

Table S1. Utilization data of the most widely used 150 parental clones from sugarcane hybrid breeding programs in China during the recent five years.

Accession	Series	2014		2015		2016		2017		2018		Total
		Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	
Co1001	Co	6	2	11	4	36	6	36	6	34	12	153
CP57-614	CP	9	24	5	26	4	28	4	28	2	28	158
CP67-412	CP	6	10	3	12	2	22	2	22	4	6	89
CP72-1210	CP	21	122	35	56	57	96	57	96	54	152	746
CP72-2086	CP	9	32	14	28	1	50	1	50	9	46	240
CP80-1827	CP	3	74	7	12	9	10	9	10	1	8	143
CP81-1254	CP	29	40	30	18	72	60	72	60	30	100	511
CP84-1198	CP	14	162	28	93	33	124	33	124	30	104	745
CP89-2143	CP	72	32	67	44	54	44	54	44	54	114	579
CP93-1382	CP	10	16	3	36	10	26	10	26	11	72	220
CP93-1634	CP	1	8	0	2	16	12	16	12	1	20	88
CP94-1100	CP	31	158	55	124	52	124	52	124	14	92	826
CT89-103	CT	2	12	14	6	25	52	25	52	19	42	249
DZ03-83	DZ	17	8	2	58	20	18	20	18	12	14	187
DZ05-61	DZ	1	2	4	32	13	40	13	40	2	4	151
DZ06-51	DZ	28	4	9	8	6	14	6	14	2	0	91
DZ93-88	DZ	24	56	17	32	28	62	28	62	13	36	358
FN02-6404	FN	12	22	36	18	30	48	30	48	31	26	301
FN02-6427	FN	50	68	9	54	30	68	30	68	20	42	439
FN05-2848	FN	20	16	17	34	34	44	34	44	13	22	278
FN0711	FN	1	2	2	14	2	14	2	14	7	32	90
FN0712	FN	7	0	9	40	9	40	9	40	19	40	213
FN0713	FN	9	0	10	42	17	38	17	38	32	48	251
FN0717	FN	11	0	11	0	14	6	14	6	28	42	132
FN91-23	FN	2	10	3	6	3	10	3	10	2	0	49
FN92-4621	FN	0	6	5	7	1	24	1	24	24	32	124
FN95-1702	FN	36	28	17	14	8	8	8	8	30	12	169
FN99-20169	FN	6	6	9	4	10	6	10	6	3	6	66
GN95-108	GN	8	12	10	18	8	8	8	8	0	0	80
GT00-122	GT	38	224	75	118	62	154	62	154	27	114	1028
GT02-1156	GT	1	18	2	10	4	8	4	8	13	44	112
GT02-208	GT	13	44	15	24	34	36	34	36	14	10	260
GT02-281	GT	8	18	2	2	8	2	8	2	7	2	59
GT02-467	GT	9	8	10	12	25	30	25	30	14	8	171
GT02-761	GT	34	134	23	132	74	142	74	142	25	54	834
GT02-901	GT	23	100	17	70	27	148	27	148	23	72	655
GT03-11	GT	6	4	10	14	6	4	6	4	9	2	65
GT03-1403	GT	19	26	5	12	5	22	5	22	3	10	129
GT03-2112	GT	49	12	8	10	3	2	3	2	3	4	96
GT03-3005	GT	28	12	3	30	9	46	9	46	15	4	202
GT03-3089	GT	9	2	6	34	15	36	15	36	20	12	185
GT03-8	GT	10	6	10	34	5	36	5	36	12	14	168
GT03-91	GT	5	8	4	12	0	14	0	14	8	2	67
GT05-3084	GT	23	16	19	22	12	2	12	2	17	0	125

