

EMBARKING ON A DRAINAGE PROJECT



CHALLENGES IN FINNISH AGRICULTURE

- 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



Only approximately 15% of our fields can be cultivated without any drainage



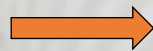
Despite unfavourable conditions, Finland has established a nearly self-sufficient agriculture.

Drainage systems built to facilitate it are a part of the basic infrastructure of our society.

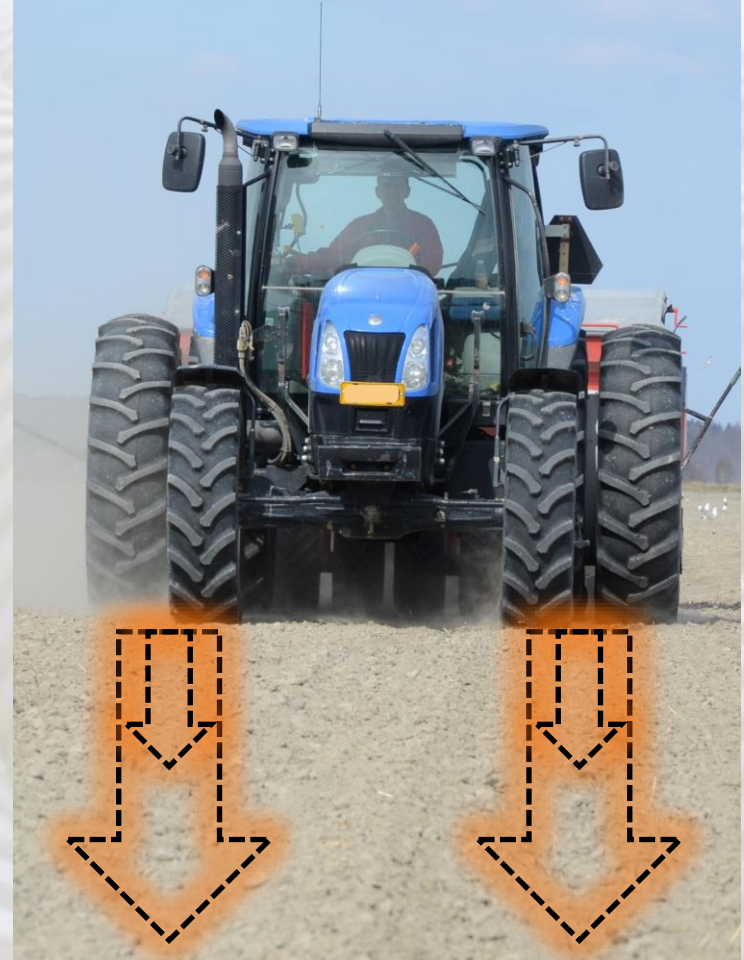
THERE ARE STILL PLENTY OF CHALLENGES

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.



Climate change affects annual rainfall and runoff

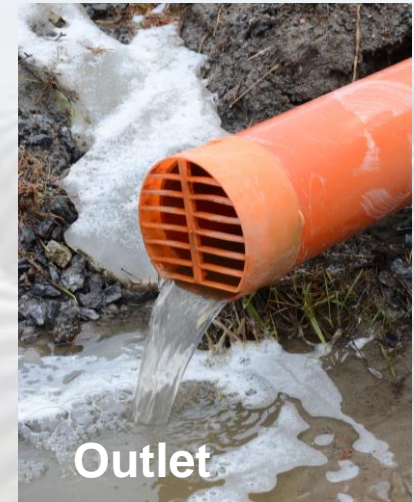


Functioning drainage is an important component of climate change adaptation



FUNCTIONING DRAINAGE

- Enables the use of the whole growing season
 - Makes it easier to start work in the field
- Maintains good soil structure
 - Prevents compaction
 - Prevents frost and drought cracking
 - Enables strong root growth
 - Facilitates the occurrence of earthworms, which create macro pores in soil
- Increases input efficiency
 - Leads to decreased costs



