Intelligent agriculture from Pöttinger ...

Mulch drilling is taking the lead

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Mulch drilling is taking

The main purpose of growing a crop is to produce food and forage. In addition to straight production, factors such as ecology (environmental protection of the ground) and economy (saving costs) play an increasing role. The agricultural processes need to be fine-tuned to the production conditions in order to fulfil each of these requirements.

New developments over the past few years in the areas of tillage and seed drill machinery have achieved high standards.

Reducing tillage does not simplify the overall agricultural process: manpower, energy consumption and wear on machinery are all reduced, but the knowledge and expertise of the farmer need to be considerably increased.

Comparison of processes

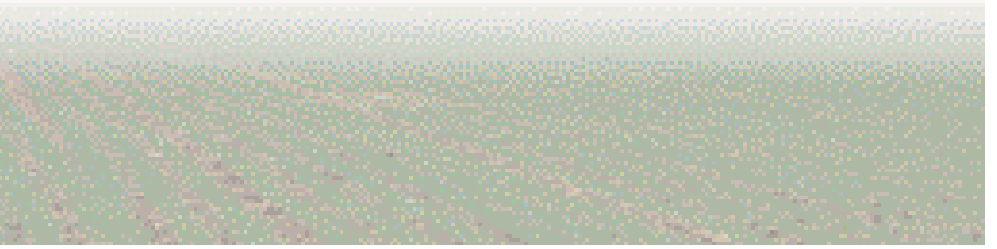
Definitions:

Mulch drilling is defined as sowing a main crop into the remains of the previous crop, or into the wilted catch crop.

Direct drilling: Direct drilling involves sowing seed that remains below the depth of tillage, placed into the ground in slots.

Conventional drilling: Conventional drilling involves extensive prior tillage. The seed is sown during a separate pass, or using implement combinations.

Tillage	Stubble tillage	Seedbed preparation	Drilling
Conventional drilling	Stubble cultivator (10 cm)	Plough (20 – 25 cm)	Combination harrow + seed drill
Mulch drilling	Stubble cultivator or trailed implement (4 - 8 cm)	Stubble cultivator or trailed implement (4 - 8 cm)	Sown into mulch seedbed
Direct drilling			Coulter-placed seed



Capabilities and limits of mulch drilling

by Dr. Helmut Wagentristl, Head of Research at the University of Agriculture in Vienna, Austria.

As an alternative to traditional full-depth tillage using the plough, we have been investigating the implementation of reduced-effect tillage processes. Reduced tillage can be practised in a number of forms. The most extreme form is direct drilling where the ground remains intact except for the opening of the seed drill for the seed to be placed in the ground.

Fully mechanised agriculture runs the risk of compressing the soil due to the number of times that a heavy tractor has to drive over each area, especially on wet ground. The ground can be compressed right down to the subsoil (RENIUS, 1985). This kind of damage cannot be eliminated by frost or by using a plough. Ploughs with slatted bodies can be used to break the upper soil, but the sole of the plough shares creates additional compaction, preventing root growth. The transport function of the soil deteriorates accordingly, promoting higher rates of water evaporation. The flat surface of the soil is exposed to increased erosion due to wind and water.

One remedy is to implement methods that leave a layer of mulch on the surface. The protection provided by the mulch layer reduces the effect of wind and water erosion. The kinetic energy of water drops impacting with the surface is reduced so that the risk of mud and crust forming is minimised.

Micro-organic substances on the soil surface promote the life of the soil. Earthworms multiply to create micro-pores that allow rain showers to infiltrate more effectively. Unproductive evaporation is prevented by the layer of mulch on the surface, a significant factor in dry areas.

An important prerequisite for successful reduction is a stable soil structure with good water supply, aeration and thermal retention. These properties are provided by soils rich in humus, lime and biologically active clay.

Reducing tillage increases the compaction of each layer so that a stable system of pores is formed between the top soil and subsoil. Mechanical tillage is not necessary to enable the growth of plants, as has been observed over the years in natural and near-natural ecosystems.

Mulch drilling – an overvie

1. Preventing mud

Heavy rain on naked soil destroys the soil particles and microstructure. The soil particles are destabilised and clog the earth with mud.

