Effects of tillage practices and straw returning on CARBON FOOTprint from farmland

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Abstract:【Objective】 In order to clarify the carbon dynamic mechanism and greenhouse gas emission effect of straw returning and tillage methods in spring maize system.**【Method】**Experiment in shenyang agricultural university in 2022, the experimental base, using two factor randomized block design, factors is a straw returned, factor two is farming, including the following treatment, ploughing straw returned (PTS), returning ploughing tillage(PT), rotary tillage straw returned (RTS) returning, rotary tillage (RT), no tillage returned (NTS), no tillage (NT), Three repetitions, using static gas chromatography to monitor greenhouse gas emissions; The carbon footprint and functional unit-scale carbon footprints of different treatment soils was analysed and the carbon sequestration and reduction effect of straw return methods and tillage practices on soils under spring maize cropping systems was further evaluated with the help of carbon intensity indicators. **【Result】**The carbon footprint and functional unit-scaled carbon footprints (yield-scaled carbon footprint and net income-scaled carbon footprint) were significantly affected by tillage and straw return. Carbon footprint was significantly affected by different tillage practices, with the order of the treatments being NT<RT<NTS<RTS<PT<PTS. NT had the lowest carbon footprint, 35.14% and 3.94% lower than RT and PT respectively, and NTS had the lowest carbon footprint compared to the other straw returning treatments. With the exception of PT and PTS, RTS and NTS had lower functional scale carbon footprint than RT and NT respectively, suggesting that straw return to the field is beneficial in promoting cleaner crop production. Although NTS did not have the lowest carbon footprint, it produced the lowest yield-scaled carbon footprint and netincome-scaled carbon footprint due to the relatively high yields and high net income generated. These results suggest that NTS is the preferred tillage system for promoting cleaner production. The carbon footprint composition of spring maize cropping systems follows the pattern of insecticide < K fertilizer < herbicide < seed < P fertilizer < labor < diesel < N fertilizer. N fertilizer is the major contributor to carbon footprint, accounting for 46.18% to 64.29% of total carbon footprint. The secondary contributors were diesel consumption for tillage, sowing and harvesting, which mainly contributed 8.64% to 31.40% of the total carbon footprint. NT and NTS do not require tillage starters and therefore consume less diesel. In spring maize production, seed (2.75% - 3.67%), herbicides (2.52% - 3.35%), K fertilizer (2.46% - 3.42%) and insecticides (1.71% - 2.27%) contribute relatively little to carbon footprint. **【Conclusion】** In conclusion, although straw returning increases carbon emissions, it reduces carbon loss compared with no returning. In combination with tillage methods, no-tillage has the potential to reduce carbon footprint, which is of great significance for food production and sustainable development of ecological environment.

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