23.97	tgcaacttctagctgctcga	gcatccgatcttgatggg
RM488	1	24.81	cagctaggggtttgaggctg	tagcaacaaccagcgtatgc
RM128	1	30.74	agcttgggtgatttcttggaaagcg	acgacgaggagtcgccgtgcag
RM543	1	32.78	ctgctgcagactctactgcg	aaatattaccatccccccc
Indel1-16	1	37.71	ttcatatccgcaggcaattt	gccttctgttcatggcagt
RM14	1	41.36	ccgaggagaggagttcgac	gtgccaatttctcgaaaaa
RM109	2	0.18	gccgccggagagggagagagag	ccccgacgggatctccatcgtc
RM110	2	1.33	tgaagccatccaccaacgaag	tccgtacgccgacgaggtcgag
RM236	2	2.10	gcgctggtgaaaaatgag	ggcatcccttttgattctc
RM555	2	4.31	ttggatcagccaaaggagac	cagcattgtggcatggatc
Indel2-3	2	5.48	atagggtgggtgtgctgaac	gcacaaaactgcaggctcc
Indel2-4	2	7.99	agtgtccaagcgagaaaac	atgcacgagtgtggtgagc
RM7288	2	9.03	cgctatgtggcagtttaagagc	ctgttggaatcaaagtgtgagc
RM324	2	11.39	ctgattccacacactgtgc	gattccacgtcaggatcttc
Indel2-8	2	18.09	ccatcagcatcagcaatagg	gaatatgtgtggagaccaatatatga
RM29	2	19.46	cagggaccacctgtcatac	aacgttggcatatcgggtgg
Indel2-9	2	20.58	ttttatctcgaggtacggtagtag	tgagaattagtgttcattgtagattc
RM262	2	20.79	cattccgtctcggctcaact	cagagcaaggtggcttgc
RM5427	2	21.52	tgctgttgacacttgacaggtagc	cacaattatcgcgctcatcg
Indel2-10	2	23.05	ggctggctgttctcatc	aaaaatccaaccctgctg
RM6318	2	24.43	aagtgcctcgaattacacatctcc	gctgctctgtccagtgtgagacc
Indel2-11	2	25.57	aaggagattagcagttggtgga	tccaatttgacacaaatgatga
RM525	2	28.27	ggcccgccaagaaatattg	cggtgagacagaatccttaccg
RM240	2	31.50	ccttaatgggtagtgtgcac	tgtaacattccttccatcc
RM250	2	32.78	ggttcaaccaagctgatca	gatgaaggccttccacgcag
Indel2-14	2	33.07	agtgaattttgagcccaacg	taaaagcaaaaggccgaaaaa
RM482	2	35.28	tctgaaagcctgactcatcg	gtcaattgcagtgcccttcc
RM535	2	35.78	actacatacacggcccttgc	ctacgtggacaccgtcacac
RM523	3	1.32	aaggcattgcagctagaagc	gcacttgggaggttctgtag
Indel3-3	3	1.73	tgtttatattggaacggagga	gttacctgcccttctgcagt
Indel3-4	3	1.74	gcttaccacacctctctctc	tccatagtcttcttctcca
Indel3-6	3	2.88	gtttacgaatgaaccagt	ctcattgaggcaaaaggac
Indel3-8	3	3.89	taatttcggctcatccaagc	gaagctccgcaggttaccg

