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Detection of agricultural flash droughts using impact-informed thresholds

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A complementary linear regression and Pearson correlation analysis between SESR and VHI was also conducted to confirm the discriminatory ability of SESR (**Figure S1**). Regression equations and correlation coefficients describing the relationship between SESR and VHI in both conditions for a year (2014) with and without (2013) drought-induced crop losses show thatthe relationship between SESR and VHI is positive in both years. However, the smaller slope (b=1.49) and correlation (r=0.29) in 2013 indicate a weak relationship, while in 2014 the clearer slope (b =3.94) and correlation (r=0.63) suggest a stronger vegetation response to evaporative stress during drought years with confirmed crop losses. The distribution of SESR values at the lower VHI values indicates poor vegetation health and aligns with more negative SESR values, reflecting stronger evaporative stress. Although correlation does not imply causation, the fact that these differences emerge even in a naturally dry environment like the Dry Corridor indicates that SESR provides a meaningful signal that is coherent with vegetation stress during drought years with confirmed crop losses.

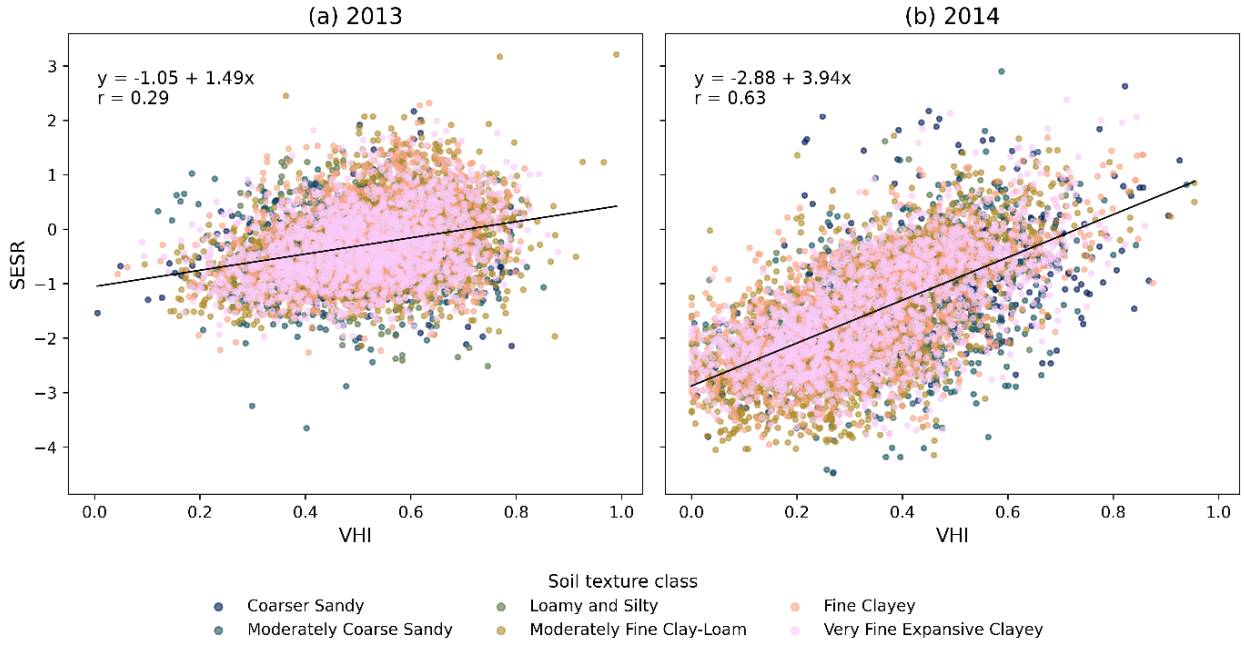


Figure S1. Scatterplots of the relationship between SESR and VHI from February to July in (a) 2013 (year without drought) and (b) 2014 (drought year with confirmed crop losses), with data aggregating across all soil textures at the sample locations. Each panel includes the fitted linear regression line, the regression equation (y), and the Pearson correlation coefficient (r).

