

**Table S1.** Details of evaluated maize genotypes and their parentages used in this study.

Genotype number	Genotype code	Genotypes	Parentage	Breeding institute
1	D9	Denghai 9	DH65232/8723	Laizhou Academy of Agricultural Sciences
2	Y23	Yuyu 23	478/C7-2	Anyang Academy of Agricultural Sciences
3	L5	Lianchuang 5	CT07/Lx9801	Henan Ketai Seed Industry Co., Ltd.
4	N988	Nongle 988	NL278/NL167	Xinxiang Seed Company
5	N101	Nonghua 101	NH60/S121	Beijing Golden Nonghua Seed Industry Technology Co., Ltd.
6	D605	Denghai 605	DH351/DH382	Denghai Seed Industry Co., Ltd.
7	D618	Denghai 618	521×DH392	Denghai Seed Industry Co., Ltd.
8	H168	Huayu 168	HF2458-1/MC712-2111	Henan Huafeng Seed Industry Technology Co., Ltd.
9	H321	Hengyu 321	H14/H13	Dryland Farming Institute, Hebei Academy of Agriculture and Forestry Sciences
10	H9	Heng 9	H1027×H765	Dryland Farming Institute, Hebei Academy of Agriculture and Forestry Sciences
11	H110	Heng 110	H58/H59	Dryland Farming Institute, Hebei Academy of Agriculture and Forestry Sciences
12	Y303	Yufeng 303	CT1669/CT3354	Beijing Lianchuang Seed Industry Co., Ltd.
13	L808	Lianchuang 808	CT3566/CT3354	Beijing Lianchuang Seed Industry Co., Ltd.
14	X335	Xianyu 335	PH6WC/PH4CV	Tieling Pioneer Seed Research Co., Ltd.
15	Q218	Qiule 218	NK05/NK07	Henan Qiule Seed Industry Technology Co., Ltd.
16	X20	Xundan 20	9058/X92-8	Hebi Academy of Agricultural Sciences
17	W702	Weike 702	WK858/WK798-2	Zhengzhou Weike Crop Breeding Technology Co., Ltd.
18	L206	Longping 206	L239/L7221	Anhui Longping Hi-Tech Seed Industry Co., Ltd.
19	Z958 (check genotype)	Zhengdan 958	Z58/C7-2	Henan Academy of Agriculture and Forestry Sciences