Indel3-11	3	5.65	ggaatccctcccttcttgc	ggcggtaaagacgggtaaa
RM517	3	6.17	ggcttactggcttcgattg	cgtctcctttggtagtgcc
Indel3-13	3	8.00	gccattgatcttctgcaggt	ttgttgtaaatgccctgtt
Indel3-16	3	14.04	cgacgctgtgatcctgtta	gaaattaagcagcggagca
Indel3-17	3	16.05	gcatccatggttgagattcc	tgcgctgctaaatgaaaaga
RM411	3	21.43	acaccaactcttgcctgcat	tgaagcaaaaacatggctagg
RM347	3	26.74	caacctaaactttaaccgcac	tccggcaagggtatcggcgg
Indel3-25	3	26.88	gttaggcctgcacttttga	gacatcaatcttggggagga
Indel3-26	3	27.37	gtgatggtgaggggatctca	atccctcctccttctgtg
RM426	3	27.59	atgagatgagttcaaggccc	aactctgtacctccatcgcc
Indel3-27	3	28.37	tgggctattattgggctttg	cgtgggataaaaccaccaag
RM55	3	29.05	ccgtcgccgtagtagagaag	tccgggtattttaaggcg
RM520	3	30.92	aggagcaagaaaagtcccc	gccaatgtgtgacgcaatag
RM468	3	32.68	cccttctctgttggctac	tgatttctgagagccaaccc
Indel3-30	3	33.01	gccatcttgcatttctct	ctctgcttttctgcctctt
RM571	3	33.15	ggaggtgaaagcgaatcatg	cctgctgctcttcatcagc
RM514	3	35.29	agattgatctcccattcccc	cacgagcatattactagtgg
RM85	3	36.35	ccaaagatgaaacctggattg	gcacaagggtgagcagctcc
RM335	4	0.69	gtacacaccacatcgagaag	gctctatgcgagtatccatgg
Indel4-3	4	5.63	ggcgcctggttcttgaatgt	aatggttgacttcgacaaaa
Indel4-4	4	8.24	ctcacagttctaggcggaaa	agccgagtagggctgaataa
RM307	4	13.15	gtactaccgacctaccgttcac	ctgctatgcatgaactgctc
RM471	4	18.99	acgcacaagcagatgatgag	gggagaagacgaatgtttgc
RM119	4	21.41	catccccctgctgctgctg	cgccggatgtgtgggactagcg
RM273	4	24.04	gaagccgctgtaagttacc	gttctctacctgacgagc
RM241	4	27.04	gagccaaataagatcgctga	tgcaagcagcagatttagtg
RM17308	4	27.47	aggactgaggacggcgaagg	cgaagaatcccgacactaacg
Indel4-12	4	28.19	cgtggcaatatggttcttt	tcggatacgtaaaacggaaaa
Indel4-13	4	30.71	ggattgcttttggcaattt	ttaacaactggagggggaaa
Indel4-14	4	33.14	ggatggtgaggtgaggtgtt	cgtgttttctccccaatc
Indel4-15	4	35.17	atgtaaccggccagagtg	ccattaactggtcggaatcg
RM280	4	35.18	acacgatccactttgcgc	tgtgtcttgagcagccagg
Indel5-1	5	0.54	ccttgatcgattgctctggt	actttctccgtgttcttgc
RM17818	5	1.61	ttgcctcatgtttgcttcatcc	agctgacaacgacgactgc
RM574	5	3.45	ggcgaattcttgcacttgg	acggtttgtaggggtgcac
Indel5-3	5	5.55	gtccccctcaactttctctc	tcggttgctgaataccttt
RM289	5	7.81	ttccatggcacacaagcc	ctgtgcacgaacttccaaag
Indel5-7	5	15.75	aaatttaggccagcagctt	tctctcacacgcttattcatctt
Indel5-8	5	18.25	cgtgccgatgacaaaacttc	gaggatccatgtccaccatt
RM164	5	19.26	tctgccccgctactgcagatatcc	gcagccctaatgctacaattctc
RM18749	5	21.23	tgagcactctgatctgtctctcacg	aatcaccgattcgtgatctcc
Indel5-10	5	23.22	tcgattgagatttgcgat	tcgtaaccacactgcaactg
RM421	5	24.04	agctcaggtgaaacatccac	atccagaatccattgacccc
RM274	5	26.91	cctcgcttatgagagcttgc	cttctccatcactcccattgg
RM589	6	1.38	atcatggtcgggtgcttaac	caggtccaaccagacactg

