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Jia, L; Zhao, W; Fu, B; Daryanto, S; Wang, S; Liu, Y; Zhai, R 2019 Effects of minimum soil disturbance practices on controlling water erosion in China's slope farmland: A meta-analysis LAND DEGRADATION AND DEVELOPMENT, 30(6), 706-716. 10.1002/ldr.3258

Background and objective

Slope farmlands are commonly found in China, and soil loss from slope farmland is the main source of river sediment. Minimum soil disturbance practices were considered effectively in controlling water erosion, especially on slope farmlands. The objectives of this study were to 1) quantify the overall effectiveness of minimum soil disturbance practices in reducing runoff and sediment yield; and 2) determine the effect of slope gradient and length on the efficiency of minimum soil disturbance practices in reducing runoff and sediment yield. Here, the results on sediment yield are reported.

Search strategy and selection criteria

Data sets of runoff and sediment yield by different minimum soil disturbance practices were collected from scientific articles published in all years ending December 2017. Papers published in Chinese journals were collected from the China National Knowledge Infrastructure and Wanfang databases, and international publications were obtained from the Web of Science and Science Direct. 1) The experiments or observations were conducted under field conditions (i.e., no laboratory or greenhouse experiments); 2) the article contained at least one minimum soil disturbance practices as response variables and conventional tillage as a control; 3) the article contained at least one response variable of runoff or sediment generation; 4) the minimum soil disturbance lands and control lands for each independently published research were under the same topography and environmental conditions; 5) the article reported the number of replications.

Data and analysis

An unweighted analysis was performed using the log response ratio (lnRR) to calculate bootstrapped confidence limits in order to include the studies that did not adequately report standard deviations using MetaWin 2.1. A one-way ANOVA was used to analyze the significance of the differences in reducing runoff and sediment yield under different minimum soil disturbance practices, slope gradient, and length. Linear regressions were used to examine the relationships of runoff and sediment yield reductions to slope gradient and length. To check the heterogeneity of the data set, the robustness of the meta-analysis results was tested using a jackknife procedure. The results showed no publication bias.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
81	Slope farmlands	Treatment under minimum soil disturbance practices (contour tillage with hedgerow or micro-basins tillage)	Control under conventional tillage	Metric: Sediment production; run-off; Effect size: Ratio of the considered metrics in the intervention to the considered metrics in the control	81.25

Results

- Minimum soil disturbance practices in China reduced runoff and sediment yield by 36.09% and 51.69%, respectively.
- Contour tillage with hedgerow reduced sediment yield more effectively ($p < 0.05$) than the other practices.

Factors influencing effect sizes

- No factors influencing effect sizes to report

Conclusion

Overall, minimum soil disturbance practices (contour tillage with hedgerow) reduced sediment yield and run-off significantly compared with conventional tillage.