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Ribbon Rotation of Maize and Peanuts Has Multi-Benefits for Agricultural Production in the Northern Agropastoral Ecotone Region of China

Xiao-Xia Zou[1†], Pu-Xiang Shi[2†], Cai-Jun Zhang[1], Tong Si[1], Jin-Woong Cho[3], Yue-Fu Wang[1], Xiao-Jun Zhang[1], Xiao-Na Yu[1], Hai-Xin Wang[2]*, Ming-Lun Wang

[1]Shandong Provincial Key Laboratory of Dryland Farming Technology/Shandong peanut industry collaborative innovation center/College of Agronomy, Qingdao Agricultural University, Qingdao 266109, China
[2]Institute of Improvement and Utilization of Sand Soils of Liaoning, Fuxin, 123000, China
[3]Department of Crop Science, College of Agriculture & Life Sciences, Chungnam National University, 220 Gung-dong, Yuseong-gu Daejeon, 305-764, Korea

[Introduction]
The northern agropastoral ecotone region is an extremely vulnerable but vitally important ecological security barrier in China. Long-term unreasonable farming management has increasingly led to ecological function collapse, and exploring an ecofriendly agricultural production model is a pathway toward sustainable development in this region.

[Materials and Methods]
A 4-year fix-point experiment (2015-2018) was carried out to study the comprehensive effects of a new cropping model (ribbon rotation of maize and peanuts, R-M//P), compared with traditional continuous maize (CM) and continuous peanuts (CP). Soils collected from the 0-40 cm soil layer were used to explore the characteristic of soil carbon pools (fractions, mineralization and sequestration), and the effects of wind prevention, erosion reduction, crop yield and economic benefits were also studied.

[Results and Discussion]
Compared with CM and CP, the R-M//P model had more multi-benefits: 1) increased the soil carbon concentrations, the carbon stock of 0-40 cm soil layer was increased by 1.35% and 4.82% compared with that of CP and CM, respectively; 2) reduced soil erosion and the carbon lost by erosion, the erosion intensities decreased by 8.28% and 45.45% compared with that in CM and CP, and the carbon lost by erosion decreased by 22.73% and 45.16%, respectively; 3) increased the grain yield and economic income, compared with CM and CP mode, maize and peanuts yield increased by 21.39% and 22.11% on average, the annual revenue increased by 23.93% and 11.63%, respectively. The main advantages were that the interaction of maize and peanuts changed the composition of soil microflora and affected the contents of microbial biomass carbon and mineralization carbon. As a result, the mineralization characteristics improved, with reduced mineralization in the topsoil (0-10 cm) but increased mineralization in the subsoil (10-40 cm) layer. This change reduced carbon emissions in the topsoil but promoted nutrient release from the subsoil, which greatly benefited emission reductions and the crop yield increasing.

*Corresponding author: E-mail. mlwang@qau.edu.cn