



Supplement of

CropPlantHarvest: a 500 m annual dataset of crop planting and harvesting dates (2001–2024) of the U.S. Midwest

Yin Liu and Chunyuan Diao

Correspondence to: Chunyuan Diao (chunyuan@illinois.edu)

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S1. Sensitivity Analysis of Pure-Pixel Threshold Selection for Planting and Harvesting Date Estimation

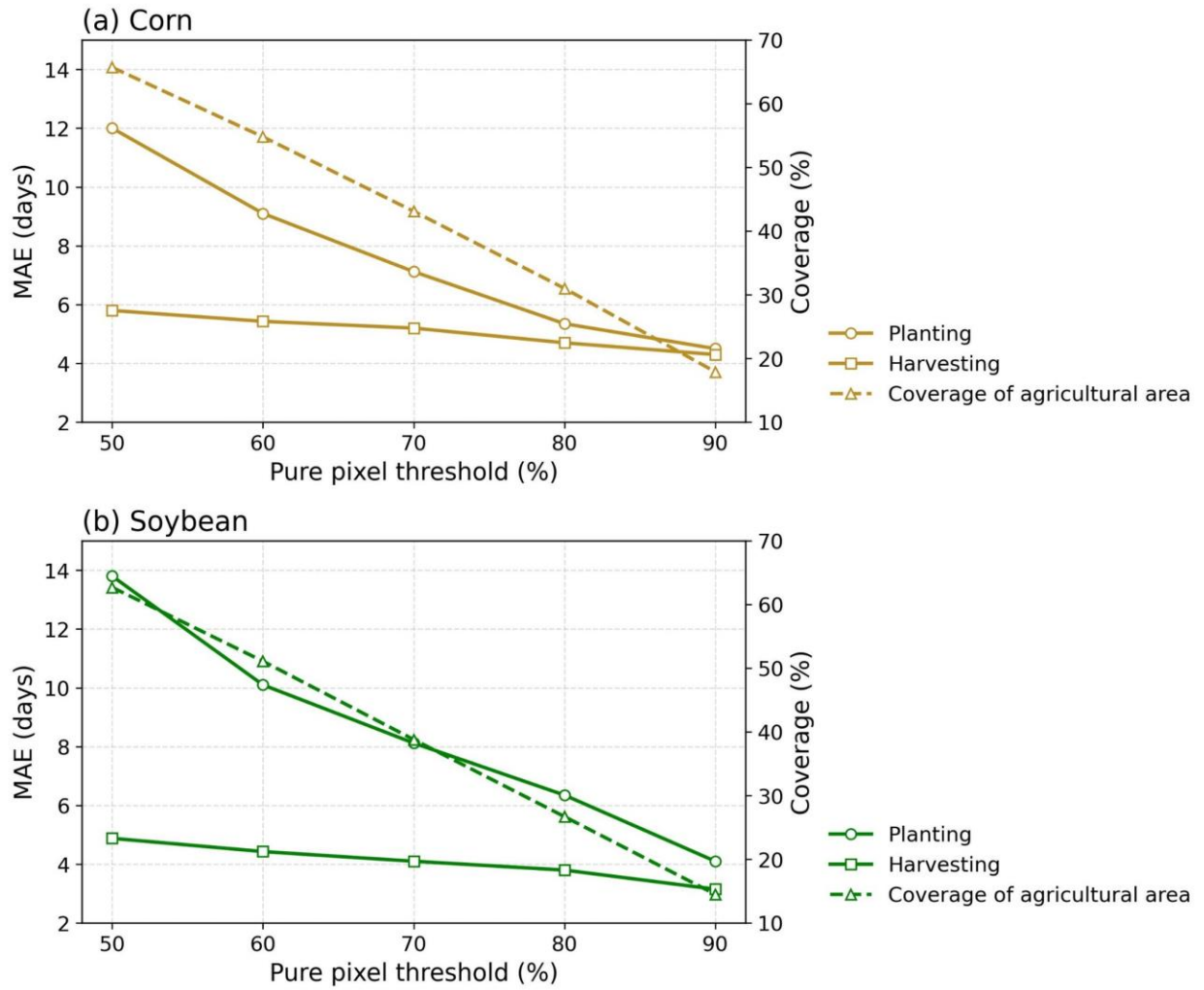


Figure S1. Sensitivity of planting and harvesting date accuracy to the pure-pixel threshold for (a) corn and (b) soybean across the U.S. Midwest in 2024. Solid lines show mean absolute error (MAE, days) for planting and harvesting date estimates, while dashed lines indicate the corresponding spatial coverage of agricultural area (%).

