FARMING PRACTICE
LANDSCAPE FEATURES

IMPACT: SOIL EROSION

Reference 18

Chen, D; Wei, W; Chen, L 2017 Effects of terracing practices on water erosion control in China: A meta-analysis EARTH-SCIENCE REVIEWS, 173, 109-121. 10.1016/j.earscirev.2017.08.007

Background and objective

Terracing has long been considered a strategy for soil and water conservation in many mountainous regions of the world. However, the effectiveness of terracing is limited by many factors, such as climate, soil properties, topography, land use, culture, demography and socioeconomic status. To identify the variations in the effect of terracing on water erosion control across various structures and land use types, slope gradients and climatic regions in China. Here, the results for terraces in agricultural lands (croplands, tree crops and grasslands) are reported.

Search strategy and selection criteria

A detailed review of literature published in peer-reviewed journals for all years ending at June 2017. The following search terms were used: "terrace" or "level bench" or "level ditch" or "fish-scale pit", "soil and water conservation" or "runoff" or "erosion" or "sediment", and "China". International publications related to terracing were obtained using the Web of Science and Science Direct, and papers published in Chinese journals were selected by the China National Knowledge Infrastructure and Wanfang Data Info Site. 1) The article contained at least one response variable of runoff or sediment generation; 2) the same response variables were compared between terraces and non-terraced lands of the same topography, hereafter called control; 3) the terraced lands and the control lands were exposed to the same environmental conditions; 4) the number of replications was reported; 5) groups of categories contained more than two data pairs.

Data and analysis

A weighted meta-analysis was conducted to consider the effect size of the SMD (standard mean difference), where the size of the overall effect was calculated using a categorical random effects model. To calculate the SMD, it is necessary to standardize the results of the studies to a uniform scale before they can be combined. The overall mean effect size and 95% confidential interval (CI) were determined by applying a bootstrapping procedure using Review Manager Version 5.3 statistical software. To further analyze terracing efficiency among different subgroup categories, the heterogeneity between different groups was examined across all data for a given response variable (I2). The larger I2 is, the higher the hetegogeneity of what is.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
46	Croplands in China	Terraces	Non-terraced land	Metric: Run-off; sediments; Effect size: Hedge g (standardized difference) comparing the considered metrics between intervention and control	75

Results

- Terracing generally had a significant effect on runoff decline compared to controls.
- Terracing generally had a significant effect on sediment decline compared to the controls.

Factors influencing effect sizes

- Land use : Both runoff reduction and sediment control were greatest in terracing with tree crops, moderately effective in cropland and non-significant in grasslands.
- Terrace type : On bench terraces (including level terraces, zig terraces and slope terraces), tree crops consistently presented the greatest benefit with respect to runoff reduction. Tree crops presented the lowest benefit on half-moon terraces. For sediment reduction, cropland presented the greatest benefit on slope-separated terraces.
- Geographical area : In SE China, terracing of tree crops had the greatest efficiency with respect to runoff reduction, while terracing of croplands and tree crops were superior for sediment reduction. In SW China, the greatest efficiency of soil and water conservation was observed for terraced croplands, followed by tree crops and grasslands. Cropland and tree crops were highly effective in reducing runoff and sediment in NE China.
- Slope : The benefits pertaining to runoff and sediment reduction were approximately equivalent for cropland terraces on 6°–35° slopes, but the benefit was slightly lower for terraces on 3°–5° slopes. The control of water erosion by terracing areas with tree crops was the highest at the gradients of 26°–35°, followed by 16°–20°, 8°–10°, and 11°–15°. However, gradients of 3°–5° resulted in the lowest and non-significant effects, while insufficient data were obtained from land with gradients of 21°–25°.

Conclusion

The results confirmed that terracing significantly and positively affected water erosion control.