**Table S2.** Description of agro-climatic characteristics of environments used in the study during 2018-2019.

Environment code	Longitude	Latitude	Locations	Province	Average annual temperature (°C)	Altitude (m)	Average annual rainfall (mm)
SP18, SP19	115°04'	38°52'	Shunping	Hebei	12.7	75	452
GC18, GC19	114°85'	38°02'	Gaocheng	Hebei	12.8	52	446
HD18, HD19	114°54'	36°63'	Handan	Hebei	13.5	55	415
JZ18, JZ19	114°75'	37°03'	Jize	Hebei	13.1	38	490
JH18, JH18	115°14'	37°55'	Jinzhou	Hebei	13.9	35	412
BT18, BT19	115°91'	38°09'	Botou	Hebei	13.6	15	543
SZ18, SZ19	115°56'	38°01'	Shen Zhou	Hebei	13.4	25	486
WY18, WY19	115°96'	37°89'	Wuyi	Hebei	12.6	20	518
NH18, NH19	114°90'	35°81'	Neihuang	Henan	13.7	65	596
QX18, QX19	114°82'	34°52'	Qixian	Henan	16.8	83	615
HX18, HX19	113°80'	35°46'	Huixian	Henan	14.8	126	592
LY18, LY19	113°93'	33°83'	Linying	Henan	14.6	64	725
MJ18, MJ19	112°50'	34°85'	Mengjin	Henan	13.9	262	650
MZ18, MZ19	112°79'	34°91'	Mengzhou	Henan	14.2	112	588
FC18, FC19	112°99'	33°18'	Fangcheng	Henan	14.5	128	805
SY18, SY19	115°56'	34°43'	Suiyang	Henan	13.9	26	826
XH18, XH19	114°53'	33°76'	Xihua	Henan	14.2	30	860
YY18, YY19	113°97'	35°05'	Yuanyang	Henan	14.3	45	882
XY18, XY19	113°38'	34°79'	Xingyang	Henan	14.4	28	606
NJ18, NJ19	116°78'	37°69'	Ningjin	Shandong	12.5	42	521
HT18, HT19	119°16'	36°71'	Hanting	Shandong	12.1	22	602
YC18, YC19	115°95'	35°54'	Yuncheng	Shandong	13.5	34	694
SS18, SS19	116°54'	35°37'	Sishui	Shandong	13.4	120	755
LZ18, LZ19	119°95'	37°17'	Laizhou	Shandong	12.8	18	804
GX18, GX19	115°99'	36°46'	Guanxian	Shandong	13.1	46	576
XT18, XT19	117°76'	35°88'	Xintai	Shandong	13.6	136	730
QZ18, QZ19	118°46'	36°61'	Qingzhou	Shandong	12.7	36	664
XJ18, XJ19	111°20'	35°55'	Xinjiang	Shanxi	13.8	408	505
QS18, QS19	111°15'	35°70'	Qinshui	Shanxi	10.3	246	452
FP18, FP19	109°30'	34°81'	Fuping	Shaanxi	10.1	622	426
YL18, YL19	108°08'	34°27'	Yangling	Shaanxi	12.9	421	635
XZ18, XZ19	112°12'	32°01'	Xiangzhou	Hubei	15.8	125	878
YI18, YI19	112°30'	31°67'	Yicheng	Hubei	16.2	42	920
FX18, FX19	116°55'	34°61'	Fengxian	Jiangsu	15.8	36	640
JS18, JS19	115°37'	33°25'	Jieshou	Anhui	14.7	35	790
SX18, SX19	116°73'	33°79'	Suixi	Anhui	15.2	26	810
MC18, MC19	116°77'	33°21'	Mengcheng	Anhui	14.8	28	732

**Table S3.** Predictive accuracy of AMMI model and BLUP by RMSPD estimates for grain yield.

Model	Mean	S. D	S. E	Q2.5	Q97.5
BLUP	1.06	0.0988	0.0442	0.917	1.16
AMMIF	1.14	0.0258	0.0115	1.11	1.18
AMMI7	1.15	0.0307	0.0137	1.11	1.18
AMMI6	1.17	0.0189	0.0085	1.15	1.19
AMMI2	1.19	0.0579	0.0259	1.11	1.25
AMMI5	1.19	0.0183	0.0082	1.17	1.21
AMMI4	1.19	0.0403	0.018	1.14	1.23
AMMI3	1.19	0.0554	0.0248	1.12	1.26
AMMI1	1.28	0.019	0.0085	1.26	1.3
AMMI0	1.35	0.0331	0.0148	1.3	1.38

BLUP, best linear unbiased prediction; RMSPD, root mean square prediction difference; S.D, Standard deviation; S.E, Standard error; Q2.5, percentile 2.5; Q97.5, percentile 97.5. The same as below.

**Table S4.** Predictive accuracy of AMMI model and BLUP by RMSPD estimates for ear length.

Model	Mean	S.D	S.E	Q2.5	Q97.5
BLUP	0.66	0.0182	0.0081	0.627	0.669
AMMIF	0.77	0.0153	0.00684	0.755	0.791
AMMI7	0.88	0.0197	0.009	0.854	0.899
AMMI6	0.92	0.0059	0.0027	0.914	0.927
AMMI5	0.98	0.0189	0.0084	0.957	1.01
AMMI4	1.04	0.016	0.0071	1.02	1.06
AMMI3	1.11	0.019	0.0085	1.08	1.13
AMMI2	1.17	0.0093	0.0041	1.16	1.18
AMMI1	1.23	0.0083	0.0037	1.22	1.24
AMMI0	1.33	0.00774	0.0035	1.32	1.34

