Soil compaction or poor drainage?

Methods for finding the root of the problem

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Outline

- The different reasons for water problems
- Assess the soil profile
- Dutch auger
- Infiltration test
- Check the drainage system

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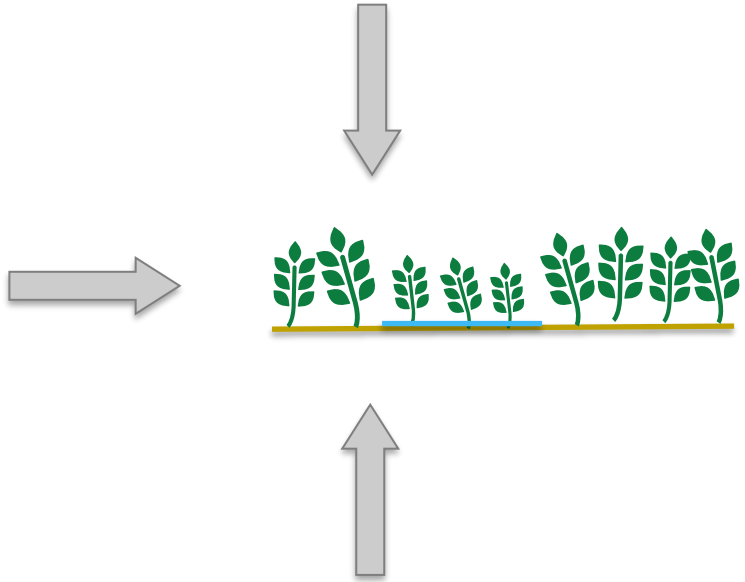
Essentially: Are the problem arising from above or below (or from the side)?

From above: Precipitation

- Impermeable layer
- Surface sealing
- Poor soil structure
- Inadequate drainage

From the side: Streams/fjords

- Inadequate stream maintenance
- Submerged drain outlets
- Increasing water level in fjords/sea.
- Insufficient stream size for peak discharge/hydrological events
- Storm surge



From below: Groundwater

- Poor soil structure
- Inadequate drainage

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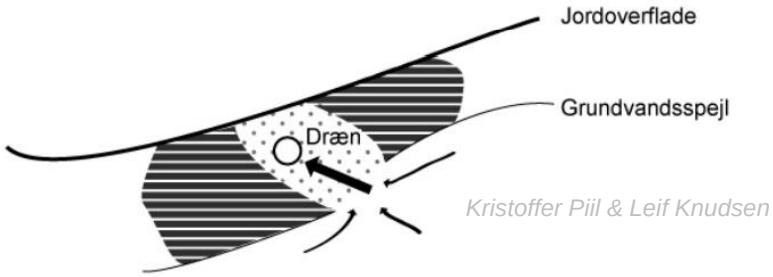
Drainage or soil structure problem?

- Dig a hole!
- 0,5 – 1 m
- Spring or autumn



Kristoffer Piil & Leif Knudsen

Stinna Susgaard Filsø

Janne Aalborg Nielsen

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Dutch auger

- Dutch auger/Edelman auger
  Video (in Danish):
  https://www.seges.tv/video/37752219/er-jorden-vandlidende-i-dybden

- Depth of waterlogged soil
- Soil structure and texture
- Periodically or permanently waterlogged

Drill until the tip of the auger is filled with soil (20 cm). If the soil is compacted or contains a lot of rocks and pebbles, use a small head.

Put a yardstick on the ground and lay the soil from the auger next to it. Make sure that the samples are lain successively, so that they represent the soil depth. Check during the drilling, if the length of the samples matches the depth of the drilling hole.

Stop the drilling at 1 meter depth. It's also possible to continue to for example the depth of the drains using an extension of the auger.

Now you can investigate the results: At what depth is the soil waterlogged? What is soil structure like at this depth? Take some pictures and compare to other samples in the field.