The less frequent the tillage the more able the soil is to let water penetrate. An undamaged pore system ensures **high infiltration rates.**

2. Preventing erosion

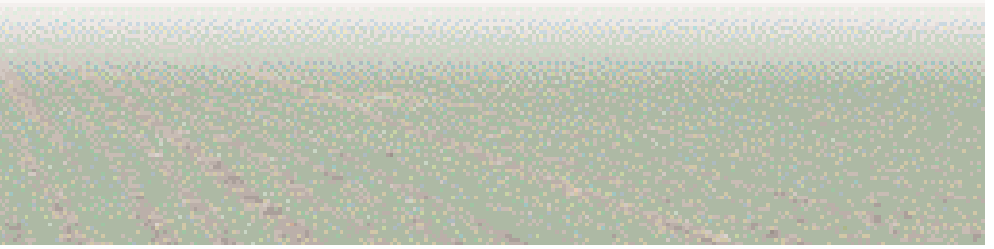
Soil is broken down by water when soil particles are transported away by flowing water. Wind erosion is caused by soil particles being loosened and transported away by the wind. Erosion at rates of up to 100 t/ha (10 kg/m_) can occur on open arable land.

Soil enriched with organic material on the surface has **an increased resistance to erosion.**

3. Increasing soil fertility

Plant remnants on the surface of the soil are broken down by organisms in the soil. The decomposed product is an organic substance that stabilises the soil microstructure (clay – humus – colloids). Reduced tillage leads to an **increase in the population of living organisms in the soil.**

ew of the advantages



4. Increasing ground compactness

The higher the compactness of the ground the more favourable the capillary effect, ensuring an improved supply of water during dry years.

5. Saving costs

The advantages of ploughless cultivation are the comparatively high yield and cost-effective mechanisation.

The time required and high energy consumption of conventional cultivation technology add around 80 Euros per hectare to costs compared to mulch drilling.

The higher costs of herbicides for direct drilling compensate for the lower cultivation costs.

	Conventional	Mulch drilling	Direct drilling
Stubble cultivation 1st pass			
stubble cultivator 3.8 m, 9 tines, 0.5 h	3,49	3,49	
tractor 110 kW, 0.5 h	18,35	18,35	
driver, 0.5 h	3,64	3,64	
Total	25,48	25,48	
Subsequent cultivation 2nd pass			
Total		25,48	
Ploughing			
5-furrow plough, 1 h	25,54		
tractor 110 kW, 1 h	36,70		
driver, 1 h	7,28		
Total	69,52		
Sowing			
power harrow 4 m, 1, 0 h	15,99		
seed drill 4 m, 1.0 h	12,89		
tractor 110 kW, 1.0 h	36,70		
slot drill machine, 0.75 h			20,55
tractor 110 kW, 0.75 h			27,53
tractor 150 kW, 0,25 h		11,90	
Terrasem 4,0 m, 0,25 h		21,80	
driver, 1,0 h	7,27		
driver, 0,25 h		1,82	
driver, 0,75 h			5,45
driver, 0,3 h			2,18
crop spraying 0.3 h			4,40
tractor 60 kW 0,3 h			6,04
Pesticide (Round up ultra) 3 l/ha			21,80
Total	72,85	35,52	81,91
Total costs/hectare	167,85	86,48	87,95

Generations cannot be

... the plough st

The plough still has a secure future in arable farming. There is nothing to be gained from eliminating ploughing entirely.
Cultivation has to be matched to the requirements of each individual location and application. The aim is to gain maximum ecological and economical effect.

Factors that speak for the plough

Location

- Clay soil with minerals that are incapable of swelling (cold, damp and air-less soil). These soil types tend to solidify and trap damp if not cultivated sufficiently.
- Soil types with high ground water levels and extended periods of damp

Ploughing ensures formation of rough pores in the soil.

- Light, sandy soils need humus to be distributed to the lower levels of the soil to increase long-term fertility.

Disease

Over the winter fusarium is to be found mainly on wilted grain or maize trash (stalks, straw, stubble). Ploughing folds the trash deeper down in the soil to considerably reduce the risk of infecting the next crop.

wrong ...
till has a secure future!

Pests

Mice multiply rapidly on soil that has not been subjected to thorough cultivation. Snails and slugs also favour crops on soil that has not been ploughed.

Straw management

Direct drilling techniques are not able to cut through freshly-harvested straw. These systems cannot be used on fields with between 5000 and 10 000 kg/ha of straw.