**Table S5.** Predictive accuracy of AMMI model and BLUP by RMSPD estimates for hundred seed weight.

Model	Mean	S. D	S. E	Q2.5	Q97.5
BLUP	4.91	0.231	0.0163	4.5	5.3
AMMIF	4.93	0.227	0.0161	4.49	5.39
AMMI7	5	0.228	0.0162	4.5	5.39
AMMI6	5.02	0.228	0.0161	4.5	5.43
AMMI5	5.08	0.221	0.0156	4.63	5.54
AMMI4	5.14	0.207	0.0146	4.76	5.54
AMMI3	5.21	0.207	0.0146	4.78	5.56
AMMI2	5.28	0.195	0.0138	4.9	5.66
AMMI1	5.35	0.185	0.0131	4.96	5.69
AMMI0	5.46	0.2	0.0142	5.05	5.83

**Table S6.** Predictive value of BLUP genotype effect on grain yield.

Rank	Genotype	Grain yield(t/ha)	BLUP <sub>g</sub>	Predicted (t/ha)	LL (t/ha)	UL (t/ha)
1	L808	11.3	0.652	11.2	11.1	11.3
2	L206	11.2	0.56	11.1	11	11.3
3	H9	11	0.445	11	10.9	11.1
4	Q218	11	0.432	11	10.9	11.1
5	Y303	10.9	0.285	10.9	10.7	11
6	H110	10.8	0.214	10.8	10.7	10.9
7	H168	10.8	0.21	10.8	10.6	10.9
8	H321	10.8	0.209	10.8	10.6	10.9
9	Y23	10.6	0.0523	10.6	10.5	10.7
10	L5	10.6	0.0504	10.6	10.5	10.7
11	N101	10.5	-0.0382	10.5	10.4	10.7
12	Z958	10.5	-0.05	10.5	10.4	10.6
13	X335	10.5	-0.103	10.5	10.3	10.6
14	N988	10.4	-0.141	10.4	10.3	10.6
15	X20	10.2	-0.31	10.3	10.1	10.4
16	W702	9.98	-0.554	10	9.88	10.1
17	D605	9.98	-0.555	10	9.88	10.1
18	D9	9.93	-0.601	9.96	9.83	10.1
19	D618	9.77	-0.757	9.81	9.68	9.94

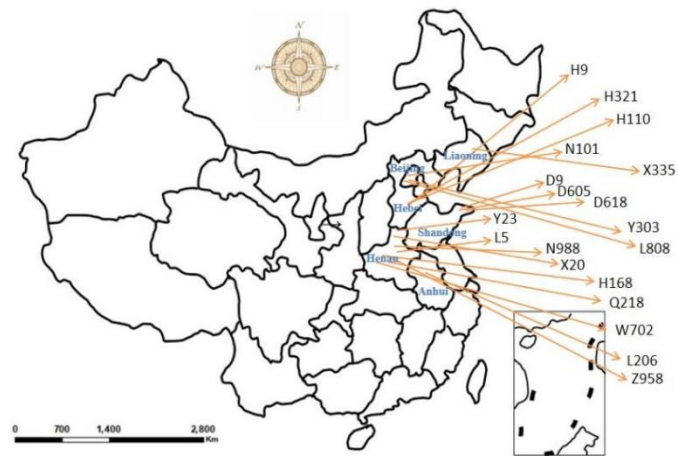
BLUP<sub>g</sub>, genotypic effect of BLUP; Predicted, predicted mean; LL, lower limit; UL, upper limit.  
The same below.