GT05-3595	GT	32	50	9	30	14	54	14	54	4	6	267
GT73-167	GT	5	18	16	32	4	22	4	22	11	16	150
GT89-5	GT	25	12	4	10	4	22	4	22	6	0	109
GT92-66	GT	41	150	71	172	63	164	63	164	22	114	1024
GT94-119	GT	45	86	47	68	9	72	9	72	12	8	428
GT96-154	GT	1	2	2	4	5	0	5	0	1	32	52
GZ75-65	GN	2	4	11	6	5	10	5	10	2	18	73
HoCP00-1142	CP	8	142	27	54	24	50	24	50	16	44	439
HoCP00-2218	CP	1	12	10	26	5	14	5	14	2	2	91
HoCP01-517	CP	0	84	29	42	10	52	10	52	14	6	299
HoCP01-564	CP	0	40	36	30	34	78	34	78	19	50	399
HoCP02-610	CP	3	6	1	4	4	18	4	18	2	4	64
HoCP02-623	CP	12	38	31	40	15	22	15	22	5	6	206
HoCP03-704	CP	8	32	17	44	17	26	17	26	25	30	242
HoCP03-708	CP	0	10	3	2	3	18	3	18	0	4	61
HoCP03-716	CP	4	30	18	62	25	52	25	52	4	8	280
HoCP05-902	CP	9	84	1	18	8	70	8	70	13	8	289
HoCP07-612	CP	2	8	1	18	2	32	2	32	12	14	123
HoCP07-613	CP	16	96	19	22	5	16	5	16	17	100	312
HoCP07-617	CP	3	88	11	24	23	60	23	60	2	38	332
HoCP91-555	CP	8	0	4	4	0	12	0	12	6	4	50
HoCP92-648	CP	8	22	12	22	40	48	40	48	19	22	281
HoCP93-746	CP	14	2	13	0	6	8	6	8	10	2	69
HoCP95-988	CP	3	62	38	106	40	92	40	92	5	28	506
K5	K	6	24	22	46	19	52	19	52	1	18	259
K86-110	K	14	16	23	24	10	54	10	54	14	12	231
LC03-1137	LC	42	68	49	172	47	102	47	102	27	120	776
LC03-182	LC	24	96	8	88	30	108	30	108	14	56	562
LC04-256	LC	4	4	17	0	16	0	16	0	2	0	59
LC05-128	LC	5	12	4	14	3	4	3	4	10	8	67
LC05-136	LC	61	120	92	228	100	196	100	196	71	106	1270
LC05-291	LC	21	24	7	28	10	10	10	10	14	38	172
LCP85-384	CP	7	6	0	12	3	12	3	12	11	36	102
NJ00-118	NJ	10	16	7	16	7	10	7	10	5	14	102
NJ00-15	NJ	7	10	6	8	11	10	11	10	7	12	92
NJ03-218	NJ	32	50	12	64	19	20	19	20	10	48	294
NJ07-13	NJ	4	8	6	10	13	10	13	10	8	8	90
NJ86-117	NJ	5	10	6	14	9	22	9	22	2	10	109
NJ92-244	NJ	4	22	5	6	5	8	5	8	1	10	74
ROC1	ROC	9	60	28	34	29	100	29	100	13	28	430
ROC10	ROC	34	76	30	74	22	128	22	128	24	76	614
ROC16	ROC	11	36	6	12	9	34	9	34	24	20	195
ROC20	ROC	19	4	27	2	38	8	38	8	21	16	181
ROC22	ROC	144	468	69	420	86	486	86	486	90	270	2605
ROC23	ROC	21	72	11	24	3	16	3	16	7	36	209
ROC25	ROC	109	134	65	102	83	168	83	168	75	72	1059
ROC26	ROC	21	38	23	72	41	52	41	52	17	82	439
ROC28	ROC	28	62	20	64	35	42	35	42	16	34	378
YC04-55	YC	6	38	5	10	5	32	5	32	2	4	139