RM190	6	1.77	ctttgtctatctcaagacac	ttgcagatgttcttctgatg
RM19398	6	2.78	tcgagtatatacattcgtgtgtgg	acctcacgtccgtcaggaagc
RM510	6	2.83	aaccggattagttctcggc	tgaggacgacgagcagattc
RM276	6	6.23	ctcaacgttgacacctcgtg	tctccatcgagcagtatca
RM527	6	9.86	ggctcgatctagaaaatccg	ttgcacaggttgcgatagag
Indel6-6	6	13.17	cctcatccaggggtcatgta	cggtaagtgtcatccaggt
Indel6-7	6	15.62	gcgattattgagagcgagga	gcctcttggggaagaacaa
Indel6-8	6	18.17	tcacctttatggtgccgaag	gaagctgcttttgctccac
RM3827	6	22.30	taggtaggacctgcttcattgc	ccctggcctttctcaatctgc
RM20438	6	25.58	cacaacgaatgtggtgtgtcc	cgacatagatgaggccctattcc
RM30	6	27.25	ggttaggcacgtcacgg	tcacctcaccacgacacg
RM400	6	28.43	acaccaggctacccaaactc	cggagagatctgacatgtgg
RM494	6	31.09	gggaggggatcgagatagac	ttaaccttcttccgctcc
RM427	7	2.68	tcactagctctgcctgacc	tgatgagagttggttgcgag
RM125	7	5.48	atcagcagccatggcagcgacc	aggggatcatgtccgaaggcc
RM7121	7	5.62	ggagatggcacacgtcaaac	aggatcccgtttttagcag
RM180	7	5.74	ctacatcggcttaggttagcaacacg	acttgcctacttgggtgagggactg
RM501	7	8.01	gcccattaatgtacagggc	atatcgtttagccgtgctgc
Indel7-6	7	13.32	ccccatgaggcctacactt	agcagcataatcagatgagacg
RM533	7	17.51	gcaactgctctacgcctctc	cctgaggcttcacctactcg
RM432	7	18.96	ttctgtctcacgtggattg	agctgcgtacgtgatgaatg
RM11	7	19.26	tctctcttccccgate	atagcgggcgaggcttag
RM182	7	21.51	tgggatgcagagtgcagttggc	cgcaggcacggtgccttgaag
RM505	7	24.53	agagtatgagccgggtgtg	gattggcgatcttagcagc
RM234	7	25.47	acagtatccaaggccctgg	cacgtgagacaaagacggag
RM47	7	25.81	actccactccactccccac	gtcagcaggtcggacgtc
Indel7-11	7	25.93	gcccactgtcattgagagta	gttttgccttttgttct
RM1335	7	28.30	gcgccattcttgcataattgc	atcgaacaagaagagtggcttgg
Indel7-12	7	28.47	cgctcgtgttttctcgtgat	gatcggaggcttttgttga
RM172	7	29.56	tgcagctgcgccacagccatag	caaccacgacaccgccgtgttg
Indel7-13	7	29.66	tggaggctttctcgtttc	gaggaagtcgaggatgagga
RM152	8	0.68	gaaaccaccacacctcaccg	ccgtagaccttctgaagtag
RM38	8	2.12	acgagctctcgcagccta	tcggtctccatgtcccac
RM126	8	5.22	cgcgtccgcgataaacacaggg	tcgcacaggtgaggccatgtcg
Indel8-3	8	5.55	ttttaaagctgcgcaaaaag	cataaccggtaaaggagtagcc
RM72	8	6.76	ccggcgataaaacaatgag	gcatcggctctaactaaggg
RM6008	8	7.61	cggagaggagaggaggagaagc	aaccgaagcacatacatcacacg
Indel8-4	8	8.06	cgtgcggcttacaagagata	tgaggcactaatcatcttctctg
Indel8-7	8	15.60	ttttaccgtgtcggfactgc	ctccaaaacagggaccat
Indel8-8	8	18.09	ccctccatgttgtgagtcc	tgattagatccagaaaggagaa
RM1309	8	19.18	gaggacactgacgacagcttgg	cgcgcaaatcattaagtctcag
Indel8-11	8	25.63	aaccatgaatgaatccctga	tgcaactgacatctgcaat
RM447	8	26.55	cccttgtcgtctcctctc	acgggcttctctcctctc
RM264	8	27.93	gttgcgtcctactgctacttc	gatccgtgtcgtatgattagc
Indel8-12	8	28.12	tgaattgaacctccgtcctc	agaactgcaccacgaagctc