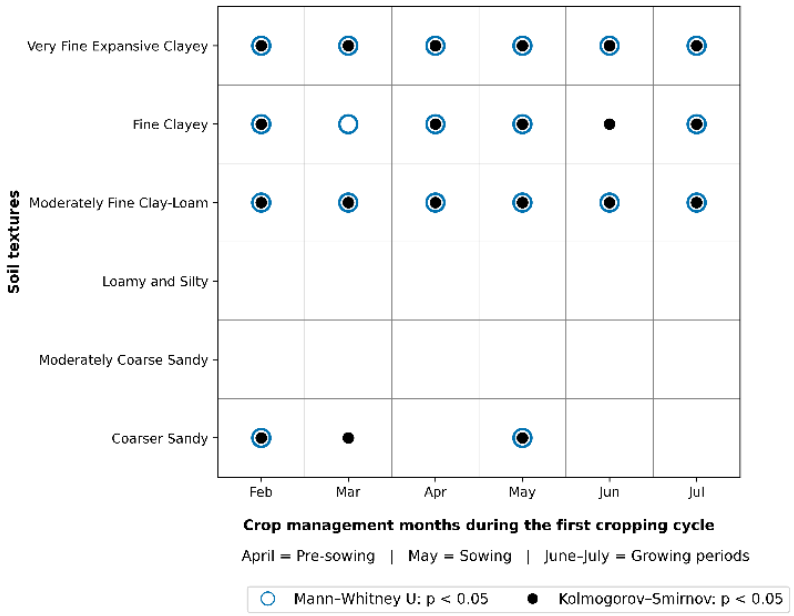


Figure S2 Statistical differences in changes in evaporative stress between drought-induced crop loss years and non-drought years. Points symbols indicate statistically significant separation ($p < 0.05$) according to Mann-Whitney U test and Kolmogorov-Smirnov tests.

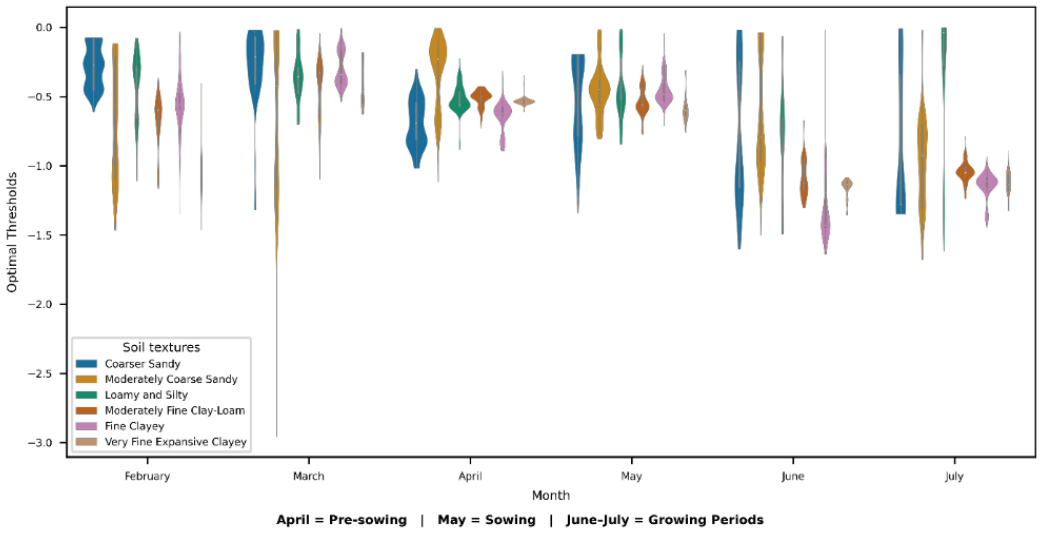


Figure S3 Variability of optimal thresholds across crop management periods and soil textures