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Innovative Technologies for spreading of manure

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European Union European Regional Development Fund

GreenAgri

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Manure in Estonian legislation

- by dry matter content from weight

1) liquid manure or slurry: < 8%;
2) semi-liquid manure: 8,0–19,9%;
3) solid manure: 20,0–24,9%;
4) deep litter manure: >25%.

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To pump or not to pump?

For handling and spreading point of view:

if dry matter content < 12%

it can be pumped.

else

it must be shovelled.

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Semi-liquid manure

Dry matter content 10–20%

- Hard to pump and hard to heep.
- Universal spreader is required

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Solid manure

Dry matter content >20%

Logistics is based on shovelling and conveyors

Loading is time consuming, automatization requires remarkable investments to terminals – not justified

Direct incorporation tecniques to soil are only in trials

Efficacy and nutrient loss depends directly from handling – mix with soil ASAP

New installments feasibity must be carefully calculated

Photo: K.Tamm, LMR Azene

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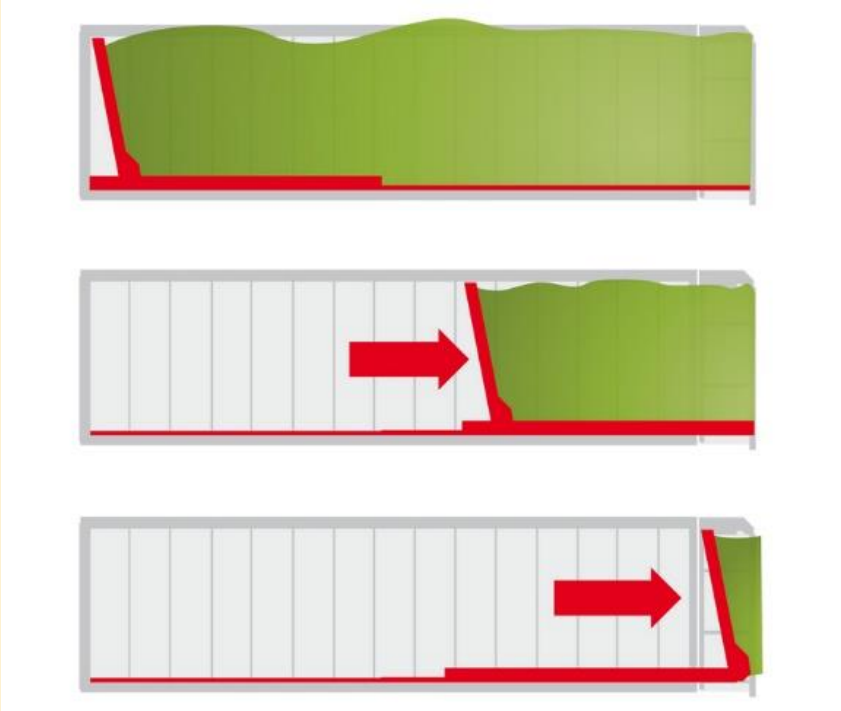
Innovations in solid manure spreading



Photos: Fliegl

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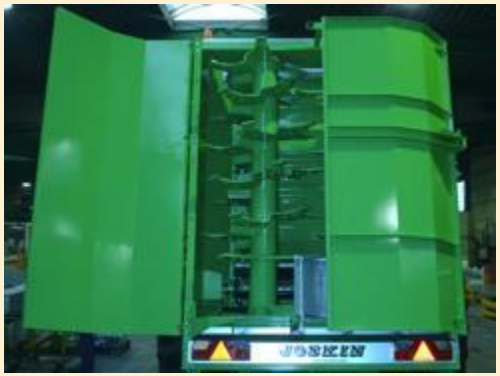
Innovations in solid manure spreading



Photos: Joskin, Samson, R.Vettik

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Innovations in solid manure spreading

Photo: Bergmann

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Liquid manure

Photo: K.Tamm

- Can be loaded and transported to short distances with pumps or by pressure difference
- Low nutrient content
- Uncovered storage tanks collect lot of rainwater – unnecessary volume increase
- Soil injection technologies available for different crops

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Broadcast spreading

- NH4-N loss without tillage – 70%
- With tillage after 12 h – 55%
- Should not be used, unless followed with instant tillage
- Remarkable nutrient loss on air born stage is unavoidable
- High risk of runoff!
- Productive, fast, simple machinery
- Bad odour issues possible
- Hygiene issues due manure covered plants
- Uneven distribution

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Band spreading

- Known also as trail hose spreading
- NH4-N loss without tillage – 24%
- With tillage after 12 h – 10%
- No air born stage emissions
- Durable and less expensive machinery
- High productivity and low running costs
- Efficient nutrient usage requires incorporation to soil by tillage
- Less hygiene issues
- Trailing hose, trailing shoe