RM23662	9	0.43	gagaggacgatggcactattgg	cgaggaacttgattcgcattgg
RM444	9	5.93	tgcatcttcaccgtagtcctagc	cttgctggagctcgtagatgc
Indel9-4	9	8.08	gccggccttatccattttt	gagcgccactgcttctactc
RM296	9	10.79	cacatggcaccacactcc	gccaagtcattcactactctgg
Indel9-6	9	13.05	gcatgtatcgtggacatgga	tccttgatcaacaccgtaaa
RM566	9	14.71	acccaactacgatcagctcg	ctccaggaacacgctctttc
RM434	9	15.66	gcctcatcccttaaccctc	caagaaagatcagtgcggtg
RM242	9	18.81	ggccaacgtgtgtatgtctc	tatatgccaagacggatggg
RM553	9	19.33	aactccacatgattccacc	gagaaggtggtgcagaagc
RM189	9	22.10	cgtcttcccaacgctaaaa	cgccgggcttcgcttc
Indel10-1	10	0.53	aattcttatggacggatacgc	tcagcatctcgtaaagcaaaa
RM474	10	1.82	aagatgtacgggtggcattc	tatgagctggtgagcaatgg
RM216	10	5.34	gcatggccgatggtaaag	tgtataaaaccacacggcca
RM239	10	9.70	tacaaaatgctgggtacccc	acatatgggacccacctg
RM184	10	16.43	atccattcgccaaaaccggcc	tgacactggagagcgggtg
RM25561	10	17.73	tactacctccacgcttccatcc	gcgatttctcgggagttaggg
RM269	10	18.03	gaaagcgatcgaaccagc	gcaaatgcgcctcgtg
RM171	10	19.12	aacgcgaggacacgtacttac	acgagatactgacgcctttg
Indel10-10	10	23.10	catgctacagagaggaagc	acggcgtcttctcggtg
RM590	10	23.12	catctccgctctccatgc	ggagttggggcttctgttcg
RM286	11	0.38	ggcttcatcttggcgac	ccggattcagagataaactc
Indel11-2	11	3.35	tgatgagctctcacttgtgaaa	cgtacattggcttatgtgatctg
RM552	11	4.84	cgcagttgtggatttcagtg	tgctcaacgtttgactgtcc
RM26227	11	5.35	caccggagaccagagtagaacg	ctcaaaactgatcagggctgacc
RM120	11	5.75	cacacaagccctgtctcagacc	cgctgcgtcatgagtatgta
Indel11-3	11	5.86	gtgaattcatgacgcgaaga	agcttgatggatgctcaggt
Indel11-4	11	8.38	tgagatgtggccattaagga	tggcaaaagatcttatatttactcg
Indel11-5	11	10.93	tctctcaaaatgggacacc	ataacgcgggacacagaatc
Indel11-7	11	16.47	tgataaatccataactaaggatctg	gcttagtccgaggccttca
RM229	11	18.87	cactcacacgaacgactgac	cgcaggttctgtgaaatgt
Indel11-8	11	18.97	acggctaaacggtactgcat	acaccaagggtgaaaagtgg
Indel11-9	11	21.48	tgcagtacaacactcagttcaaa	catgttacggtactggcatca
RM27074	11	2.98	ggaggagatatcagcaataagagg	gaagaagaatcgtggataggc
RM27400	12	0.11	ctcgttctctctctcatcacc	ggtgaagtactcattccgatgg
Indel12-1	12	0.55	tctggagagctgcagaaaca	gcaatctctgcactttgatacc
RM19	12	2.43	caaaaacagagcagatgac	ctcaagatggacccaaga
RM27686	12	4.69	atgggaacaacctatcgtctgc	gagagttgggcttctgttgagg
RM7119	12	6.70	ctgagaccatgacgggataaacacc	ggcctcagatcatcaacttgg
RM27791	12	7.09	gtgatatgccatgaggcaatgg	agggtgccacatgacagtttagg
Indel12-5	12	10.48	tgggcaactgaatctaacca	ggagatgatgatcgggtgat
Indel12-6	12	13.05	caactaaaaccaacacaaaatcca	tgtctagtgtcatgtctgagtgc
RM7102	12	13.21	ggcggttgcgtttacttggfactcg	ggcgcataggagtgttagagtgc
RM277	12	18.32	cggcctcaatcatcacctgac	caaggcttgaagggaag
RM28448	12	22.64	catctttagcttactcctctctcg	gagatgatccgcttctcttcc
RM3331	12	23.49	acgagagggaggagagaaaacg	ggagagccacaggaacagatcg