S2. Sensitivity Analysis of NHPI Threshold for Harvesting Date Estimation

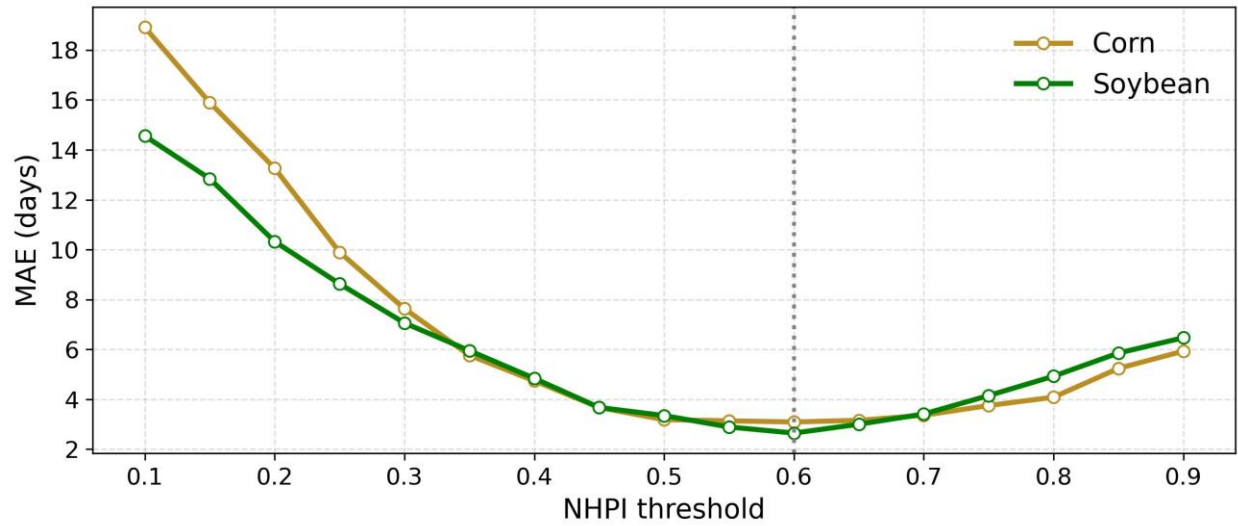


Figure S2. Sensitivity analysis of the NHPI threshold for estimating field-level harvesting dates. Mean Absolute Error (MAE; y-axis) is evaluated across a range of NHPI thresholds (x-axis) for corn and soybean, based on Beck's dataset from U.S. Midwest (2016-2024). Results indicate that a threshold around 0.6 consistently achieves the lowest MAE, suggesting optimal agreement between estimated and observed harvesting dates.

