MAINTENANCE OF SUBSURFACE DRAINS

FIELD DRAINAGE ASSOCIATION

LUOKO RY

FIELD DRAINAGE ASSOCIATION

LUOKO RY

CHALLENGES IN FINNISH AGRICULTURE 1/2

- Short growing season
- Abundant melting water in the spring
- Uneven distribution of rain during the growing season
- Increase in extreme weather
- Level fields
- Poor hydraulic conductivity in the fields
- Abundance of peat and clay soils

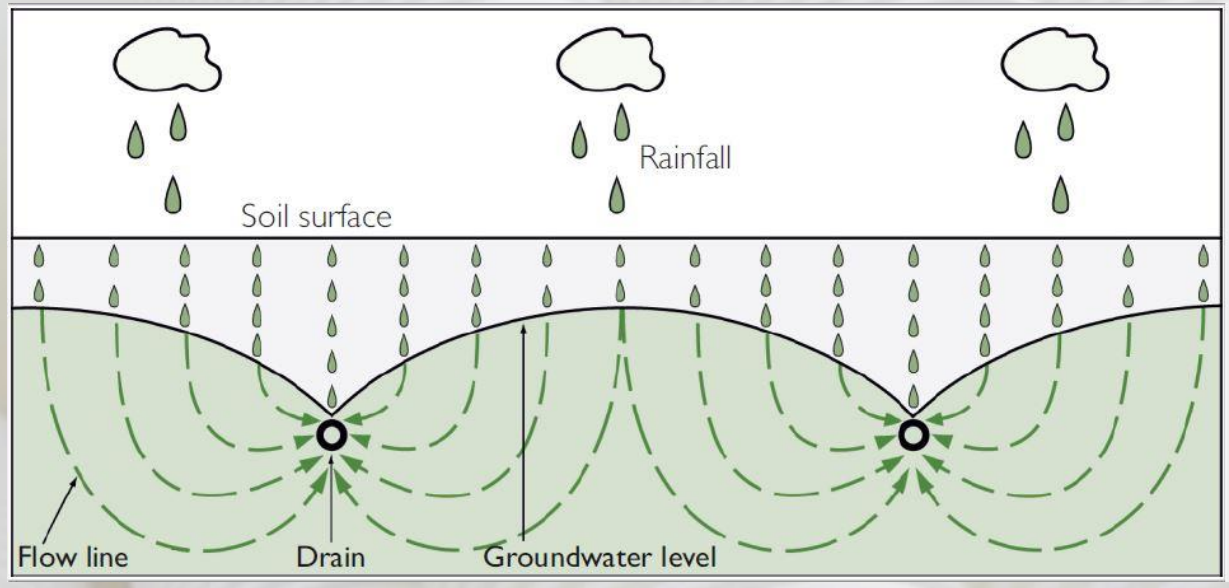
CHALLENGES IN FINNISH AGRICULTURE 2/2

Use of heavy machinery requires a field in good condition.

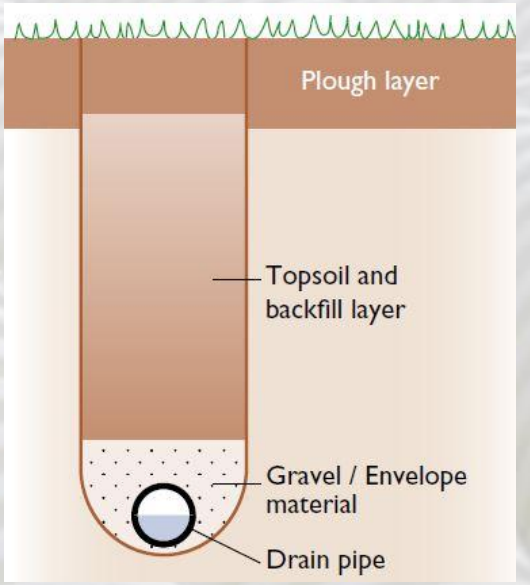
Soil compaction impaires plant growth and field water balance

A functioning drainage decreases the risk of compaction.

WHAT IS SUBSURFACE DRAINAGE?