Photos: R.Vettik

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Band spreading

Photo: R.Vettik

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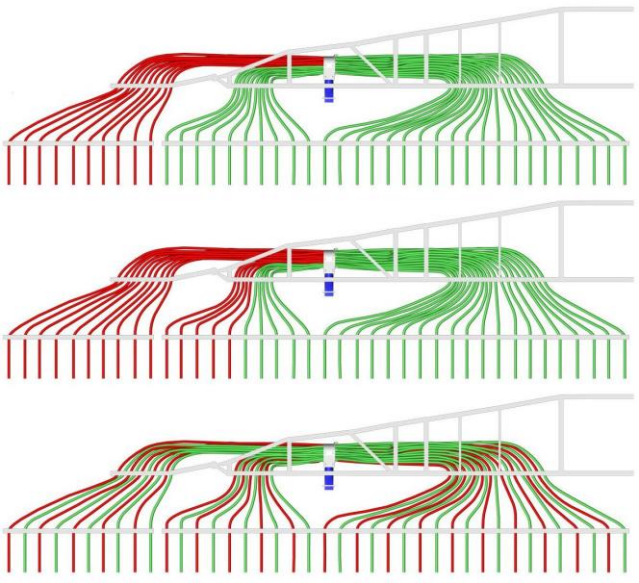
Band spreading innovations

Photos: Vogelsang



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Injection – open slot

1-discs spreader

2-discs spreader

Photos: R.Vettik

- NH4-N loss on grassland – 10%
- Faster infiltration to soil
- Small amounts for shallow slots
- Deep slots disturb plants, minor slots less
- Remarkable runoff losses, when slots are slope-oriented
- Higher draught force requirement
- Smaller field capacity
- Trailing shoe with knife, one- or two disk coulters

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Injection – open slot

South-Estonia, 24. May, Winter Wheat

Photos: R.Vettik

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Injection – open slot

Grassland –plants are too big allready and slurry amount is too big

Photo: R.Vettik

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Injection – inclined open slot

Inclined discs- soil gravity helps to close slot

Photo: R.Vettik

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Injection – closed slot

Photo: Pichon

Photo: Kotte

- NH4-N loss – 1%
- Amount is limited to slot dimensions
- Better field contour coping, more even working depth
- Higher draught force requirement
- Tine coulters are lifting stones
- Plants can suffer remarkably, if used improper growth stage
- Odour issue reduction
- Disk coulters, tine coulters

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Injection in stripe tillage

Photo: Kverneland

- Slurry injection only into the stripes where crop will be sown
- Intended to use in stripe-tillage technology where only 30% of field surface is mixed with soil
- Manure spreading and first tillage can be done in one pass
- NH4-N loss – 1%
- High overall efficiency
- Minor odour issues

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Injection in stripe tillage

Photos: Kverneland

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Incorporation spreading

Photos: K.Tamm, Fliegl

- NH4-N loss – 5%
- Band spreading directly to soil tillage equipment active zone
- Manure spreading and first tillage can be done in one pass
- Mainly disc harrows
- High overall efficiency
- Minor odour issues
- High draught requirement because soil tillage equipment

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Transportation

Photos: K.Tamm, R.Vettik

- Liquid manure transport with spreader tanker is feasible up to distances 3 km
- Longer distances require separate hauling tankers
- Trucks are fast, but can have problems in field
  - Soil compaction!!!
- Volume matching
  - Spreading device should not wait!
- Buffer tanks
  - Old marine containers

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Umbilical systems

Photo: Agrometer

- Less pressure to soil
- High output
- No wasted runs with empty tank
- Some durability issues if used with high speed equipment
- Obstacles in field are problem (electrical poles, big stones or stone piles etc.)
- Requires constant feed, if prehauling tankers are used
- Buffer tanks!

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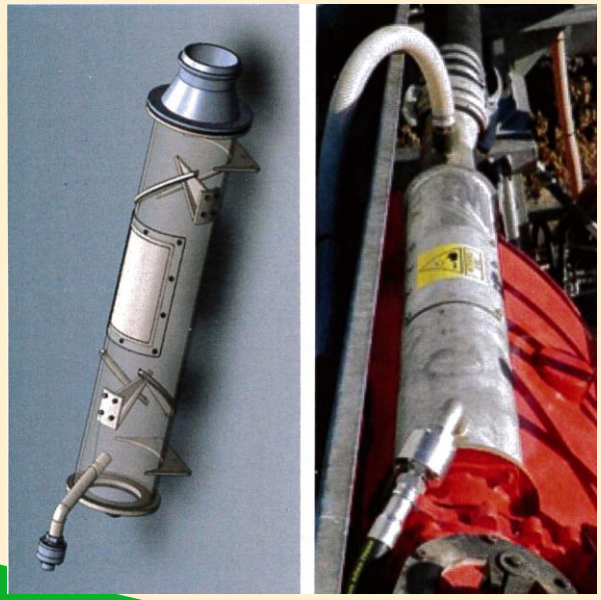
Acidification - SyreN



Photos: Agrotech

- Acidification reduces remarkably NH_4 emissions
- Expensive equipment
- Adjustable by manure pH
- Used in Danmark, contractors
- H_2NO_4 is dangerous substance to handle
- Economical and agronomical efficiency is studied in Baltic Slurry Acidi

Manure is a bless, not the problem!

Questions:
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