**Table S7.** Predictive value of BLUP genotype effect on ear length.

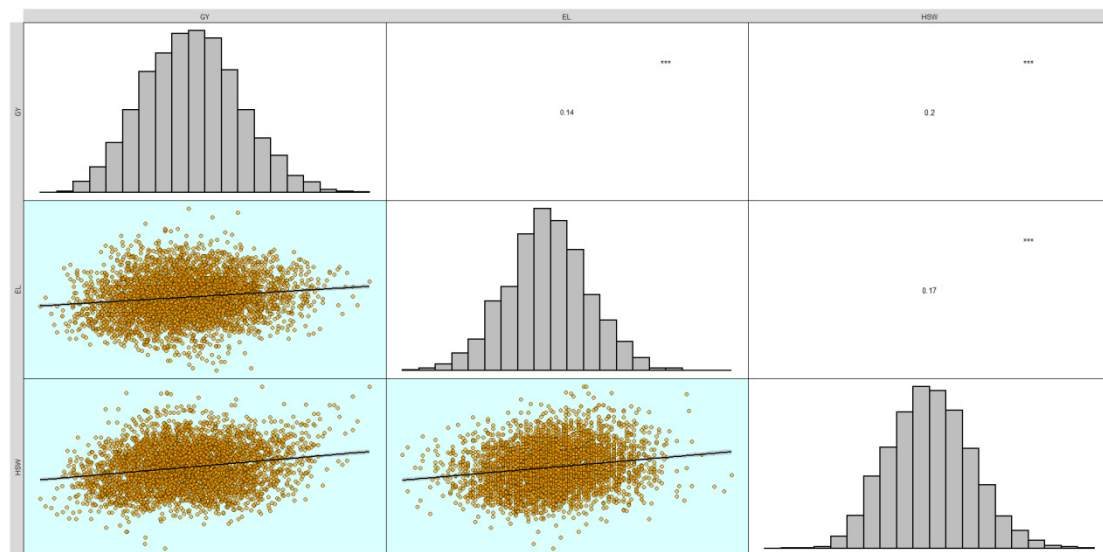
Rank	Genotype	Ear length(cm)	BLUP <sub>g</sub>	Predicted (cm)	LL (cm)	UL (cm)
1	H9	19.5	1.31	19.5	19.3	19.6
2	H110	19.2	0.965	19.1	18.9	19.3
3	W702	19	0.791	18.9	18.7	19.1
4	D9	18.8	0.644	18.8	18.6	19
5	X20	18.7	0.539	18.7	18.5	18.9
6	Y23	18.7	0.505	18.6	18.5	18.8
7	L206	18.6	0.394	18.5	18.3	18.7
8	N101	18.2	0.0782	18.2	18	18.4
9	N988	18.1	-0.0224	18.1	17.9	18.3
10	Q218	18.1	-0.0288	18.1	17.9	18.3
11	D618	17.9	-0.224	17.9	17.7	18.1
12	D605	17.8	-0.33	17.8	17.6	18
13	L5	17.7	-0.457	17.7	17.5	17.9
14	L808	17.6	-0.528	17.6	17.4	17.8
15	X335	17.5	-0.581	17.6	17.4	17.8
16	H321	17.4	-0.669	17.5	17.3	17.7
17	H168	17.4	-0.714	17.4	17.2	17.6
18	Z958	17.3	-0.789	17.4	17.2	17.5
19	Y303	17.2	-0.881	17.3	17.1	17.5