YC05-64	YC	1	32	1	8	6	24	6	24	2	52	156
YC06-111	YC	1	4	0	12	2	46	2	46	0	0	113
YC06-140	YC	3	6	9	8	6	4	6	4	3	2	51
YC06-166	YC	3	12	0	8	1	22	1	22	0	0	69
YC06-61	YC	0	32	0	38	2	60	2	60	3	20	217
YC06-63	YC	0	32	1	0	9	4	9	4	1	0	60
YC06-91	YC	1	12	0	0	0	16	0	16	1	8	54
YC06-92	YC	2	10	2	4	6	22	6	22	3	0	77
YC07-65	YC	33	0	14	0	17	4	17	4	3	0	92
YC07-71	YC	43	70	12	106	29	154	29	154	47	146	790
YC09-13	YC	0	0	5	6	30	20	30	20	32	30	173
YC71-374	YC	20	22	1	4	0	4	0	4	0	0	55
YC94-46	YC	43	0	21	0	31	0	31	0	21	0	147
YC97-24	YC	0	24	6	48	2	26	2	26	5	14	153
YC97-40	YC	8	6	9	30	5	4	5	4	0	0	71
YC98-2	YC	1	6	0	10	3	16	3	16	1	10	66
YC98-27	YC	0	0	1	28	2	28	2	28	3	4	96
YN73-204	YN	50	42	33	28	40	26	40	26	11	22	318
YT00-236	YT	81	142	102	188	114	206	114	206	79	90	1322
YT00-318	YT	5	4	8	6	11	16	11	16	1	4	82
YT00-319	YT	35	26	39	46	21	96	21	96	7	26	413
YT01-120	YT	3	2	1	40	4	30	4	30	20	14	148
YT01-125	YT	7	2	7	4	8	4	8	4	13	6	63
YT01-71	YT	23	62	28	46	20	52	20	52	3	12	318
YT03-373	YT	23	20	22	32	23	22	23	22	39	38	264
YT03-393	YT	32	16	53	4	56	8	56	8	10	30	273
YT85-177	YT	51	44	35	52	49	32	49	32	21	22	387
YT86-368	YT	22	0	4	4	12	0	12	0	11	0	65
YT89-240	YT	4	10	2	22	9	18	9	18	1	6	99
YT91-976	YT	91	149	71	108	57	74	57	74	46	50	777
YT92-1287	YT	51	20	20	22	39	24	39	24	11	14	264
YT93-124	YT	34	40	26	20	13	24	13	24	8	2	204
YT93-159	YT	95	325	120	286	137	330	137	330	58	162	1980
YT94-128	YT	79	48	58	42	94	36	94	36	18	68	573
YT96-86	YT	37	32	33	26	22	26	22	26	27	8	259
YT97-20	YT	9	0	1	0	18	8	18	8	3	2	67
YT97-76	YT	0	4	2	24	5	20	5	20	4	16	100
YT99-66	YT	23	48	38	36	47	62	47	62	5	8	376
YZ02-2540	YZ	10	8	1	8	3	12	3	12	2	12	71
YZ02-588	YZ	19	12	20	44	20	64	20	64	1	14	278
YZ03-194	YZ	18	66	12	54	4	12	4	12	0	12	194
YZ07-100	YZ	7	4	7	2	11	6	11	6	10	0	64
YZ07-49	YZ	3	30	1	12	5	12	5	12	0	2	82
YZ89-7	YZ	18	42	8	54	29	44	29	44	21	44	333
YZ94-343	YZ	15	14	5	40	15	24	15	24	7	22	181
YZ94-375	YZ	20	12	3	6	9	24	9	24	1	2	110
YZ99-601	YZ	4	20	0	8	6	36	6	36	1	0	117
YZ99-91	YZ	1	12	15	36	4	2	4	2	0	0	76
ZZ33	YT	5	4	9	2	20	4	20	4	4	0	72

ZZ41	YT	11	0	11	10	16	2	16	2	11	4	83
ZZ43	YT	0	0	12	0	11	46	11	46	0	0	126
ZZ45	YT	0	0	13	0	24	4	24	4	0	0	69
ZZ49	YT	7	8	5	0	10	2	10	2	5	0	49
ZZ50	YT	30	0	25	26	29	2	29	2	14	0	157
ZZ80-101	YT	8	6	0	0	21	0	21	0	14	0	70
ZZ90-76	YT	2	2	12	12	26	32	26	32	7	40	191
ZZ92-126	YT	22	6	22	6	20	10	20	10	6	16	138

Table S2. Tabulated K values of 150 most popular parental clones from sugarcane breeding programs in China at $K=1$ to 10.

K	Reps	Mean LnP(K)	Stdev LnP(K)	Ln'(K)	Ln''(K)	Delta K
1	10	-29182.27	0.4809	NA	NA	NA
2	10	-27962.56	2.0354	1219.71	256.57	126.05668
3	10	-26999.42	2.978	963.14	232.72	78.146581
4	10	-26269	7.7386	730.42	241.17	31.16436
5	10	-25779.75	14.9126	489.25	122.07	8.185707
6	10	-25412.57	236.996	367.18	186.49	0.786891
7	10	-24858.9	42.6001	553.67	153.11	3.594127
8	10	-24458.34	56.7052	400.56	40.75	0.718628
9	10	-24098.53	143.8331	359.81	86.14	0.598889
10	10	-23824.86	392.8114	273.67	NA	NA

Table S3. Sub-population assignment of the 150 most popular parental clones from the sugarcane breeding programs in China based on the Q value.