S3. Interannual Variability of Planting and Harvesting Dates

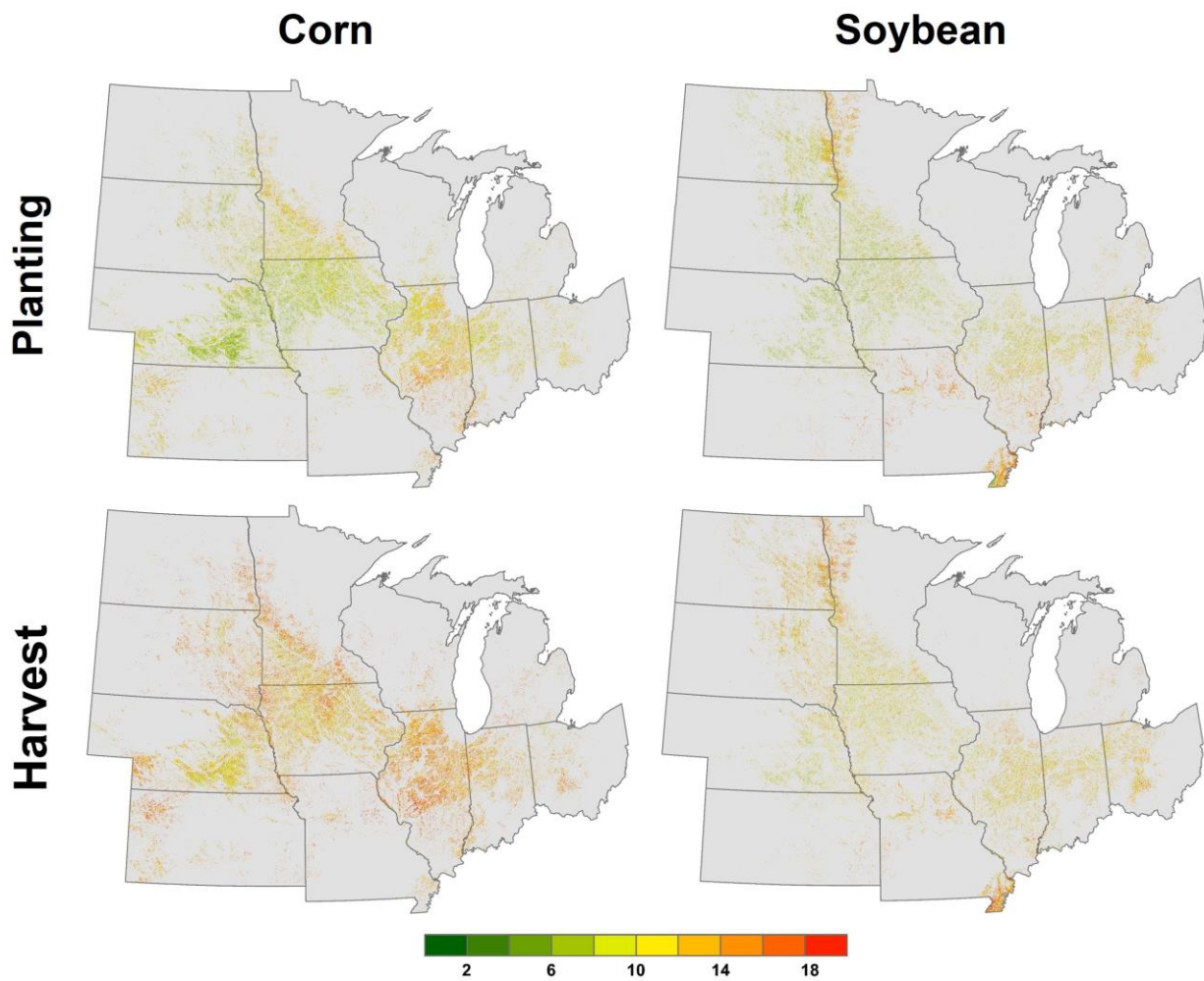


Figure S3. Spatial patterns of interannual variability (standard deviation) in planting and harvesting dates, shown alongside their long-term means, for corn and soybean during 2001–2024.

S4. Seasonal Weather Effects on Detrended Planting and Harvesting Dates

Table S1. Summary of fitted coefficients for early season weather variables in county- and year-fixed effects panel regression models estimating county-level planting day for corn and soybean. The models are applied to detrended planting date series to isolate interannual weather effects from long-term technological and management trends. The weather variables include mean minimum temperature (T_{\min}), mean maximum temperature (T_{\max}), and total precipitation (Precip) during January–May. Coefficient type indicates whether coefficients are based on non-standardized or standardized weather variables. Standard errors are shown in parentheses. Statistical significance is indicated using multiple p-value thresholds (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$) to distinguish different levels of statistical significance. Coefficients without symbols are not statistically significant.

