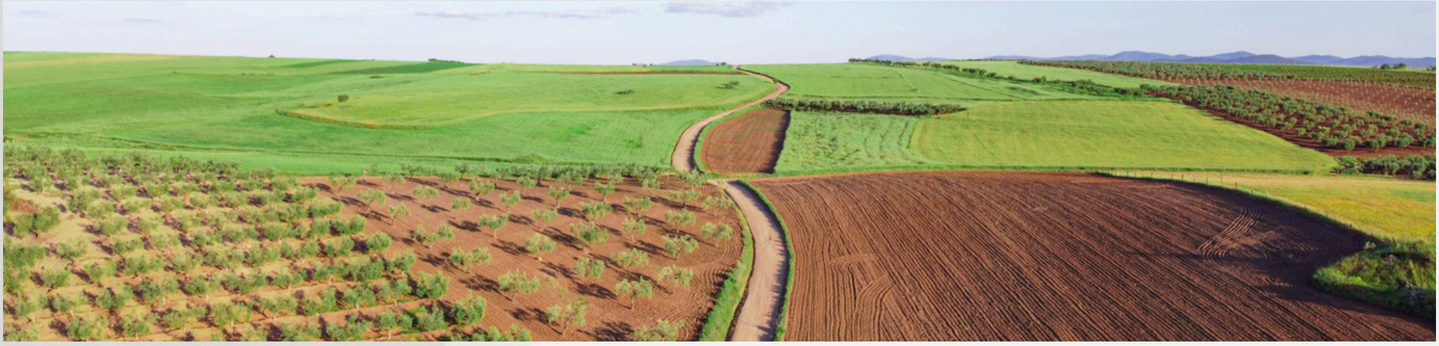


NBS CASE

Innovative crop-mushroom rotation to improve soil fertility

The objective of the NBS is to develop an innovative crop rotation approach to improve soil fertility in the flatlands formed by alluviation of Yellow River, Huai River and Hai River. In this NBS case, Stropharia rugoso-annulata, an edible mushroom was introduced into the usual wheat-maize rotation system in this flatland region to form an innovation rotation manner "wheat-maize-edible mushroom-maize-wheat-maize". Returning mushroom residue to the field facilitated the rapid increase of organic matter, available phosphorus and potassium in soil, forming a sustainable soil utilization strategy.

The NBS sites located in Chenzhuang town, Fan County of Puyang City and Wenji township, Yucheng County of Shangqiu City, Henan province. Fan County is in the lower reaches of Yellow River, where wheat-rice rotation is mainly adopted in agricultural production.

The land of Chenzhuang town is mostly saline-slkali soil, with low fertility and low grain yield, especially winter wheat yield. Attempts with rice-duck system to improve soil fertility had been conducted and showed some effect but it is slow, hence crop-mushroom rotation system was introduced into this region in 2024. The Soil in Wenji township is manly sandy, with low grain yield, where wheat-maize rotation is the main planting mode in this region.

The innovative grain-mushroom rotation technology was introduced in 2021, significant improvement of soil has been exhibited， and the utilization scale of this technology is increasing and forming a good demonstration effect in this region.

Funded by the European Union

Challenges addressed by the NBS

This NBS project addresses a fertility improvement challenge of lands with medium or low yield, effectively **improve soil quality, increase soil organic matter and soil fertility by corn-mushroom rotation.**

After the harvest of corn or rice, the corn stalk, corncob, rice chaff and other materials were mixed in a certain proportion, prewetted and fermented for 10-15 days to make culture material. The fermented material is spread in an open field, with a width of 60 cm and a height of 30-40 cm. After the mycelia of Stropharia rugoso-annulata was sowed, soil was covered on the ridge with a thickness of 2 cm. By May of the following year, after the fruiting body of Stropharia rugoso-annulata were harvested, the mushroom residue is directly returned to the field, and the next crop (corn or rice) was planted. The mushroom residues returned to the field as organic fertilizer and significantly enhanced soil fertility.

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

- In comparison with common wheat-corn rotation, grain-mushroom significantly decreased the cumulative emissions of N_2O and CH_4 in the whole year.
- Grain-mushroom rotation enhanced the proportion of soil aggregates with size of 0.25-2 mm in 0-20 cm soil layer, improved the stability of soil aggregates and increased organic carbon content in the soil.
- Compared to wheat-corn rotation, grain-mushroom rotation significantly increased the content of organic matter, available phosphorus, available potassium and total nitrogen, improving soil fertility.
- Grain-mushroom rotation increased the yield of corn and wheat following the planting of mushroom by more than 22% in comparison to wheat-corn rotation.
- Grain-mushroom rotation significantly decreased the occurrence of weeds, epidemic and disease index of wheat sheath blight when wheat was cultivated in the next year in the same plot.

Funded by the European Union

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

- Monitoring the emissions of greenhouse gases during different stages of crop rotation and grain-mushroom rotation.
- Monitoring the improvement in soil structure.
- Measuring the content of organic matter, available phosphorus , available potassium and total nitrogen of the soil.
- Measuring the yield of crops and mushroom.
- Monitoring the health of the crops.
- Monitoring biological diversity (e.g. weeds).
- Monitoring input of chemical fertilizers.

These indicators provide a comprehensive assessment of the NBS's success in addressing its challenges.

What methods/tools are used for the NBS assessment?

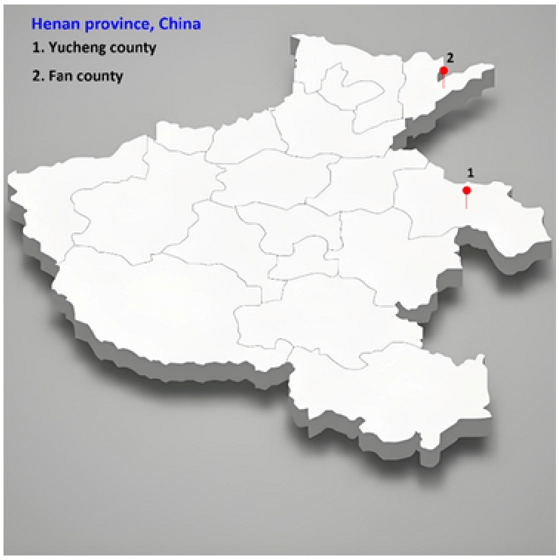
- Soil sampling and soil physical properties (e.g. Soil aggregates)
- Soil chemical properties: Assessing soil fertility by measuring the content of organic matter, available phosphorus, available potassium, available nitrogen and total nitrogen.
- Economic, social and ecological benefits: cost, labor input, yield, price and income of farmers.

Funded by the European Union

Contact NBS team

The Institute of Edible Fungi
of
Henan Academy of Agricultural Sciences
kongweili2005@126.com
Prof. Weili Kong

NBS site and scale



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.

@trans4num

http://trans4num.eu

trans4num China

Funded by the European Union