Faktaark - hvad fejler jorden? (e-pages.dk)

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Infiltration test

- Infiltration test
  Video (in Danish):
  https://www.seges.tv/video/38237014/kompakt-jord-hvor-hurtigt

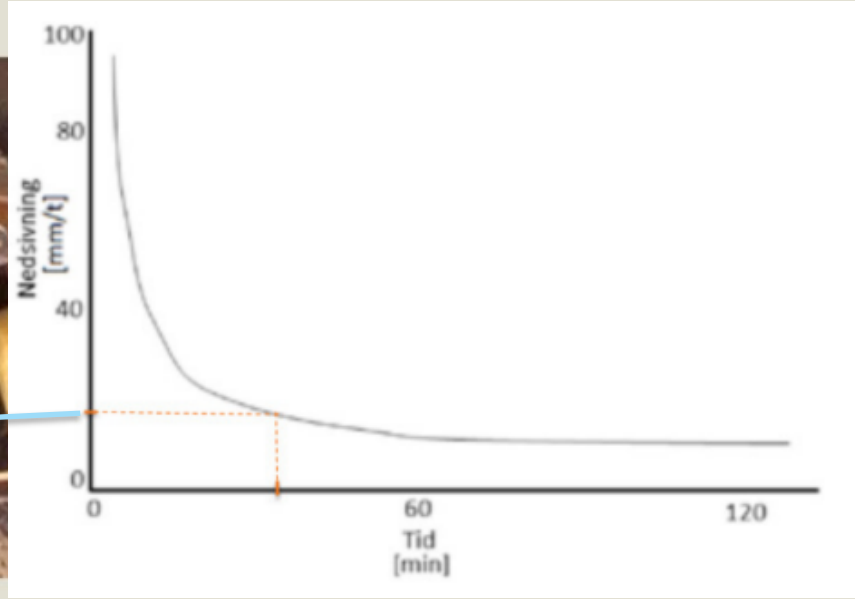
- Infiltration rate – compacted layer?
- Subsoiling…

Soil type	Infiltration rate, mm/h
Sand	180
The average easily permeable soil	18
Soils with a high content of fine sand, silt, or clay + a poor soil structure/is compacted	1,8
Compact clay soil with a very low infiltration rate	< 0,0001

Faktaark - hvad fejler jorden? (e-pages.dk)

Dig a small hole to the depth of what you suspect is the impermeable layer. Dig carefully, so you don't interrupt the soil structure.
If you run the test on the soil surface and the surface is completely sealed, make sure to carefully scrape off the sealing.

Knock a large pipe (15 cm in diameter, 20-30 cm in height) into the compacted layer. Use a wooden board to knock the pipe into the soil. The pipe should go 3-5 cm into the compacted layer and make sure that the water will run downwards and not sidewards – this can be avoided by wetting the soil around the pipe.



Pour water into the pipe. Pour onto a sponge, so that the falling water doesn't ruin the soil structure at the bottom. Fill the pipe as fast as possible; when it's filled, start a stopwatch. After 1 minute write down how much the water level has decreased.

Refill the pipe and wait 2 minutes. Write down again the drop of the water level. Do it again with 5 and 10 minutes and so on, until the infiltration is constant. Run test in other spots on the field to compare the infiltration capacities.

Subsoiling

Henning Sjørslev Lyngvig

More on subsoiling: AHDB Field Drainage Guide (https://ahdb.org.uk/drainage)

If soil structure is not the problem…

- An old drainage system?
- Damages?
- Inadequate/undersized?
  - Number and placement of pipes
  - Depth
  - Diameter
- Blockages?
  - Silt, fine sand, ochre
  - Roots
  - Blockage of main or end pipe
  - Condition of the outfall

Locate the pipes:

- Find an outfall (winter or after rainfall)
- Make an approximate estimation of location
  - → dig a V-shaped trench (90°, 30 m on each side)
  - → be careful not to damage the pipes that may appear
- Help from a drainage entrepreneur

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