

1.3.1. No-till farming: direct drilling



Summary: In no-till farming seeding is done without tilling of the soil with direct seeding machine and it decreases soil erosion and nutrient runoff (N and PP). It is cost-effective method because yield loss is compensated by savings in fuel and work costs. The benefits of the methods will be shown in a time when soil structure improves naturally.

Operation and Applicability: For direct seeding the specialized machine is needed. It suites for almost all soil types (except for heavy clay soils) with good drainage of the field. Usage of the herbicides is needed.

Efficiency: Lowers N and P loss from the field and saves time and fuel costs compared to tilling based cultivation.

Efficiency and functionality  Costs of the Practice  Ease of Operation  Potential for nutrient recovery 

Basics of the good practice:

- No-till cultivation method and direct drilling is seeding without tilling and ploughing of the soil.
- Suitable seeding depth for cereals is 2–3 cm.
- Field has a vegetation cover whole year around which increases the organic matter content of the soil and improves the soil condition and activity of the micro-organism.
- No-till improves soil conditions for the worms which enhances water economy and structure of the soil.
- Bind of carbon dioxide into the soil is increased.
- P of the plant material stays in the field and may accumulate in the upper level of the soil.

Special notes:

- Plant organic material may increase risk of the plant pathogens e.g. *Fusarium* fungus.
- Usually optimal seeding time in no-till is one to two weeks later than in conventional-till because soil needs to be dry enough.
- Direct drilling changes the weed ratio when it enables rhizome and stolon spread weeds to spread.
- Use of glyphosate is usefull to prevent weeds especially couch grass and annual meadow grass.
- Without herbicide treatment (barley) yield may lower 40 % because of couch grass -> not suitable method for organic farming.
- On heavy soils like clay it takes time to improve soil structure and yield will drop during the first years.
- In heavy clay soils seeding furrow may not close properly if direct drilling is done too early and germination success is lowered.
- Increases soil compaction in the upper soil levels and reduce growth of the roots.
- Drainage of the field must be in condition before using direct drilling

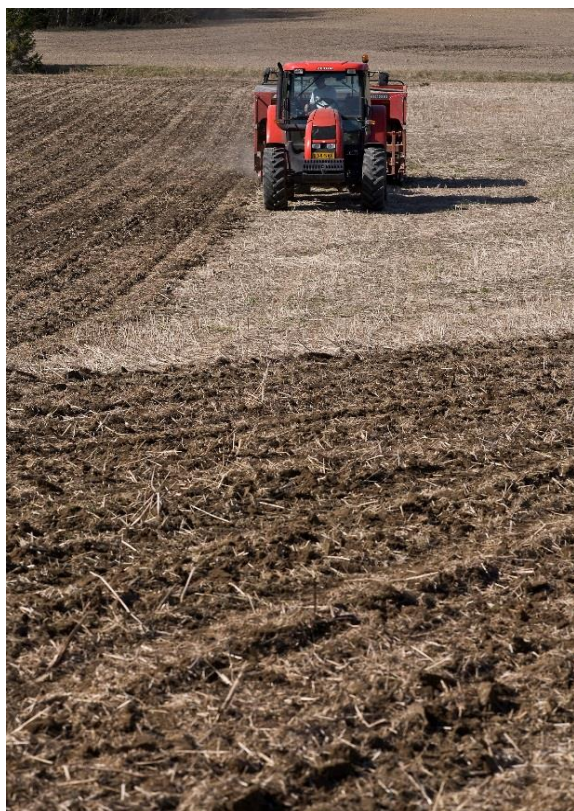
Pictures: ©Maaseutuverkosto, Yrjö Tuunanen (left) & Martina Motzbäuchel (right)

Costs of the Practice: Direct seeding machine is needed for the no-till farming. Co-ownership with other farms or usage of contracting work is recommended.

Ability for climate chance mitigation: Lowers greenhouse gas emissions due to less machine work on the field. Binds carbon dioxide into the soil.

Potential for nutrient recovery: Improves nutrient economy of the farm when N and particle P runoffs are decreased. Increases organic material content in the top soil level.

Evidence of Success: Cultivation of barley with direct drilling



Picture: ©Maaseutuverkosto, Yrjö Tuunanen

In no-till farming cereal yield might be lower (10-20 %), but is more cost-effective method than traditional tilling based cultivation.

No-till method increases the importance of crop cycle.

Plant materials prevents warming of the land in the spring time.

Fuel costs are only 20-25 % of the costs in the tilled farming.

No-till saves 65-70 % in working hours and is 30-50 % cheaper method to establish a new growth. But direct drilling machines are quite expensive and benefits of it will be shown in longer time scale.

Achieved environmental benefits:

- No-till farming prevents soil erosion and particle-P runoff when plant roots bind the soil.
- Soluble-P in surface runoff increases, but N and total-P loss is still lower than in traditional tilling based cultivation due to lower particle-P loss.
- Slurry should be injected into the ground to prevent nutrient runoff and evaporation of the ammonia (ca. 75 % loss in soluble-N).
- No-till cultivation decrease environmental impacts which become to the same level as in grass production.

Appropriate performance indicators:

- 3 year experiment by MTT (Lötjönen et al. 2012) in three different light soil types and places in Northern Ostrobothnia, Finland.
- The treatment with glyphosate was done against couch grass but the annual meadow grass become more problematic.
- Direct drilling worked well on peat lands giving only 10 % lower yield than in autumn-tilled field.
- No difference in hectolitre weights between direct drilling and tilled fields.
- In no-till fields the barley yield can be even to 820 kg/ha (16 %) lower than in the traditionally tilled field.
- The yield loss of barley is compensated by savings in fuel and working hours in direct drilling.

MORE INFORMATION:

<https://portal.mtt.fi/portal/page/portal/mtt/mtt/esittely/toimipaikat/ruukki/Tietopankki/Peltokasvituotanto/Rehuviljat/Muokkausmenetelmat.pdf>. Lötjönen, T., Saarinen, E. & Keränen, T. 2012.

Isolahti, M., Lötjönen, T. & Uusitalo, R. 2008.

<http://www.mtt.fi/met/pdf/met118.pdf>.



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