Cross section of water flow into the drains in permeable soil



Drain profile

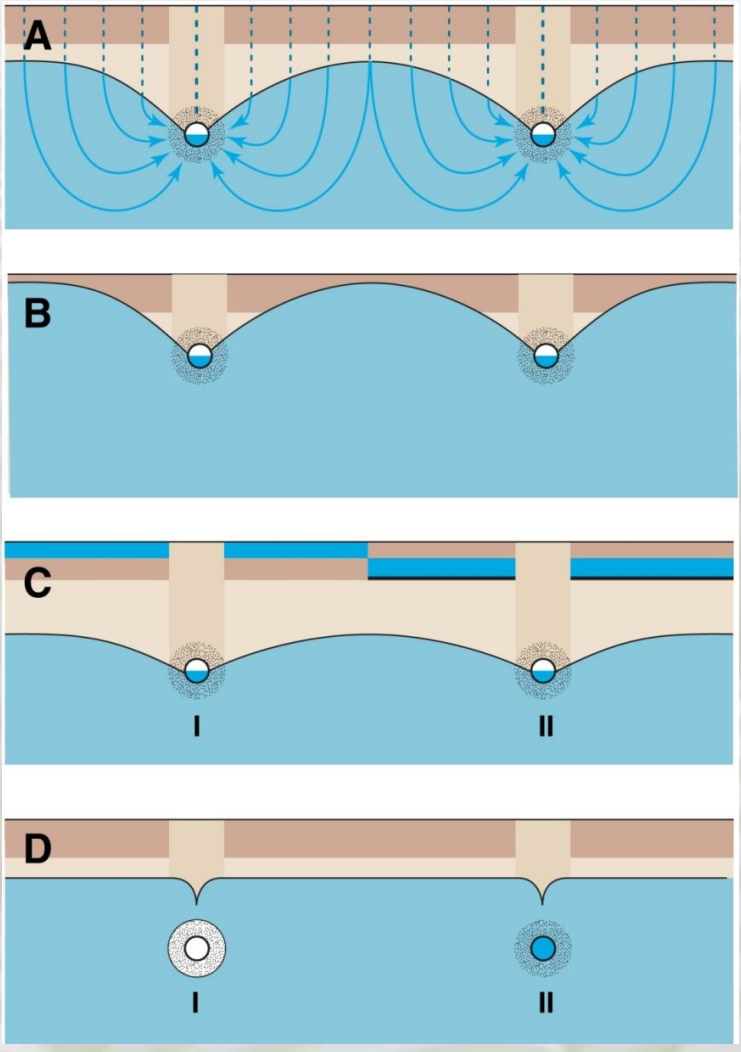
GROUNDWATER LEVEL IN DIFFERENT DISORDERS

A. Effective subsurface drainage

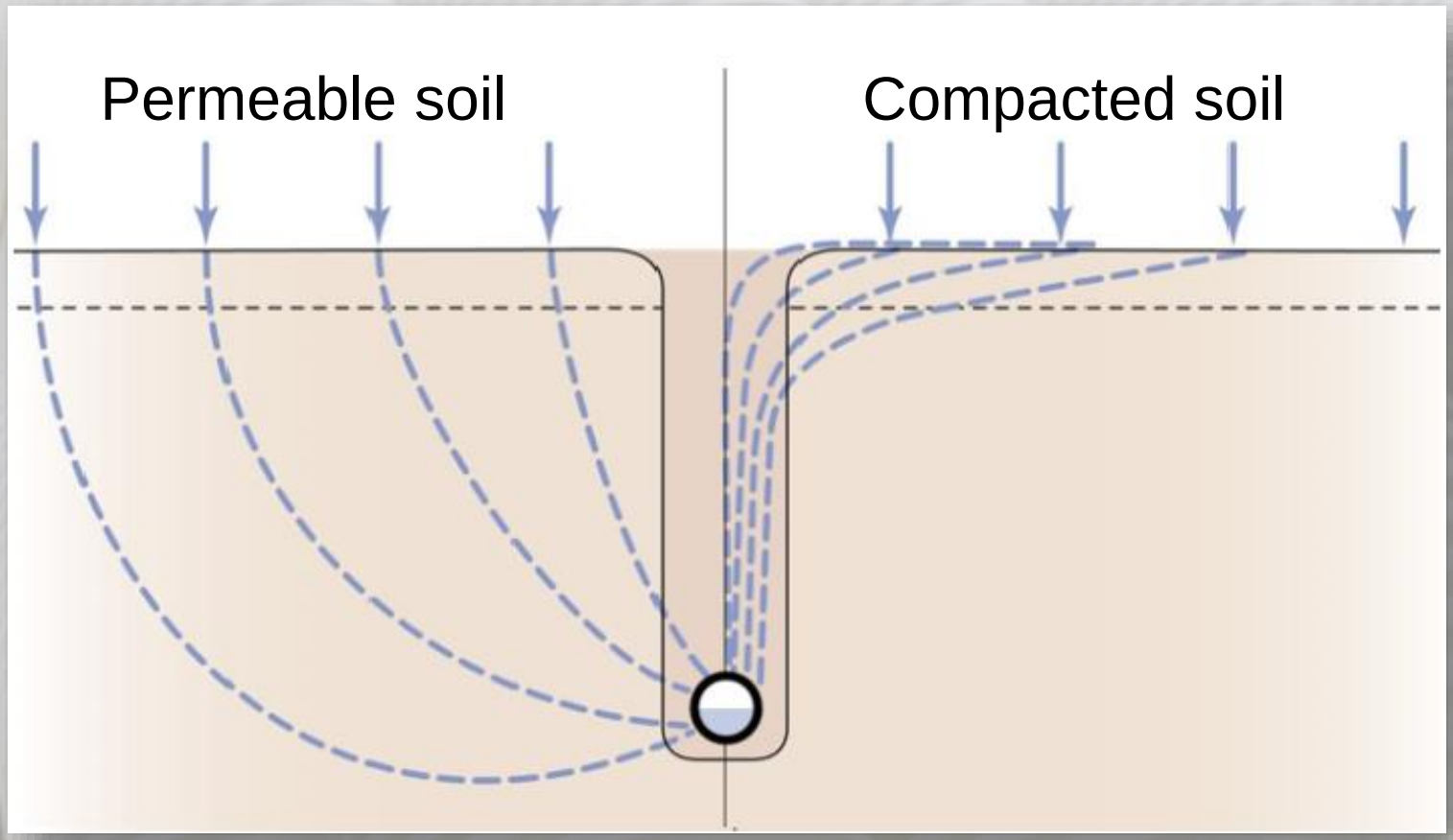
B. Depressed soil

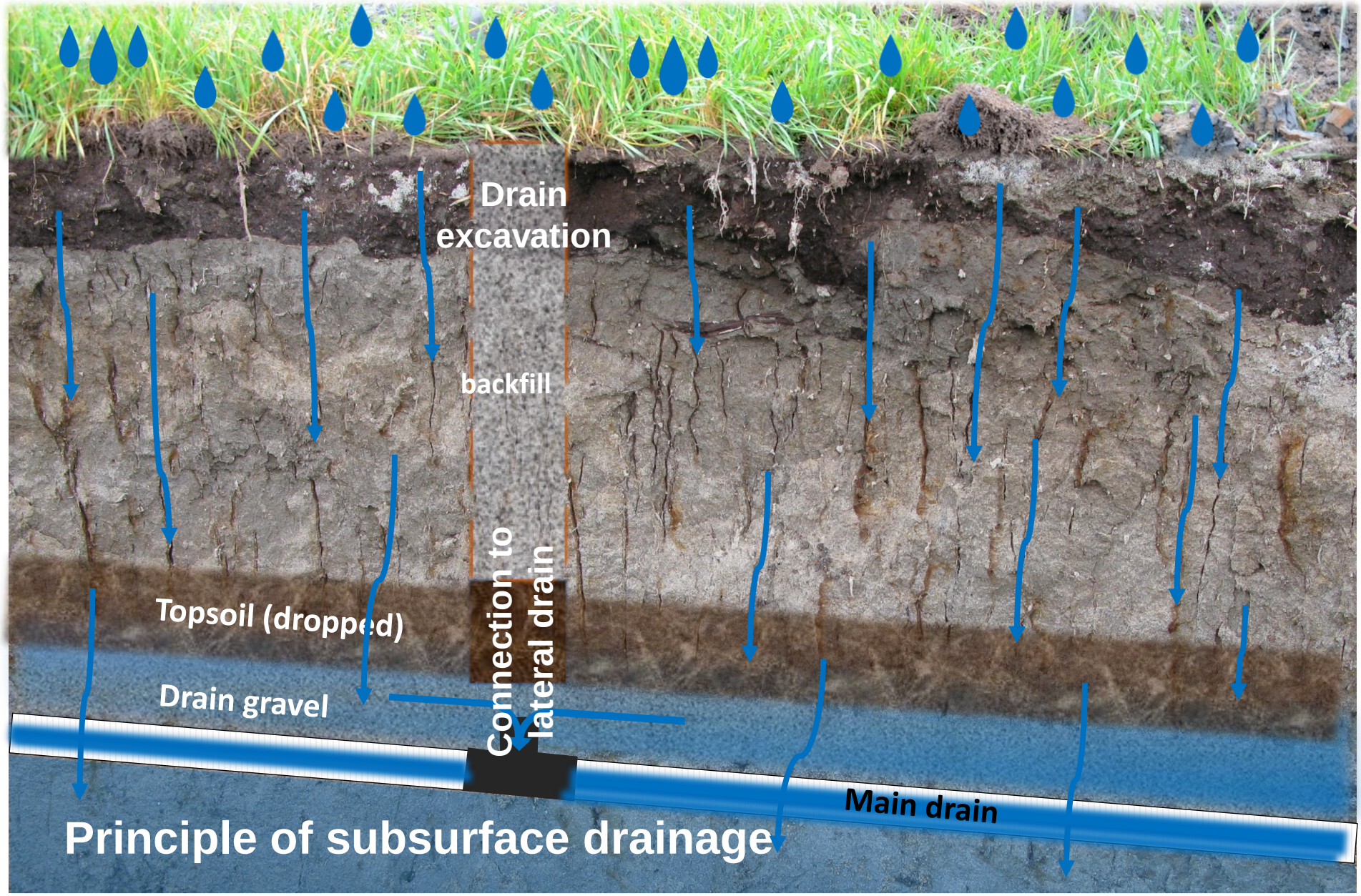
C. Compacted soil

D. Blockage in the drain



EFFECT OF SOIL STRUCTURE ON WATER FLOW

