Supporting Information

Safeguarding food supply and groundwater safety for maize production in China

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Figures S1 to S6 Table S1 Supplementary Data: Source references of all datasets used in Meta-analysis of national NO₃⁻ leaching Supplementary Data: Source references of all datasets used in Meta-analysis of the leaching factor for enhanced efficiency fertilizers



Figure S1. Distribution of farmer survey for maize systems from 2005 to 2014 in China (a). The irrigation amount of maize production across the 12 agroecological subregions from farmer survey (b).



Figure S2. Soil properties (a, Slope; b, soil sand contend; c, pH; d, total N; e, organic matter) and climate factors (f, rainfall during growth period; g, potential evapotranspiration during growth period; h, mean temperature during growth period) of the input variable for NO_3^- leaching predicted with Random Forest (RF).



Figure S3. Maize yield (a), corresponding above-ground N uptake (b), and N balance (c) for NO₃⁻ leaching predicted with Random Forest (RF).



Figure S4. Observed NO_3^- leaching versus predicted emissions obtained of training (a) and test (b) with random forest (RF).



Figure S5. The relationship of predicted leaching factor (LF) (a), NO_3^- leaching (b) and N rate. The number represents number of county.



Figure S6. Effects of Enhanced efficiency fertilizers (EEF) application on NO₃⁻ leaching (a), and maize yield (b). Numbers of experimental observation are in bottom of bar chart.

Database	Subset	Number of studies	Number of observations	Related parameters	
NO ₃ ⁻ leaching	Ι	41	198 observations	Field measurement : grain yield, N rate, area-scaled NO ₃ ⁻ leaching Calculated data : leaching factor (LF) Remarks: These observations provided the basis for the influence factors analysis and Forest Random model analysis.	
	II	19	43 paired	Field measurement : grain yield, N rate, area-scaled NO ₃ ⁻ leaching Calculated data : leaching factor (LF) Remarks: These observations provided the basis for NO ₃ ⁻ leaching mitigation analysis.	
County-level weather data	III		1,406 counties	 Basic information: precipitation, potential evapotranspiration, temperature. Calculated data: precipitation, potential evapotranspiration, mean temperature, for the duration of growth for each county. Remarks: These observations provided the basis for prediction of county-level NO₃⁻ leaching LFs. 	
County-level soil properties	IV		Basic information: soil total nitrogen, organic matter, pH, and s content1,406 countiesCalculated data: average total nitrogen, soil organic matter, pH content for each county Remarks: These observations provided the basis for prediction level NO3 ⁻ leaching LFs.		
Farmer survey	V		2.89 million	Basic information: yields, and fertilizer use Calculated data: N productivity Remarks: These observations provided the basis for calculation of county-	

Table S1. Summar	y of different	databases used	for the	present study.
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		level NO ₃ ⁻ leaching.
		Basic information: irrigation amounts
VI	 31,942	Remarks: These observations provided the basis for calculation of county-
		level NO ₃ ⁻ leaching.

Supplementary Data: Source references of all datasets used in Meta-analysis of national NO₃⁻ leaching

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Supplementary Data: Source references of all datasets used in Meta-analysis of the leaching factor for enhanced efficiency fertilizers

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