

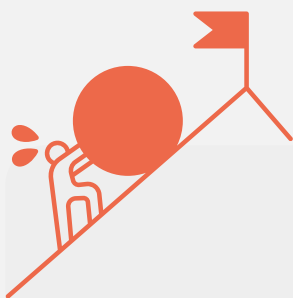


Maize-Soybean Rotation System in Northeast China

NBS CASE



Low yield, high production costs, and limited profitability are major factors contributing to insufficient soybean production in China. The Northeast region, which accounts for over 60% of the national soybean planting area, plays a pivotal role in national soybean output. Therefore, optimising production practices in this region is crucial for improving soybean yield and economic returns. The experiment site was located at the Zhalantun Experimental Base of the Institute of Crop Sciences, Chinese Academy of Agricultural Sciences, since 2023. Based on the Maize-Soybean Rotation system, four tillage treatments were evaluated: no-tillage with straw returning (NTRS), deep ripping every two years with straw returning (STRS), ridge tillage with straw returning (DTRS), and rotary tillage without straw returning (RTR). The objective was to assess the effects of these production modes on yield formation, weed control, and economic benefits.



Challenges addressed by the NBS

- Long-term continuous cropping results in the accumulation of soil-harmful substances and deterioration of the soil environment, leading to crop yield reduction.
- Large input in agricultural production.
- Continuous and intensive farming has damaged the soil structure.

Which indicators/criteria are used to assess the success of the NBS in addressing the challenge?

The success of the NBS in addressing its challenges is assessed using the following indicators/criteria:

- Soybean yield, production inputs.
- Soil quality.
- Economic benefits.

Which biophysical, agronomic, and farm management implications does the NBS have at field and farm level?

1. Biophysical

- The NTRS treatment increased soil temperature and moisture at the emergence stage, moderately enhanced soil compaction in the tillage layer, improved soil moisture during sowing, and significantly enhanced both the emergence rate and speed.

2. Agronomic

- Compared with the STRS, DTRS, and RTR treatments, NTRS improved emergence rates by 3.63%, 2.72%, and 4.66%, respectively.
- NTRS also significantly reduced weed density and the weed dominance index while increasing weed diversity. Weed emergence was primarily concentrated in the V2–V3 growth stages, which facilitated timely herbicide application and effective weed suppression, ultimately reducing weed dry weight at the R8 stage.

3. Farm management

- Compared with RTR, all three straw-returning treatments (NTRS, STRS, and DTRS) reduced the height of the lowest pods. Among them, NTRS significantly increased the number of pods and grains per plant, resulting in a yield of 3603 kg ha⁻¹, representing a 5.12% to 9.22% increase over other treatments.
- In terms of economic benefits, the NTRS treatment minimised the need for intensive tillage, reduced labour costs, and significantly lowered production inputs, thereby improving both agricultural productivity and profitability.



What methods/tools are used for the NBS assessment?

- Plot design with tillage treatments in Maize-Soybean rotation.
- Simplified cultivation, such as reducing the farming processes.
- Simple economic analysis including cost, income and profit.

NBS site and scale

The experiment site was located at the Zhalantun Experimental Base of the Institute of Crop Sciences, Chinese Academy of Agricultural Sciences, since 2023.

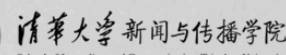
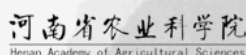
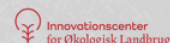
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trans4num is a four-year project funded under the Zero Pollution call as an EU-China international cooperation action on nature-based solutions (NBS) for nutrient management in agriculture.

trans4num ambition is to broadly enhance the NBS implementation in Europe with an integrative and tested multi-level approach, in dialogue with academic partners, practice partners and societal stakeholders.



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