BASIC DRAINAGE

Basic drainage creates the conditions for an efficient local drainage

- Ditch depth to ensure sufficient drainage depth in the field
- Sufficient cross-sectional area to ensure conductivity

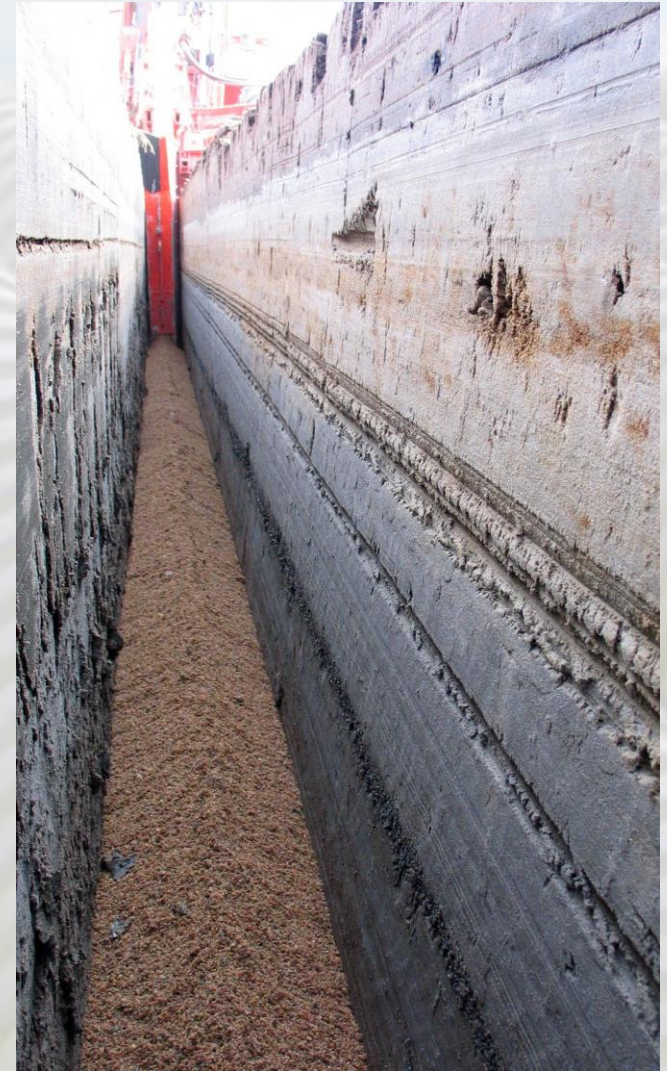


Good arterial drainage also avoids flooding

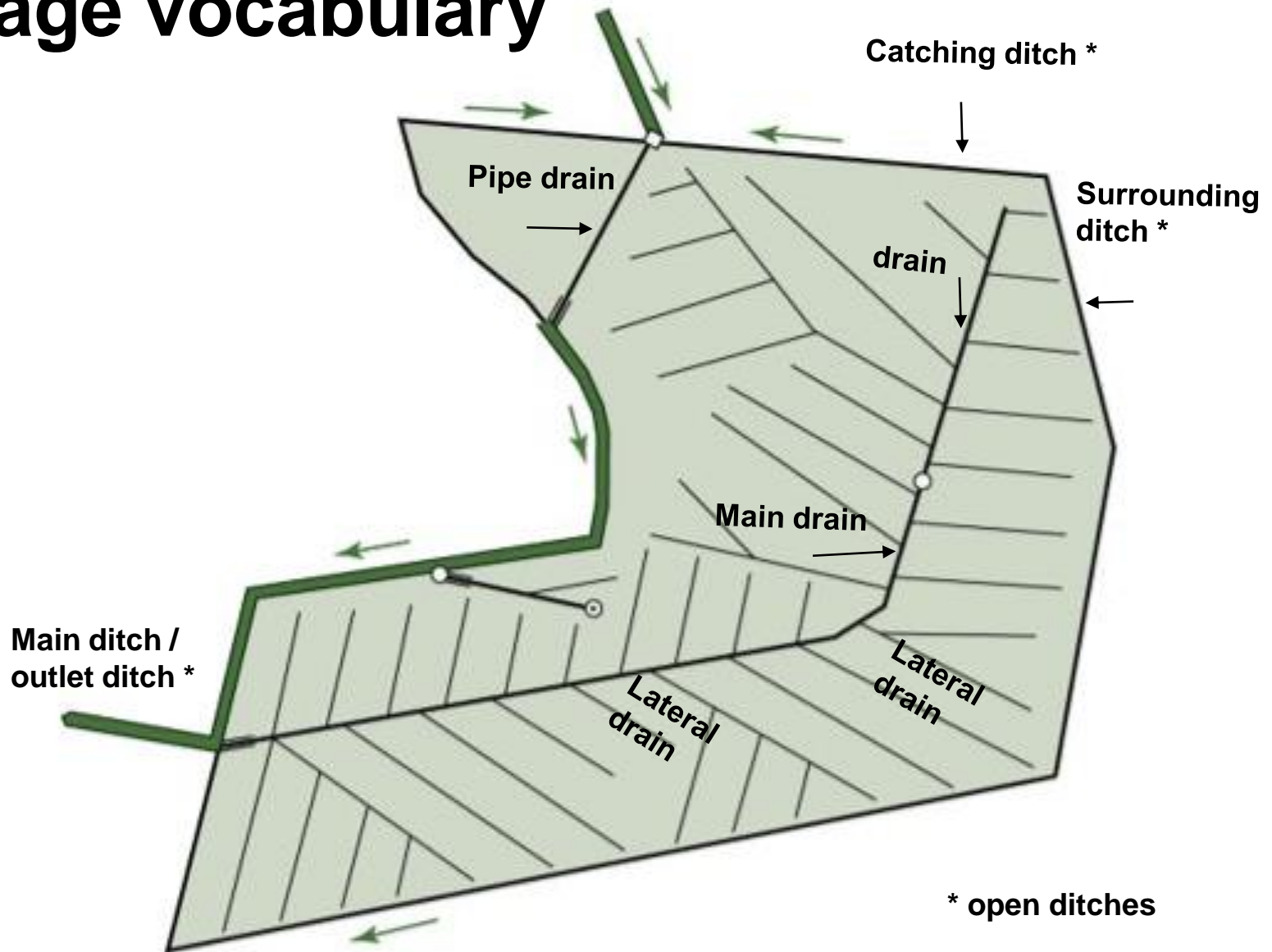


FIELD DRAINAGE

- Subsurface drainage (first, supplementary and renewal)
- Open ditches (field ditches)
- Soil surface formation
- Catching and surrounding ditches



Drainage vocabulary



Drainage issues/ subsurface drainage not working



Old drains are not working, or
they are too widely spaced

WHEN IS DRAINAGE NECESSARY?



- When a field with open ditches is converted to make field work easier and improve drainage.
- When an already drained field is too wet
 - ✓ Drain spacing too wide
 - ✓ Drainage network too close to soil surface
 - ✓ Sedimentation, rust deposits etc.

DRAINAGE PROJECT CAN BE:

- First drainage, when a field with open ditches is converted to subsurface drainage, or when new land is reclaimed for agriculture
- Drainage renewal, when an existing drainage system is replaced with a new one
- Supplementary drainage, when new lateral drains are installed between existing ones
- Reparation of drains due to civil construction (roads, tracks, pipelines etc.)

WHAT IS SUBSURFACE DRAINAGE?

The goal of subsurface drainage is to remove excess water from the field by lowering groundwater level

Subsurface drainage is implemented by installing perforated pipes into the soil. Water percolates into the pipes from the surrounding soil and flows away from the field.



