Supplementary

Table S1. Data sources used in this study.

Dataset Type	Variable	Spial Resolution	Temporal Resolution	Time Coverage	Source
Maize yield and planting area	Maize yield	County	Year	2000-2010	Agricultural Statistical Yearbook
	Planting area	1 km	Year		ChinaCropPhen dataset
Satellite dataset	EVI	1 km	16-day	2000-2010	MOD13A2 EVI product
	SIF	0.05°	4-day		CSIF datasets
	LAI	500 m	8-day		MOD15A2H LAI product
Climate dataset	TMAX TMIN PRE AET PET VPD PDSI SRAD	4 km	Monthly	2000-2010	TerraClimate datasets
	SM	4 km	Monthly	2000-2010	TerraClimate datasets
Soil dataset	GRAVEL	1 km	-	-	Harmonized World Soil Database
	SAND		-	-	
	SILT		-	-	
	CLAY		-	-	
	BULK		-	-	
	OC		-	-	
	PH		-	-	

LAI: the leaf area index; EVI: the enhanced vegetation index; SIF: the Sun/Solar-induced Chlorophyll Fluorescence; TMAX: maximum temperature; TMIN: minimum temperature; PRE: total precipitation; AET: actual evapotranspiration; PET: potential evapotranspiration; SRAD: downward surface shortwave radiation; VPD: vapor

pressure deficit; PDSI: monthly Palmer Drought Severity Index; GRAVEL: subsoil gravel content; SAND: sand fraction; SILT: the subsoil silt fraction; CLAY: subsoil clay fraction; BULK: subsoil reference bulk density; OC: the subsoil organic carbon; PH: subsoil Ph; SM: soil moisture.

Table S2. A total of 79 variables in the dataset.

Variables	Variable descriptions
	Climate variables (total of 48)
TMAX4-TMAX9	Monthly maximum temperature for each month from Apr to Sep [°C]
TMIN4-TMIN9	Monthly minimum temperature for each month from Apr to Sep [°C]
PRE4-PRE9	Monthly total precipitation for each month from Apr to Sep [mm]
SRAD4-SRAD9	Monthly solar radiation for each month from Apr to Sep [MJ/m2]
PET4-PET9	Monthly potential evapotranspiration for each month from Apr to Sep [mm]
AET4-AET9	Monthly actual evapotranspiration for each month from Apr to Sep [mm]
VPD4-VPD9	Monthly vapor pressure deficit for each month from Apr to Sep [h PA]
PDSI4-PDSI9	Monthly Palmer Drought Severity Index from Apr to Sep
	Satellite variables (total of 18)
EVI4-EVI9	Monthly enhanced vegetation index for each month from Apr to Sep
SIF4-SIF9	Monthly solar-induced chlorophyll fluorescence for each month from Apr to Sep
LAI4-LAI9	Monthly leaf area index for each month from Apr to Sep
	Soil variables (total of 13)
SM4-9	Monthly soil moisture for each month from Apr to Sep [mm]
GRAVEL	Gravel content [%]
SILT	Silt fraction [%]
CLAY	Clay fraction [%]
BULK	Bulk density [g/cm3]
OC	Organic Carbon [%]
SAND	Sand Fraction [%]
PH	pH

Table S3. The RMSE, MAE and R^2 of county-level maize yield prediction model performance from 2000 to 2009.

Model	Dataset	RMSE (kg/ha)	MAE (kg/ha)	R^2
LASSO	Satellite	1116	985	0.35
	Climate	1156	903	0.31
	Combined	1075	839	0.43
RF	Satellite	815	536	0.51
	Climate	796	512	0.56
	Combined	581	398	0.8
XGB	Satellite	851	578	0.49
	Climate	805	542	0.53
	Combined	599	412	0.75
SVM	Satellite	866	610	0.54
	Climate	831	590	0.6
	Combined	610	435	0.76
LSTM	Satellite	979	779	0.45
	Climate	1021	732	0.48
	Combined	877	651	0.65
BP	Satellite	1034	806	0.46
	Climate	1056	826	0.43
	Combined	1016	717	0.6
KNN	Satellite	1153	810	0.44
	Climate	1109	851	0.41
	Combined	1057	774	0.57