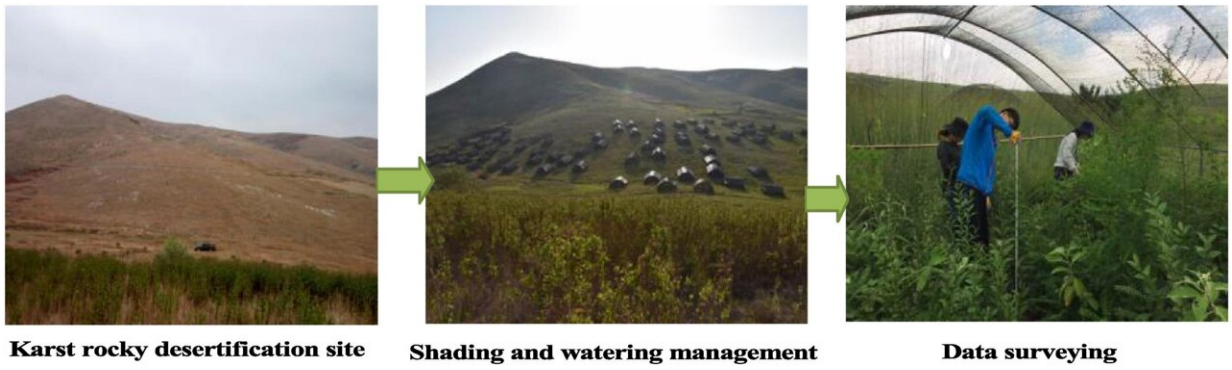
Positive effects of shading and watering on early seedling survival after topsoil translocation in karst region

June 14 2022, by Zhang Nannan



The process of experimental design, soil translocation and data recording. Credit: Zhao Gaojuan

Restoration of degraded habitats using traditional techniques is a slow process, and many practices are unsuccessful after a few years. Topsoil translocation has been demonstrated as a promising method for vegetation restoration in mined areas and other severely degraded areas. However, some dominant or constructive species did not survive due to plant stress in the seedling stage, which ultimately led to a poor community structure and low similarity between new communities and the donor forest.

In a study published in *Forest Ecology and Management*, researchers from the Xishuangbanna Tropical Botanical Garden (XTBG) of the Chinese Academy of Sciences explored how shading and watering quantitatively impact seedling survival and growth and whether different species respond differently to shading and watering over time when forest topsoils are exposed to open environments.

By using a multiple regression model, the researchers conducted a field experiment to quantify the effects of shade degrees and water quantity on survival and growth of woody species (tree species + shrub species) after topsoil translocation at the second, third and fifth years, respectively.

They prepared and established 90 experimental plots, with each plot size of 4 m x 4 m, at the receiving site (karst rocky desertification area). The donor forest is a residual secondary sclerophyllous-evergreen broadleaved forest.

They found a positive linear relationship between base diameter of tree species and water quantity at the second year after soil translocation, and the effect disappeared at the fifth year. The effect of shade degree on height of woody species increased over time. The effect of watering on height and base diameter of woody species disappeared in the fifth year.

Moreover, no-shading and heavy shading reduced species diversity, and moderate shading not only improved the species diversity, but also species survival and growth.

Therefore, the researchers suggested that shading of 33.3–45% should be recommended in first two to three years after topsoil translocation, so as to enhance species adaptability and accelerate similar community establishment.

"Our results, to our knowledge, represents the first large set of field data and quantitative evidence showing the positive effects of shading and watering on early seedling survival and growth of flora assembly from translocated donor forest soil," said Shen Youxin of XTBG.

More information: Gaojuan Zhao et al, Response strategies of woody seedlings to shading and watering over time after topsoil translocation in dry-hot karst region of China, *Forest Ecology and Management* (2022). DOI: 10.1016/j.foreco.2022.120319

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