No.	Accession	Sub-population	Q_1^a	Q_2^b
1	Co1001	pop1	0.9930	0.0070
2	CP57-614	pop1	0.9840	0.0160
3	CP67-412	pop1	0.9669	0.0331
4	CP72-1210	pop1	0.9922	0.0078
5	CP72-2086	pop1	0.9828	0.0172
6	CP80-1827	pop1	0.9800	0.0200
7	CP81-1254	pop2	0.4072	0.5928
8	CP84-1198	pop1	0.9607	0.0393
9	CP89-2143	pop1	0.9565	0.0435
10	CP93-1382	pop1	0.8601	0.1399
11	CP93-1634	pop1	0.8580	0.1420
12	CP94-1100	pop1	0.9720	0.0280
13	CT89-103	pop2	0.3615	0.6385
14	DZ03-83	pop2	0.1434	0.8566
15	DZ05-61	pop2	0.1281	0.8719
16	DZ06-51	pop2	0.0609	0.9391
17	DZ93-88	pop1	0.6874	0.3126
18	FN02-6404	pop1	0.7450	0.2550
19	FN02-6427	pop1	0.5248	0.4752
20	FN05-2848	pop1	0.5363	0.4637
21	FN0711	pop2	0.2851	0.7149
22	FN0712	pop2	0.4170	0.5830
23	FN0713	pop1	0.7942	0.2058
24	FN0717	pop2	0.4873	0.5127
25	FN91-23	pop1	0.5727	0.4273
26	FN920-4621	pop2	0.1416	0.8584
27	FN95-1702	pop2	0.0650	0.9350
28	FN99-20169	pop2	0.0808	0.9192
29	GN95-108	pop2	0.2960	0.7040
30	GT00-122	pop2	0.4592	0.5408
31	GT02-1156	pop1	0.5287	0.4713
32	GT02-208	pop2	0.3910	0.6090
33	GT02-281	pop2	0.1993	0.8007
34	GT02-467	pop2	0.0755	0.9245
35	GT02-761	pop2	0.4730	0.5270
36	GT02-901	pop1	0.5098	0.4902
37	GT03-11	pop2	0.0903	0.9097
38	GT03-1403	pop1	0.6449	0.3551
39	GT03-2112	pop2	0.3785	0.6215
40	GT03-3005	pop1	0.5298	0.4702
41	GT03-3089	pop2	0.4986	0.5014

42	GT03-8	pop2	0.0813	0.9187
43	GT03-91	pop2	0.0909	0.9091
44	GT05-3084	pop2	0.3133	0.6867
45	GT05-3595	pop2	0.3324	0.6676
46	GT73-167	pop2	0.1611	0.8389
47	GT89-5	pop2	0.1530	0.8470
48	GT920-66	pop2	0.4460	0.5540
49	GT94-119	pop2	0.1885	0.8115
50	GT96-154	pop2	0.3761	0.6239
51	GZ75-65	pop2	0.0581	0.9419
52	HoCP00-1142	pop1	0.8056	0.1944
53	HoCP00-2218	pop1	0.7758	0.2242
54	HoCP01-517	pop1	0.5399	0.4601
55	HoCP01-564	pop1	0.9555	0.0445
56	HoCP02-610	pop1	0.8311	0.1689
57	HoCP02-623	pop1	0.5869	0.4131
58	HoCP03-704	pop1	0.9519	0.0481
59	HoCP03-708	pop1	0.9270	0.0730
60	HoCP03-716	pop1	0.9520	0.0480
61	HoCP05-902	pop1	0.9546	0.0454
62	HoCP07-612	pop1	0.9236	0.0764
63	HoCP07-613	pop1	0.9756	0.0244
64	HoCP07-617	pop1	0.7017	0.2983
65	HoCP91-555	pop1	0.9807	0.0193
66	HoCP920-648	pop1	0.9791	0.0209
67	HoCP93-746	pop1	0.9426	0.0574
68	HoCP95-988	pop1	0.9375	0.0625
69	K5	pop2	0.0509	0.9491
70	K86-110	pop2	0.0518	0.9482
71	LC03-1137	pop2	0.2836	0.7164
72	LC03-182	pop1	0.5662	0.4338
73	LC04-256	pop2	0.2054	0.7946
74	LC05-128	pop2	0.3312	0.6688
75	LC05-136	pop1	0.5335	0.4665
76	LC05-291	pop2	0.3744	0.6256
77	LCP85-384	pop1	0.8665	0.1335
78	NJ00-118	pop2	0.2844	0.7156
79	NJ00-15	pop2	0.1720	0.8280
80	NJ03-218	pop2	0.1087	0.8913
81	NJ07-13	pop2	0.3039	0.6961
82	NJ86-117	pop2	0.1384	0.8616
83	NJ920-244	pop2	0.2032	0.7968
84	ROC1	pop2	0.3057	0.6943
85	ROC10	pop2	0.0609	0.9391