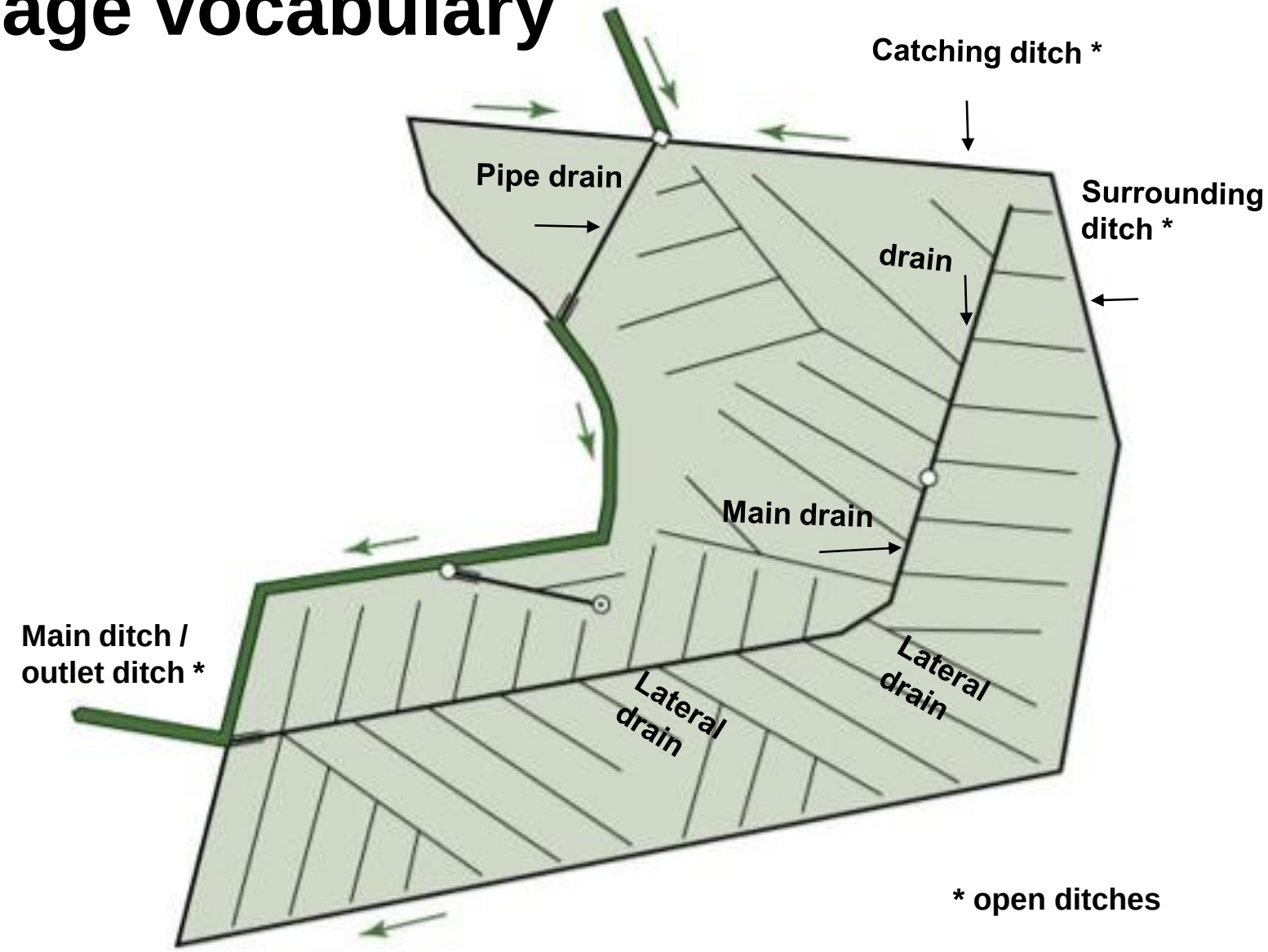




FIELD DRAINAGE ASSOCIATION

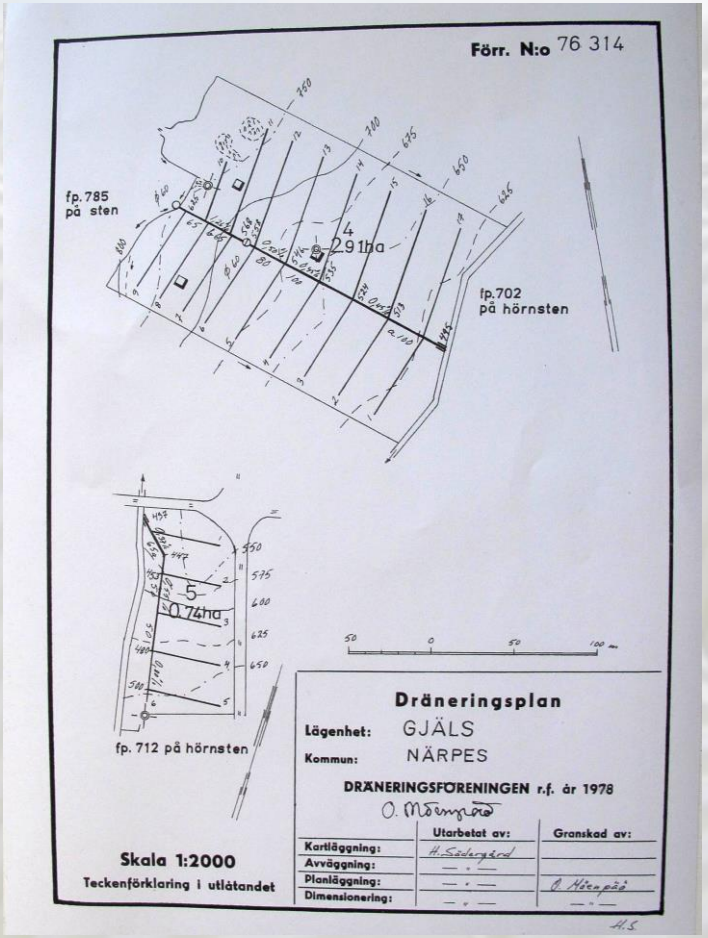
LUOKO RY

Drainage vocabulary



HOW TO FIND THE SUBSURFACE DRAINS 1/6

There are drainage maps of almost all subsurface drains made in Finland. The map shows the location of drains, wells and drain outlets, among other things. If a drainage map