**Table S8.** Predictive value of BLUP genotype effect on hundred seed weight.

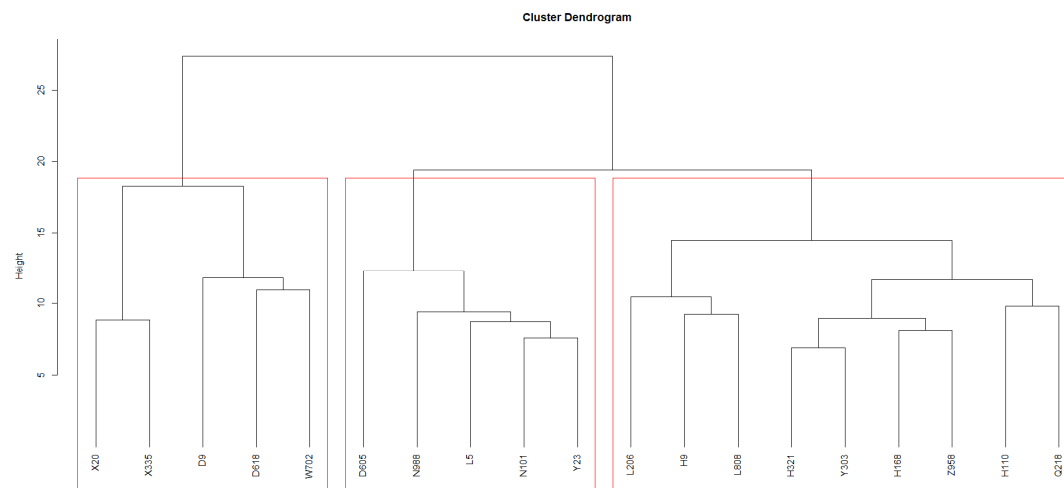
Rank	Genotype	Hundred seed weight (g)	BLUP <sub>g</sub>	Predicted (g)	LL (g)	UL (g)
1	N988	37.6	2.39	37.6	37.1	38
2	Y303	37.5	2.24	37.4	37	37.8
3	W702	37.1	1.83	37	36.6	37.4
4	H110	36.3	1.07	36.2	35.8	36.7
5	X20	36.2	1	36.2	35.7	36.6
6	L808	36.1	0.877	36	35.6	36.5
7	Z958	36	0.841	36	35.6	36.4
8	H9	35.9	0.754	35.9	35.5	36.4
9	H321	35.7	0.516	35.7	35.2	36.1
10	Q218	35.6	0.387	35.5	35.1	36
11	L206	35.5	0.3	35.5	35	35.9
12	D618	35.1	-0.0839	35.1	34.6	35.5
13	X335	34.9	-0.282	34.9	34.4	35.3
14	N101	34.5	-0.682	34.5	34	34.9
15	D605	33.8	-1.33	33.8	33.4	34.3
16	Y23	33.5	-1.63	33.5	33.1	34
17	D9	33.4	-1.72	33.4	33	33.9
18	L5	32.7	-2.35	32.8	32.4	33.2
19	H168	30.9	-4.14	31	30.6	31.5



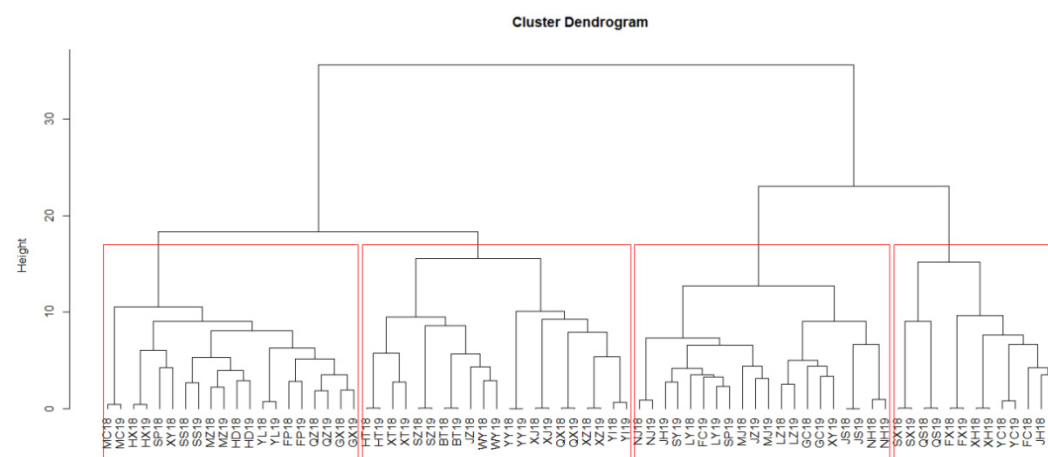
**Figure S1.** The main distribution map of the evaluated genotypes samples in China. The names of maize genotype in this figure were shown in Table S1.



**Figure S2.** The Pearson's correlation between different agronomic traits used in this study. GY, grain yield; EL, ear length; HSW, hundred seed weight.



**Figure S3.** Cluster analysis of tested genotypes for grain yield based on a dissimilarity matrix.



**Figure S4.** Cluster analysis using euclidean distance for grain yield among environments.