RM5479	12	24.41	ctcaccatagcaatctcctgtgc	acttcgttcaactgcatcatgg
RM28621	12	24.98	gtgtcaactgtcaacaacacc	aaggcagggttacatgatagg
RM12	12	26.99	tgcctgtattttctctctc	ggtgatcctttcccattca
RM1296	12	27.09	atgttattggtgagaggccaacg	ctgtggaattgaatcctcttcc
Indel12-12	12	27.38	tgtgcttctggtgaacaactt	ccaaatggcgggtaatacata

Supplemental Table 2. Analysis of variance for grain traits of the CSSL population across two years \times three locations

Source	DF	TGW		LWR		GL		GW	
		MS	F	MS	F	MS	F	MS	F
CSSL	133	36.48	60.88**	0.33	102.07**	1.44	62.94**	0.08	52.49**
Site	2	551.22	919.98**	0.22	67.30**	1.11	48.67**	0.29	178.97**
Year	1	284.10	474.16**	0.83	255.53**	6.99	306.31**	0.02	11.80**
CSSL \times Site	266	2.97	4.96**	0.02	5.76**	0.10	4.33**	0.01	3.51**
CSSL \times Year	133	4.25	7.09**	0.02	7.62**	0.18	8.09**	0.01	4.19**
Site \times Year	2	58.47	97.58**	0.17	50.94**	2.18	95.36**	0.12	77.40**
CSSL \times Site \times Year	266	2.89	4.82**	0.01	4.03**	0.09	3.93**	0.00	2.91**

DF: degrees of freedom, MS: mean square, F: F-statistic. The abbreviations for the four traits (TGW, LWR, GL and GW) are the same as those in Table 2. Asterisks indicate significance levels: *, $P \leq 0.05$; **, $P \leq 0.01$.

Supplemental Table 3. QTLs of four traits in CSSL population across six environments