is lost, it can be ordered from the Finnish Field Drainage Association www.salaojayhdistys.fi

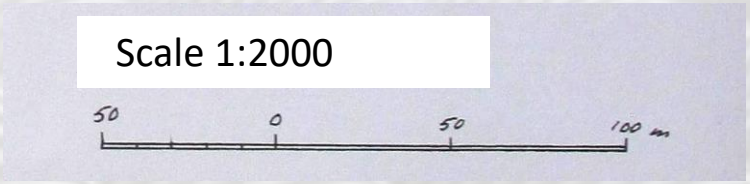


FIELD DRAINAGE ASSOCIATION

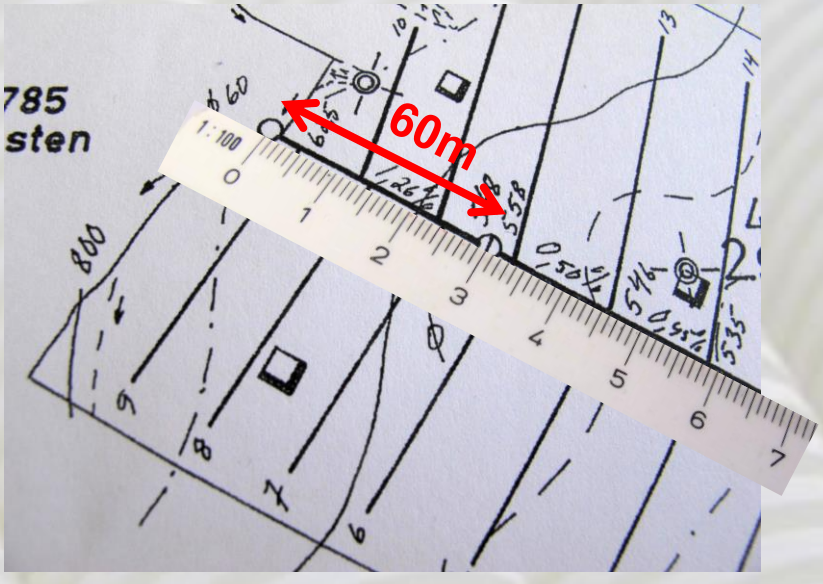
LUOKO RY

HOW TO FIND THE SUBSURFACE DRAINS 2/6

It is necessary to know the scale of the map in order to measure the location of different objects in the terrain