Crop type	Corn		Soybean	
	Non-standardized	Standardized	Non-standardized	Standardized
T_{\min}	-0.9641 (0.1350) ***	-3.2150 (0.4503) ***	-0.3680 (0.1486) *	-1.2590 (0.5085) *
T_{\max}	-0.0169 (0.1020)	-0.0608 (0.3668)	-0.5843 (0.1246) ***	-2.1104 (0.4500) ***
Precip	0.0231 (0.0008) ***	3.3338 (0.1219) ***	0.0314 (0.0009) ***	4.5661 (0.1356) ***
Adjusted R^2	0.357	0.357	0.306	0.306

* for $p < 0.05$, ** for $p < 0.01$, *** for $p < 0.001$

Table S2. Summary of fitted coefficients for harvesting season weather variables in county- and year-fixed effects panel regression models estimating county-level harvesting day for corn and soybean. The models are applied to detrended harvesting date series to isolate interannual weather effects from long-term technological and management trends. The weather variables include mean minimum temperature (T_{\min}), mean maximum temperature (T_{\max}), and total precipitation (Precip) during August–October. Coefficient type indicates whether coefficients are based on non-standardized or standardized weather variables. Standard errors are shown in parentheses. Statistical significance is indicated using multiple p-value thresholds (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$) to distinguish different levels of statistical significance. Coefficients without symbols are not statistically significant.

Crop type	Corn		Soybean	
	Non-standardized	Standardized	Non-standardized	Standardized
T_{\min}	1.9442 (0.1197) ***	4.6237 (0.2846) ***	2.2683 (0.1525) ***	5.3826 (0.3618) ***
T_{\max}	-2.9336 (0.0979) ***	-7.3856 (0.2464) ***	-3.6269 (0.1597) ***	-10.196 (0.4491) ***
Precip	0.0197 (0.0018) ***	1.1205 (0.1020) ***	0.0133 (0.0011) ***	1.2214 (0.1047) ***
Adjusted R^2	0.446	0.446	0.325	0.325

* for $p < 0.05$, ** for $p < 0.01$, *** for $p < 0.001$

S5. Pre-Planting Weather Effects on Planting Dates

Table S3. Summary of fitted coefficients for pre-planting weather variables in county- and year-fixed effects panel regression models estimating county-level planting day for corn and soybean. To strengthen causal interpretation, all weather predictors are restricted to the pre-planting period (January–March), ensuring temporal precedence relative to observed planting dates. The weather variables include mean minimum temperature (T_{\min}), mean maximum temperature (T_{\max}), and total precipitation (Precip) during January–March. Coefficient type indicates whether coefficients are based on non-standardized or standardized weather variables. Standard errors are shown in parentheses. Statistical significance is indicated using multiple p-value thresholds (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$) to distinguish different levels of statistical significance. Coefficients without symbols are not statistically significant.

Crop type	Corn		Soybean	
	Non-standardized	Standardized	Non-standardized	Standardized
T_{\min}	-0.5703 (0.1009) ***	-3.2150 (0.4503) ***	-0.3834 (0.1583) *	-1.3116 (0.5418) *
T_{\max}	0.1910 (0.0794) *	0.8457 (0.3517) *	-0.3483 (0.1303) **	-1.2580 (0.4708) **
Precip	0.0155 (0.0012) ***	1.4177 (0.1131) ***	0.0318 (0.0009) ***	4.6135 (0.1375) ***
Adjusted R^2	0.707	0.707	0.546	0.546

* for $p < 0.05$, ** for $p < 0.01$, *** for $p < 0.001$

Table S4. Summary of fitted coefficients for pre-planting weather variables in county- and year-fixed effects panel regression models estimating county-level planting day for corn and soybean. The weather variables include mean minimum temperature (T_{\min}), mean maximum temperature (T_{\max}), and total precipitation (Precip) during the two months preceding the overall median planting date. Coefficient type indicates whether coefficients are based on non-standardized or standardized weather variables. Standard errors are shown in parentheses. Statistical significance is indicated using multiple p-value thresholds (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$) to distinguish different levels of statistical significance. Coefficients without symbols are not statistically significant.

Crop type	Corn		Soybean	
	Non-standardized	Standardized	Non-standardized	Standardized
T_{\min}	-0.2334 (0.1168) *	-0.7822 (0.3915) *	0.0353 (0.1423)	0.1035 (0.4164)
T_{\max}	-0.0499 (0.0813)	-0.1971 (0.3216)	-0.8081 (0.1089) **	-2.5081 (0.3381) **
Precip	0.0425 (0.0013) ***	3.1095 (0.0972) ***	0.0418 (0.0014) ***	3.2990 (0.1069) ***
Adjusted R^2	0.725	0.725	0.548	0.548

* for $p < 0.05$, ** for $p < 0.01$, *** for $p < 0.001$