- Disc coulter technology: Longer lengths of straw are just pressed into the ground and the seed placed on top of the straw (hairpin effect)
- Tine or chisel-point technology: High risk of clogging because the straw is pushed along by the tool, eventually blocking the drill mechanism. Rows any closer than 18 cm cannot be sown effectively.

Direct drilling without cultivation is only recommended in the most ideal soil conditions. The seed is normally not covered over properly. The seed does not germinate as a result. A coulter pressure of at least 200 kg is necessary.

Mulch drilling – looking

Harvesting the previous crop

While harvesting the crop attention should be paid to careful chopping up and distribution of crop residues.

Objective: Promote microbiological decomposition – Prevent water rising due to capillary action

Technology:

- Harvest machinery with effective chopping systems
- Distribution using rotary tedder or rake

Stubble cultivation

The basic tillage required for the next crop is stubble cultivation.

Objective:

- Promote germination of weeds and dropped crop seed
- Stop unproductive capillary evaporation

Technology:

- The first pass is carried out with a spread-wing share stubble cultivator or shallow-tillage implement (working depth 4 to 8 cm).
- Trailed rollers such as tine packer rollers or flexicoil rollers compact the soil to prevent it drying out.

g after the ground

2nd pass

The germinated plants are worked into the topsoil (10 to 15 cm).

Objective: Decompose plant trash in the active soil layer

Technology:

- Stubble cultivator with spread-wing shares or duckfoot shares with trailed rollers suitable for compacting the soil and controlling the working depth. Implement-mounted seed drills can be used to sow a catch crop during this pass (e.g. mustard, etc.).

Sowing

Secondary cultivation should be carried out in a single pass.

Objective:

Precision seed drill operation dispensing of the need for a separate pass.

Technology:

Disc coulters or chisel points are required ahead of the seed coulters to ensure exact seed placement.

Tools of rotary hoes are not suitable because they compress the soil in wet conditions preventing plants from rooting properly.

Pöttinger mulch drilling

The seed drill technology plays a critical role in mulch drilling.

The most important criteria are:

1. setting leading cultivation implement to mix in harvest trash properly

The degree of cultivation must be adjusted to the operating conditions.

Implement-mounted seed drills

a) Mulch drilling

✔ Compact harrow with trailed tines and toothed packing roller

✔ Power harrow with toothed packing roller

b) Conventional drilling

✔ Compact harrow with steep-angled vibra-tines and toothed packing roller

✔ Power harrow with toothed packing roller

Trailed seed drills

a) Mulch drilling

✔ 2-roller rotary harrow with toothed packing roller

✔ Tine harrow with trailed tines and toothed packing roller

b) Conventional drilling

✔ Tine harrow with steep-angled vibra-tines and toothed packing roller

✔ Tine harrow with trailed tines and toothed packing roller

g technology

2. formation of a tidy drill, free of harvest trash

Serrated, dished disc coulters clear earth and trash away from the drill. Compared to Suffolk coulters, disc coulters are less susceptible to clogging. The angle of the coulter ensures that the drill remains free of earth for longer. The integrated Suffolk coulter draws a uniform drill and places the seeds on the water-bearing subsoil. Share pressures of up to **80 kg** ensure that the seed is placed at a uniform depth.

3. Packing effect

Farmflex pressure rollers provide the best packing.
A trailed wide Farmflex pressure roll presses the seed and earth into the drill slot. After compaction the drill is filled with an earth and seed mixture. Uniform germination and growth is guaranteed.
"Perfect" following harrows (both angle and pressure can be adjusted) provide a perfect cover for the seed.

Speeds of up to 15 km/h ensure that high-performance is maintained.

The intelligent choice

Pöttinger provides innovative, economical and convenient technology for every type of process

Conventional drilling or mulch drilling – agricultural intelligence from Pöttinger

Technical data:

Machine type	Terrasem 3000	Terrasem 4000	Terrasem 6000L
Working width (m)	3,00	4,00	6,00
Number of coulters	24	30	48
Coulter pressure	130	130	130
Speed (km/h)	up to 15	up to 15	up to 15
Spacing of drills (cm)	12,5	13,3	12,5
Transport width (m)	3,0	4,0	3,0
Seed hopper volume (l)	1400	1400	3300
Power requirement (kW/PS)	88/120	103/140	132/180

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