The scale is usually 1: 2000
1 mm on the map = 2 m in the terrain

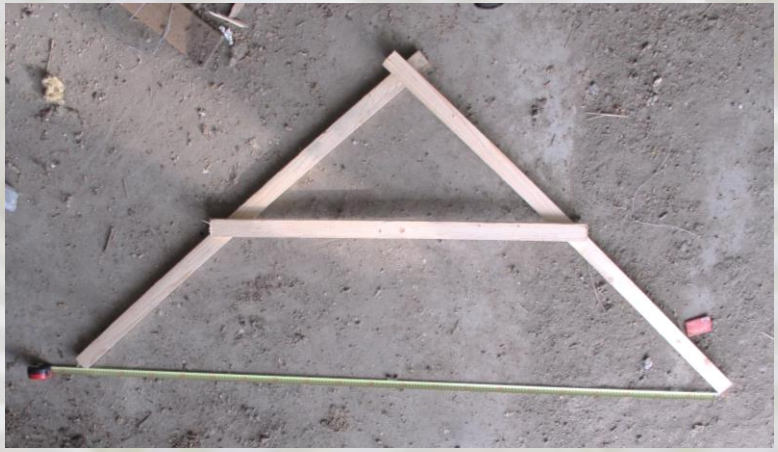


In the picture the distance between the surface inlet and the underground slope well is 60 m.

HOW TO FIND THE SUBSURFACE DRAINS 3a/6

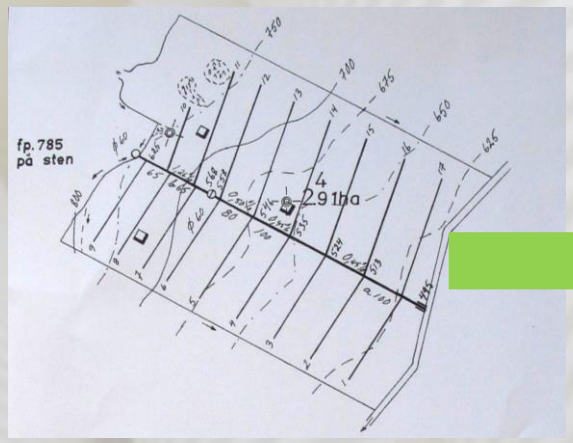
Manufacture of a simple measuring tool

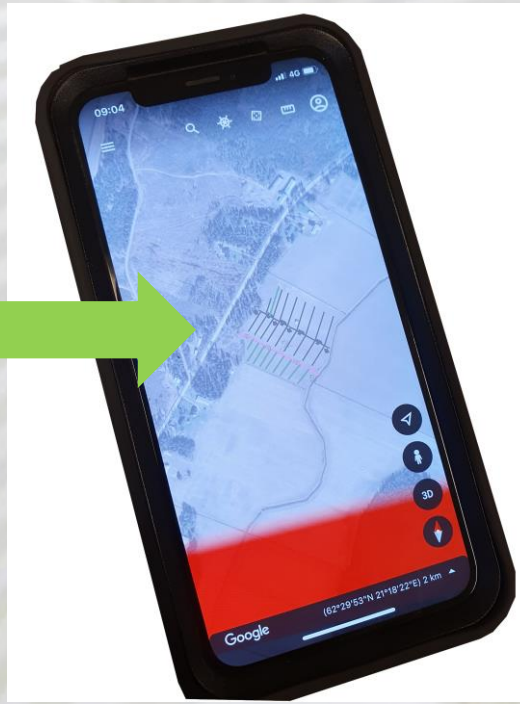
If a long tape measure or digital map is not used, a simple measuring tool can be made to measure the distances in the field. A suitable tip spacing is 200.5 cm.

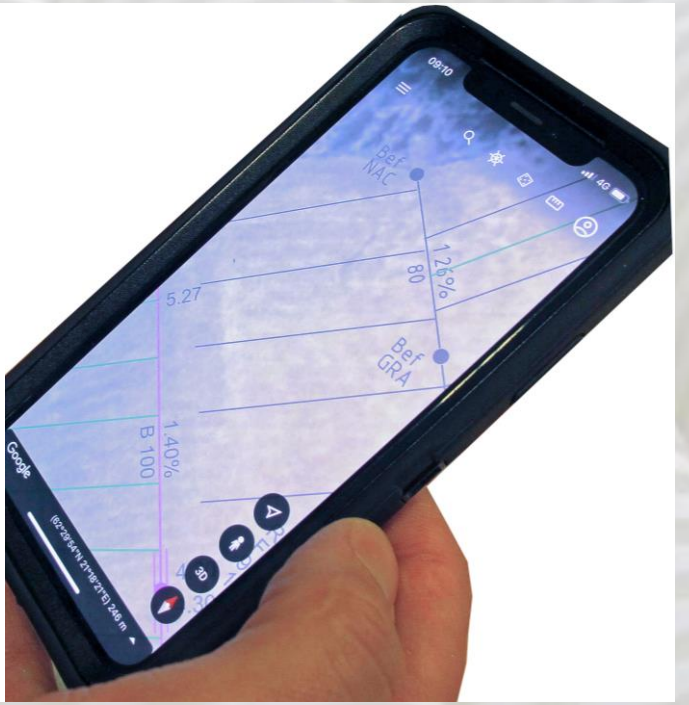


HOW TO FIND THE SUBSURFACE DRAINS 3b/6

Digitized maps can be exported to the Google Earth template, which runs on your phone or tablet. Accuracy is about 1 meter in terrain. It's handy when you can see where you are in the field, and where the subsurface drains are located. Drainage designers can digitize old drainage maps as needed.