86	ROC16	pop2	0.4442	0.5558
87	ROC20	pop2	0.4717	0.5283
88	ROC22	pop2	0.0523	0.9477
89	ROC23	pop2	0.0514	0.9486
90	ROC25	pop2	0.2780	0.7220
91	ROC26	pop2	0.0470	0.9530
92	ROC28	pop2	0.3839	0.6161
93	YC04-55	pop2	0.0956	0.9044
94	YC05-64	pop2	0.1260	0.8740
95	YC06-111	pop2	0.2894	0.7106
96	YC06-140	pop2	0.0421	0.9579
97	YC06-166	pop2	0.1887	0.8113
98	YC06-61	pop2	0.1657	0.8343
99	YC06-63	pop2	0.1856	0.8144
100	YC06-91	pop2	0.2824	0.7176
101	YC06-920	pop2	0.4354	0.5646
102	YC07-65	pop2	0.0204	0.9796
103	YC07-71	pop2	0.0382	0.9618
104	YC09-13	pop2	0.2868	0.7132
105	YC71-374	pop2	0.3339	0.6661
106	YC94-46	pop2	0.2029	0.7971
107	YC97-24	pop2	0.0264	0.9736
108	YC97-40	pop2	0.2333	0.7667
109	YC98-2	pop2	0.0203	0.9797
110	YC98-27	pop2	0.3313	0.6687
111	YN73-204	pop2	0.0187	0.9813
112	YT00-236	pop2	0.4042	0.5958
113	YT00-318	pop2	0.1691	0.8309
114	YT00-319	pop1	0.5728	0.4272
115	YT01-120	pop1	0.6508	0.3492
116	YT01-125	pop1	0.7066	0.2934
117	YT01-71	pop1	0.6694	0.3306
118	YT03-373	pop2	0.3236	0.6764
119	YT03-393	pop2	0.2362	0.7638
120	YT85-177	pop2	0.1501	0.8499
121	YT86-368	pop2	0.0479	0.9521
122	YT89-240	pop1	0.5437	0.4563
123	YT91-976	pop2	0.2618	0.7382
124	YT920-1287	pop2	0.0910	0.9090
125	YT93-124	pop2	0.0448	0.9552
126	YT93-159	pop2	0.4394	0.5606
127	YT94-128	pop2	0.1705	0.8295
128	YT96-86	pop2	0.0816	0.9184
129	YT97-20	pop1	0.5993	0.4007

130	YT97-76	pop2	0.0203	0.9797
131	YT99-66	pop1	0.5855	0.4145
132	YZ02-2540	pop2	0.4394	0.5606
133	YZ02-588	pop1	0.8495	0.1505
134	YZ03-194	pop1	0.6518	0.3482
135	YZ07-100	pop2	0.0454	0.9546
136	YZ07-49	pop2	0.0640	0.9360
137	YZ89-7	pop2	0.3656	0.6344
138	YZ94-343	pop2	0.0224	0.9776
139	YZ94-375	pop2	0.2656	0.7344
140	YZ99-601	pop2	0.0860	0.9140
141	YZ99-91	pop2	0.0380	0.9620
142	ZZ33	pop2	0.0453	0.9547
143	ZZ41	pop2	0.1262	0.8738
144	ZZ43	pop2	0.0945	0.9055
145	ZZ45	pop2	0.3476	0.6524
146	ZZ49	pop2	0.0436	0.9564
147	ZZ50	pop2	0.2396	0.7604
148	ZZ80-101	pop2	0.0225	0.9775
149	ZZ90-76	pop2	0.2683	0.7317
150	ZZ920-126	pop2	0.0172	0.9828

^a The thresholds of Q₁ for Pop 1 was Pop1: 0.5098. ^b The thresholds of Q₂ for Pop2 was 0.4902