

NO-TILLAGE SOYBEAN SYSTEMS FOR IMPROVED SOIL MOISTURE AND YIELD STABILITY



Summary

Soybean production in Northeast China is increasingly affected by soil degradation, moisture loss, rising production costs, and climate variability. Conventional tillage practices often disturb soil structure, accelerate moisture loss, and increase labour requirements. Within trans4num, researchers tested conservation agriculture approaches that reduce soil disturbance while maintaining productivity. Results show that no-tillage systems can improve crop establishment, reduce production costs, and support more resilient soybean production systems.

The need

Soybean is an important crop in Northeast China, but farmers face several challenges:

- Reduced soil moisture availability during crop establishment
- Increasing production costs linked to intensive tillage
- Weed pressure and unstable crop emergence
- Soil degradation caused by repeated soil disturbance
- The need to maintain yields while reducing environmental impacts



The benefits

The tested system delivers multiple benefits:

For farmers

- Lower fuel, labour, and machinery costs
- Improved crop establishment
- Higher yield potential
- Reduced tillage operations

For the environment

- Better soil moisture conservation
- Reduced soil disturbance and erosion risk
- Improved soil biological activity
- More efficient use of resources

For advisors and policymakers

- Practical pathway towards conservation agriculture
- Reduced environmental footprint without sacrificing productivity
- Scalable solution for large soybean-growing regions



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trans4num solution

The project compared four soybean production systems:

- No-tillage with row-specific seeding (NTRS)
- Strip tillage with row-specific seeding (STRS)
- Deep tillage with row-specific seeding (DTRS)
- Conventional ridge tillage (RTR)

The NTRS system combines direct seeding with minimal soil disturbance. Crop residues remain on the soil surface, helping retain moisture, regulate soil temperature, and protect soil structure.

Results (Y1–Y3)

Field trials demonstrated that NTRS:

- Increased soil temperature and moisture during early crop development
- Improved emergence rates by 2.7–4.7%
- Increased emergence speed and crop uniformity
- Reduced weed dominance and improved weed management timing
- Increased pod numbers and yield potential
- Reduced labour requirements and production costs
- Improved overall profitability compared with conventional systems

AKIS System

- The innovation is supported by a strong research-led AKIS involving:
 - Chinese Academy of Agricultural Sciences (CAAS)
 - Regional research institutes
 - Experimental stations
 - Demonstration fields
 - Farmer outreach activities
- Knowledge generation is currently driven primarily by research institutions, with increasing efforts to strengthen farmer engagement and practical demonstration activities.



What were the challenges / limitations in the implementation process?

- Adoption may be slow where conventional tillage is deeply established
- Performance may vary depending on local soil conditions
- Farmers may perceive higher risks during transition



What kind of resources do you need to implement the proposed solution?

- Specialised no-tillage machinery
- Advisory support
- Long-term monitoring
- Farmer training and demonstration activities

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More information

Advisory and Policy Needs

- Successful scaling requires:
 - Farmer training programmes on conservation agriculture
 - Demonstration farms and peer-to-peer learning
 - Technical guidance on no-tillage management
 - Improved access to suitable seeding equipment
 - Incentives supporting reduced-tillage adoption

Simple changes in tillage practices can improve soil conditions, increase profitability, and strengthen climate resilience while reducing production costs.

Explore more Practice Abstracts: <https://trans4num.eu/library/?type=ABS>



Learn more about the project at <https://trans4num.eu/en/>

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