HOW TO FIND THE SUBSURFACE DRAINS 4/6

Underground objects are located using a probe stick. The probe stick is about 130 cm long with an arrow-shaped tip and a handle.

The arrow-shaped end of the probe should be larger in diameter than the rod

HOW TO FIND THE SUBSURFACE DRAINS 5/6

The location of the object to be inspected is measured with the measuring tool (a simple measuring tool, measuring tape or GPS on the phone or tablet).

A probe stick is used to locate the subsurface drain. The search proceeds in a direction transverse to the drain. The probe is pressed into the ground every 5 to 10 cm until a drain or drainpipe is felt.

When searching for an underground well, seek with the probe stick along the drain until a well is found.

WATCH THE VIDEO

HOW TO FIND THE SUBSURFACE DRAINS 6/6

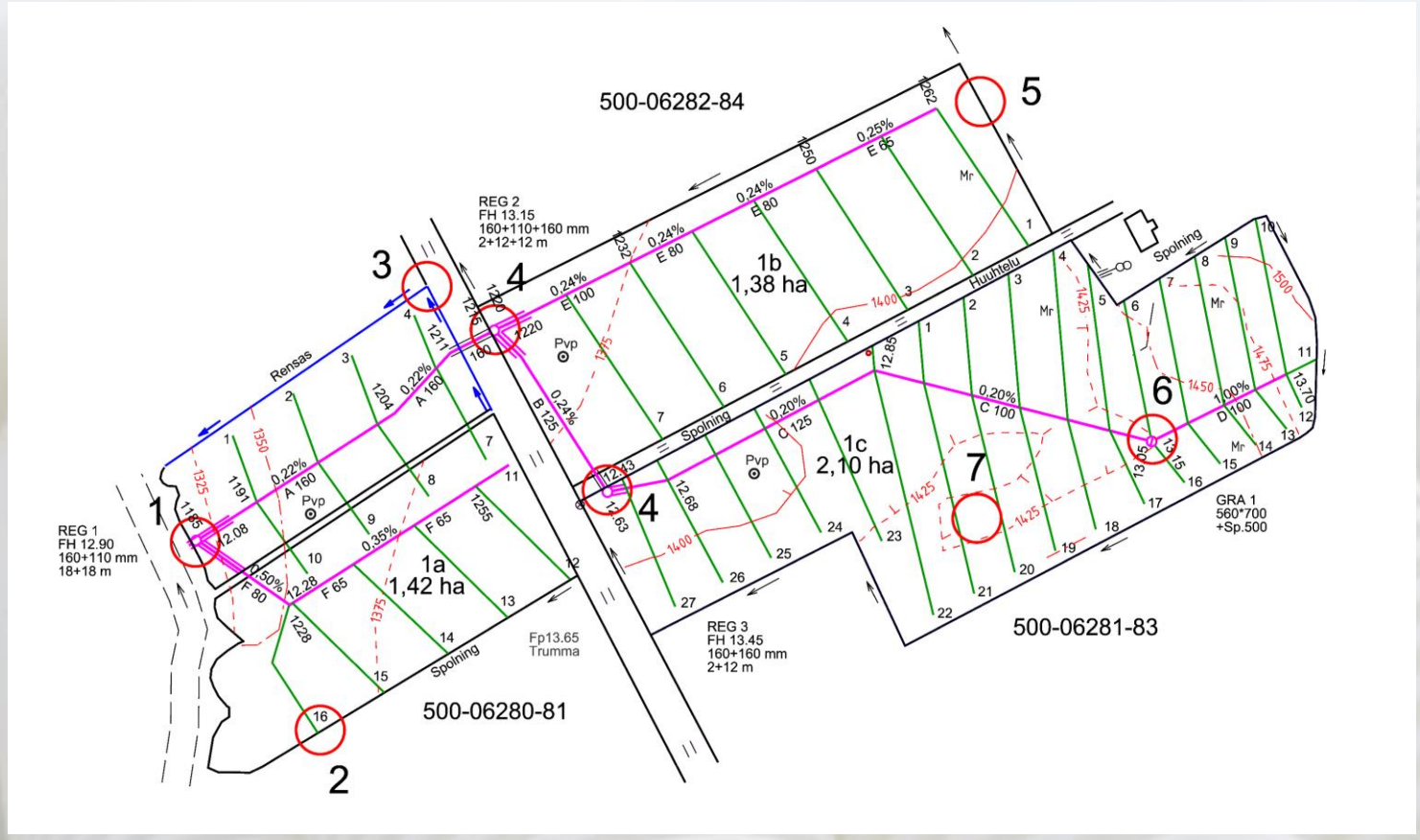
The subsurface drain is excavated by first removing the topsoil layer and then digging up to the drain gravel, after which from the side of the pipe. Finally, the pipe is carefully dig out the pipe with a shovel.

WATCH THE VIDEO

MAINTENANCE OF SUBSURFACE DRAINS

- To ensure that the field is drained, it is advisable to check the condition of the subsurface drainage regularly, so that any problems with drainage can be identified and the necessary maintenance can be carried out in good time.
- Good soil structure is important to achieve good hydraulic conductivity and efficient drainage.
- In connection with various construction projects, such as the construction of roads, cable lines and pipelines, care must be taken not to jeopardize the operation of the drainage system.