QTL		<i>qTGW4</i>	<i>qTGW5</i>	<i>qTGW3</i>	<i>qTGW8</i>	<i>qLWR1.2</i>	<i>qLWR8</i>	<i>qLWR1.1</i>	<i>qLWR2.2</i>	<i>qLWR3.2</i>	<i>qLWR6</i>	<i>qLWR12</i>	<i>qLWR1.3</i>	<i>qLWR2.1</i>
Marker		RM280	Indel5-10	RM411	Indel8-3	RM128	RM126	RM3740	Indel2-9	Indel3-11	RM30	RM28621	Indel1-16	Indel2-8
LOD	E1	0.69	1.84	5.82	4.72	2.22	1.33	4.59	1.76	0.28	0.18	2.04	1.55	1.40
	E2	3.05	2.67	0.62	0.53	1.30	1.45	1.60	1.28	0.70	4.57	1.46	1.25	0.92
	E3	2.15	3.65	0.11	0.02	3.38	4.54	1.26	0.10	1.10	0.06	3.11	0.05	7.05
	E4	2.60	1.16	0.09	0.55	0.00	6.31	1.57	3.60	3.58	0.29	3.51	6.18	0.09
	E5	3.67	1.02	0.12	0.69	2.55	6.20	2.01	5.44	2.35	3.14	1.73	1.27	0.02
	E6	3.87	1.01	0.03	0.29	3.49	1.22	3.86	1.46	2.86	0.51	2.02	0.32	1.96
P-values	E1	0.999	0.515	0.000	0.004	0.375	0.869	0.005	0.621	1.000	1.000	0.454	0.738	0.832
	E2	0.048	0.148	1.000	1.000	0.882	0.802	0.712	0.890	0.998	0.006	0.794	0.903	0.989
	E3	0.323	0.021	1.000	1.000	0.043	0.007	0.899	1.000	0.958	1.000	0.049	1.000	0.000
	E4	0.157	0.934	1.000	1.000	1.000	0.000	0.727	0.030	0.031	1.000	0.036	0.000	1.000
	E5	0.019	0.974	1.000	0.999	0.206	0.000	0.467	0.001	0.304	0.050	0.638	0.895	1.000
	E6	0.014	0.976	1.000	1.000	0.036	0.916	0.019	0.794	0.105	1.000	0.462	1.000	0.503
PVE(%)	E1	1.72	4.58	16.53	12.44	5.62	3.37	12.91	4.44	0.73	0.48	5.12	3.92	3.73
	E2	8.17	7.43	1.50	1.33	3.47	3.85	4.25	3.40	1.90	13.49	3.88	3.35	2.60
	E3	6.37	12.38	0.33	0.07	5.69	7.58	1.90	0.15	1.69	0.09	5.08	0.08	12.79
	E4	8.54	3.69	0.29	1.75	0.00	11.14	2.42	6.06	6.11	0.45	5.89	10.89	0.14
	E5	11.18	2.70	0.36	2.00	5.18	14.66	4.11	12.69	4.86	6.74	3.55	2.64	0.04
	E6	11.26	2.78	0.09	0.81	8.37	2.66	9.19	3.18	6.74	1.12	4.36	0.71	4.45

Supplemental Table 3. QTLs of four traits in CSSL population across six environments

(continuous table)

QTL		<i>qLWR3.1</i>	<i>qLWR3.3</i>	<i>qLWR9</i>	<i>qGL12.2</i>	<i>qGL3.2</i>	<i>qGL4</i>	<i>qGL12.1</i>	<i>qGL2</i>	<i>qGL10</i>	<i>qGL3.1</i>	<i>qGW4</i>	<i>qGW9</i>	<i>qGW1.2</i>
Marker		Indel3-3	Indel3-17	RM553	RM28621	Indel3-17	RM280	RM277	Indel2-8	RM171	Indel3-3	RM119	RM553	Indel1-16
LOD	E1	3.97	0.34	0.35	2.84	0.59	0.17	0.00	0.50	0.57	4.28	0.01	3.74	0.86
	E2	0.50	1.05	1.43	6.40	1.51	0.81	0.57	0.24	0.38	1.16	0.33	5.13	0.51
	E3	0.69	2.25	4.30	1.38	5.90	1.29	5.65	6.71	5.90	0.04	0.37	3.03	0.43
	E4	0.50	4.32	1.51	3.24	5.41	3.41	4.19	1.62	1.70	1.02	3.82	1.08	8.35
	E5	0.63	0.75	1.99	9.70	0.40	3.76	1.51	0.60	0.55	0.46	6.40	0.37	0.85
	E6	0.34	1.75	1.24	5.94	3.02	3.86	2.01	1.34	1.16	0.91	3.84	0.96	6.90
P-values	E1	0.017	1.000	1.000	0.199	1.000	1.000	1.000	1.000	1.000	0.011	1.000	0.026	0.994
	E2	1.000	0.971	0.814	0.000	0.793	0.998	1.000	1.000	1.000	0.949	1.000	0.002	1.000
	E3	0.999	0.363	0.009	0.861	0.001	0.904	0.001	0.000	0.001	1.000	1.000	0.054	1.000
	E4	1.000	0.008	0.762	0.048	0.002	0.045	0.014	0.735	0.690	0.982	0.023	0.958	0.000
	E5	1.000	0.999	0.484	0.000	1.000	0.031	0.793	1.000	1.000	1.000	0.000	1.000	0.995
	E6	1.000	0.628	0.907	0.001	0.067	0.029	0.516	0.884	0.949	0.995	0.023	0.985	0.000
PVE(%)	E1	11.06	0.85	0.90	8.09	1.49	0.46	0.00	1.35	1.53	12.50	0.02	7.86	1.68
	E2	1.36	2.94	3.70	19.87	4.07	2.23	1.59	0.68	1.05	3.16	0.63	11.14	0.98
	E3	1.06	3.67	6.99	2.45	11.94	2.29	11.39	14.47	11.90	0.07	1.02	8.60	1.18
	E4	0.79	7.25	2.35	7.14	12.09	7.53	9.17	3.43	3.44	2.09	7.66	2.04	18.16
	E5	1.33	1.58	4.16	24.29	0.85	8.48	2.97	1.29	1.15	0.97	12.62	0.65	1.48
	E6	0.76	4.11	2.72	14.85	7.22	9.30	4.37	3.06	2.56	2.02	8.41	1.95	15.97