It is a good idea to mark the key spots on the ground and check them regularly



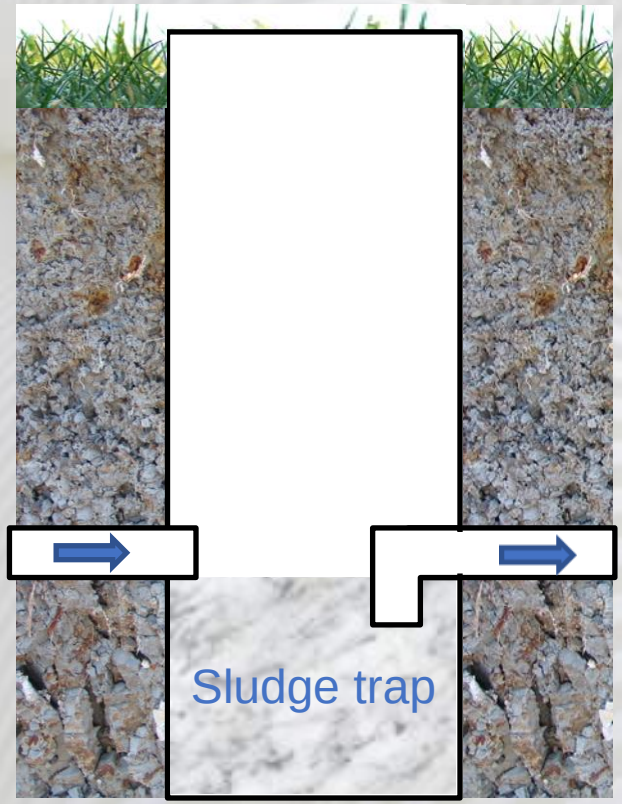
1. outlet ditch, drain outlet and control well
2. flushing extensions
3. roadside and partition ditch
4. underpass, culvert and well
5. catching ditch
6. inspection well
7. depression

FIELD DRAINAGE ASSOCIATION

LUOKO RY

1a. The bottom of the outlet ditch must be at least 30 cm below the landing opening.
1b. Excess vegetation, sludge and roots is removed around **the drain outlet**. The drain outlet must be fitted with a grille and with a marker stick. Cloudiness or red color of drainage water may be a sign of the need for flushing.

1c. The sludge trap of **the control well and the outlet well** must be empty, and the control device must be in good condition.



2. Flushing extensions are equipped with a marker stick and an end plug.

WATCH THE VIDEO

3. Roadside and partition ditches will be cleaned if necessary. The risk of erosion can be reduced by paving or piping a ditch.

4. Underpass and culverts. Subsurface drains passing under the road often have underground manhole on both sides of the road. The wells are inspected and cleaned if necessary. Culverts should also work well.

5. If necessary, the **surface inlet** should be cleaned and protected from erosion. Sludge is removed from the catching ditch and its surroundings, if necessary.

Foto M.Gjäls

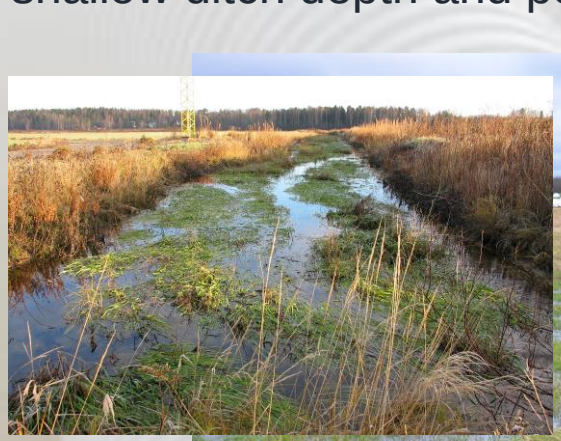
6. Manhole and slope wells are often underground. They should be checked and cleaned if necessary.

7. General overview of the field. It is worth observing drainage, vegetation, soil structure and groundwater level.

Video inspection of the drainpipes requires that the water is not too cloudy or that the pipe is not full of sludge. The video inspection is mainly used to locate a technical fault or blockage.

POSSIBLE PROBLEMS

The most common problems with drainage are insufficient arterial drainage, iron-containing groundwater and root or sludge clogging in the pipe, too sparse drain spacing, too shallow ditch depth and poor soil structure.



FIELD DRAINAGE ASSOCIATION

LUOKO RY

Malfunctions and recommendations for action

Minor maintenance is not always enough, but more extensive maintenance measures are needed to ensure that the drainage works properly.

Insufficient arterial drainage

- water cannot flow freely from the drain outlet to the outlet ditch
- the drain outlet must be above the mean water level of the summer
- the bottom of the outlet ditch must be at least 30 cm below the drain outlet

⇒ Improving arterial drainage, contacting the drainage corporate bodies

Iron precipitates

- soluble iron compounds precipitate because of oxidation in the drainpipe, pipe holes and envelope material
- common in ferruginous peatlands and new drainage areas

⇒ Drainage flushing, drainage renewal, control drainage and flushing connections

Clogged ditches

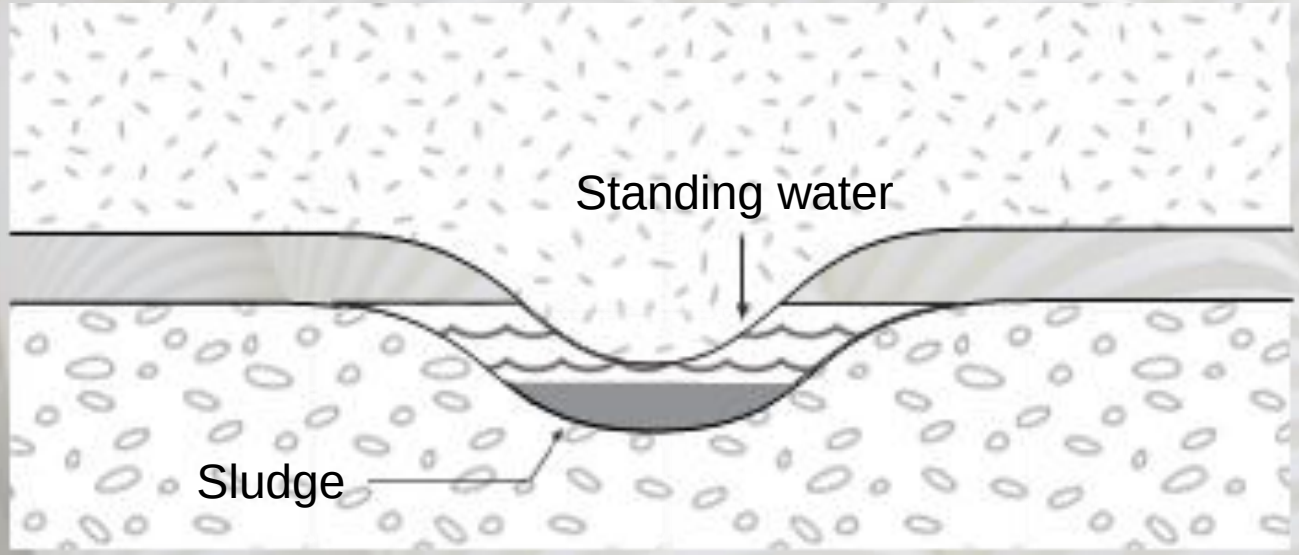
- soil or Iron precipitates in the pipe
- broken pipe
- roots of trees or shrubs have grown in the pipe
- water freezes in the pipe in the spring

⇒ Drainage flushing, repair of broken spots, frost protection in areas sensitive to frost

Installation errors

- for example, the drain has notches that collect sludge
- difficult to verify
- careful implementation of ditches is used to avoid errors

⇒ repair or drainage renewal of broken spots



Surface water problem

- on flat clayey fields with poor water conductivity on topsoil or subsoil
- in flat peat fields with poor water conductivity and high water- containing capacity in topsoil
- in depressions where water easily accumulates

⇒ gravel inlets, subsoiling, drain trench, mole drainage, field levelling

Gravel inlets

Field levelling

Subsoiling

Mole drainage

Poor soil structure

- water conductivity of the soil is poor
- a big problem in clayey soils, but also occurs in other soils

⇒ Supplementary drainage in dry conditions, topsoil drop is important, crop rotation, deep-rooted plants, subsoiling

Too sparse drain spacing

- heavy agricultural machinery needs denser drain spacing than before

⇒ Supplementary and renewal drainage

Too shallow drainage

- if the ground is submerged after subsurface drainage, the drainage system may be too close to the ground surface, which reduces drainage efficiency
- common in peatlands and former seabed of coastal areas
- the depression is greatest immediately after drainage when the field plot is put into cultivation

⇒ Renewal drainage

PROBLEM	REASON	OBSERVATION	MEASURE
WATER FLOW FROM THE GROUND TO GROUNDWATER	COMPACTION OF THE TOPSOIL	PUDDLES ON THE GROUND GROUNDWATER LEVEL HIGH	CULTIVATION IN DRY TIME USE OF LIGHT MACHINES
	COMPACTED LAYER	SHOVELING TEST GROUNDWATER LEVEL	SOIL STRUCTURE IMPROVING
	COMPACTED LAYER	SHOVELING TEST GROUNDWATER LEVEL	SUPPLEMENTARY DRAINAGE
WATER FLOW THROUGH THE PIPE AND THE ENVELOPE	CLOGGINGS IN THE ENVELOPE OR IN THE HOLES OR JOINTS OF THE PIPE	SHOVELING TEST GROUNDWATER LEVEL	FLUSHING THE SUBSURFACE DRAINS
WATER FLOW IN THE PIPE	IRON PRECIPITATES ROOT CLOGGINGS ALLUVIONS	INSPECTION OF DRAIN INLETS AND WELLS USING THE FLUSHING HOSE VIDEO RECORDING	FLUSHING THE SUBSURFACE DRAINS
	BROKEN PIPE PIPE FLAT INSTALLATION ERRORS	USING THE FLUSHING HOSE VIDEO RECORDING	REPAIR OF PIPE BREAKS RENEWAL OF THE SUBSURFACE DRAIN

FUNCTIONING DRAINAGE

- Enables the utilization of the entire growing season
  - facilitates the scheduling of field work

- Maintains good soil structure
  - prevents compaction
  - prevents frost and drought cracking
  - enables strong root growth
  - facilitates the occurence of earthworms, which create macro pores in soil

- Increases input efficiency
  - leads to decreased costs

Editors

Rainer Rosendahl, Helena Äijö

Videos, animations and pictures

Rainer Rosendahl

Producers

Luonnonhoidon koulutusyhdistys, Luoko ry
Finnish Field Drainage Association

Financier

Drainage Foundation sr

FIELD DRAINAGE ASSOCIATION

LUOKO RY

CONTACT INFORMATION

FIELD DRAINAGE ASSOCIATION

Salaojayhdistys ry
Simonkatu 12 A 11
00100 Helsinki
www.salaojayhdistys.fi
salaojayhdistys@salaojayhdistys.fi

LUOKO RY

Luonnonhoidon
koulutusyhdistys, Luoko ry
Simonkatu 12 A 11
00100 Helsinki

Salaojituksen
Tukisäätiö sr

Drainage Foundation sr
Simonkatu 12 B 25
00100 Helsinki
www.tukisaatio.fi