Supplemental Table 3. QTLs of four traits in CSSL population across six environments

(continuous table)

QTL		<i>qGW8.1</i>	<i>qGW8.3</i>	<i>qGW1.1</i>	<i>qGW2</i>	<i>qGW3.1</i>	<i>qGW3.2</i>	<i>qGW6</i>	<i>qGW8.4</i>	<i>qGW8.2</i>	<i>qGW11</i>	<i>qGW12</i>
Marker		RM126	Indel8-11	RM3740	RM110	Indel3-26	RM85	RM589	RM264	RM6008	RM27074	RM7119
LOD	E1	4.71	0.08	0.52	0.53	0.33	4.07	0.06	3.85	0.25	0.75	1.24
	E2	1.22	0.22	0.76	0.31	0.57	0.00	1.63	1.98	5.75	0.00	4.20
	E3	0.83	1.57	0.85	0.02	0.16	0.02	1.15	1.36	0.52	0.01	0.37
	E4	0.56	2.71	4.74	1.76	1.23	0.51	3.27	0.25	0.01	3.66	0.42
	E5	6.10	3.35	1.36	5.94	1.07	0.01	0.86	0.63	0.48	0.66	0.67
	E6	1.23	4.06	1.42	0.56	3.33	0.25	0.81	0.48	1.94	0.91	0.64
P-values	E1	0.003	1.000	1.000	1.000	1.000	0.016	1.000	0.022	1.000	0.999	0.904
	E2	0.913	1.000	0.999	1.000	1.000	1.000	0.673	0.450	0.001	1.000	0.013
	E3	0.997	0.708	0.995	1.000	1.000	1.000	0.940	0.837	1.000	1.000	1.000
	E4	1.000	0.154	0.003	0.584	0.909	1.000	0.049	1.000	1.000	0.031	1.000
	E5	0.000	0.047	0.837	0.001	0.961	1.000	0.994	1.000	1.000	1.000	1.000
	E6	0.909	0.016	0.794	1.000	0.047	1.000	0.997	1.000	0.476	0.990	1.000
PVE(%)	E1	10.15	0.16	1.01	1.03	0.65	8.70	0.11	8.39	0.49	1.48	2.42
	E2	2.31	0.43	1.44	0.60	1.10	0.00	3.06	4.08	12.27	0.00	8.72
	E3	2.26	4.21	2.30	0.05	0.45	0.05	3.10	3.73	1.42	0.04	1.01
	E4	1.04	5.33	9.67	3.21	2.27	0.90	6.48	0.48	0.01	7.53	0.00
	E5	11.96	6.26	2.35	11.61	1.86	0.01	1.49	1.13	0.84	1.18	1.18
	E6	2.47	8.94	2.85	1.13	7.23	0.50	1.64	1.01	3.85	1.86	1.30

LOD: LOD score; PVE: percentage of variance explained; P-values: the genome-wide P-value; in bold type when $P \leq 0.05$; the abbreviation for the four traits (TGW, LWR, GL and GW) are the same as those in Table 2. Naming of six environments is the same as Table 1.