WHAT IS SUBSURFACE DRAINAGE?

The drainage network includes lateral drains, main drain and wells.

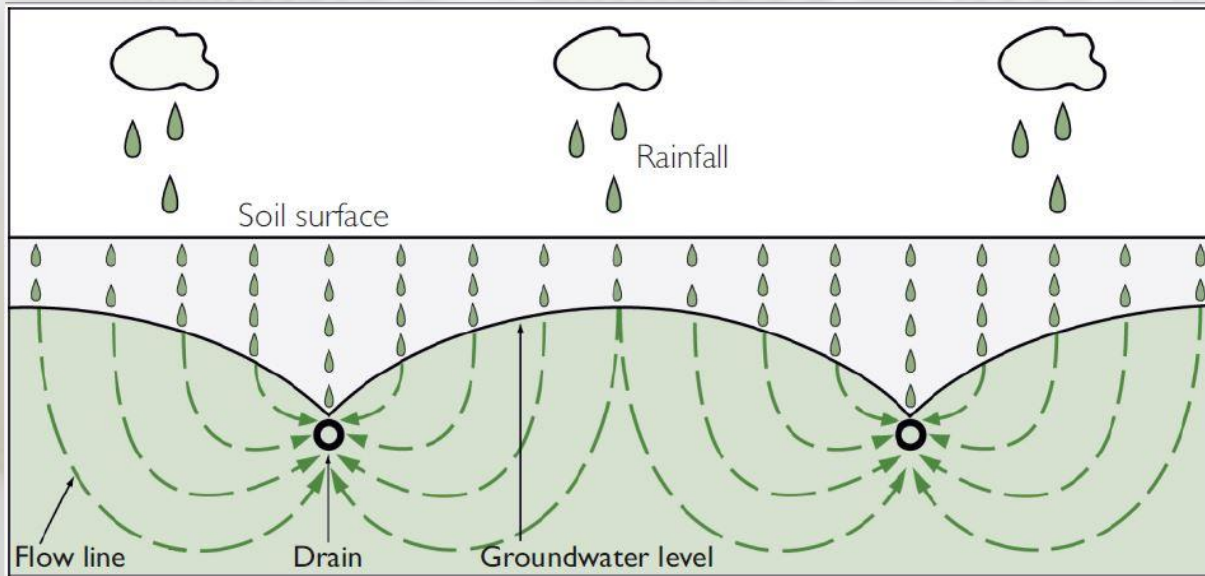
Lateral drains collect water from the soil, and they are connected to the main drain.

The main drain directs the water from the drainage network into the outlet ditch.

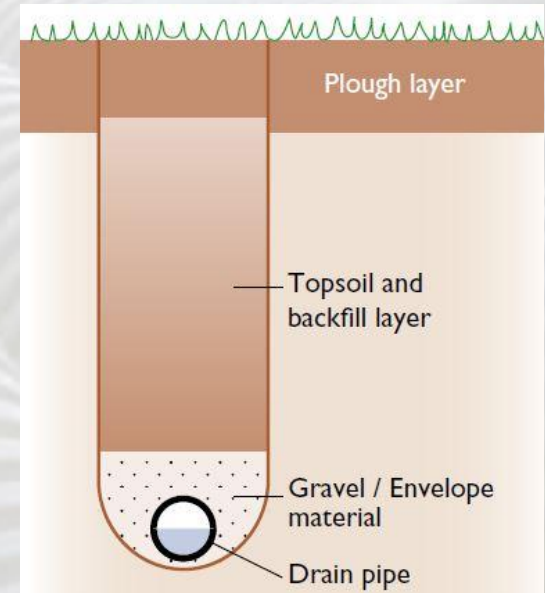
Different kinds of wells are installed in catching ditches, at turns and inspection points and in controlled drainage.



WHAT IS SUBSURFACE DRAINAGE?

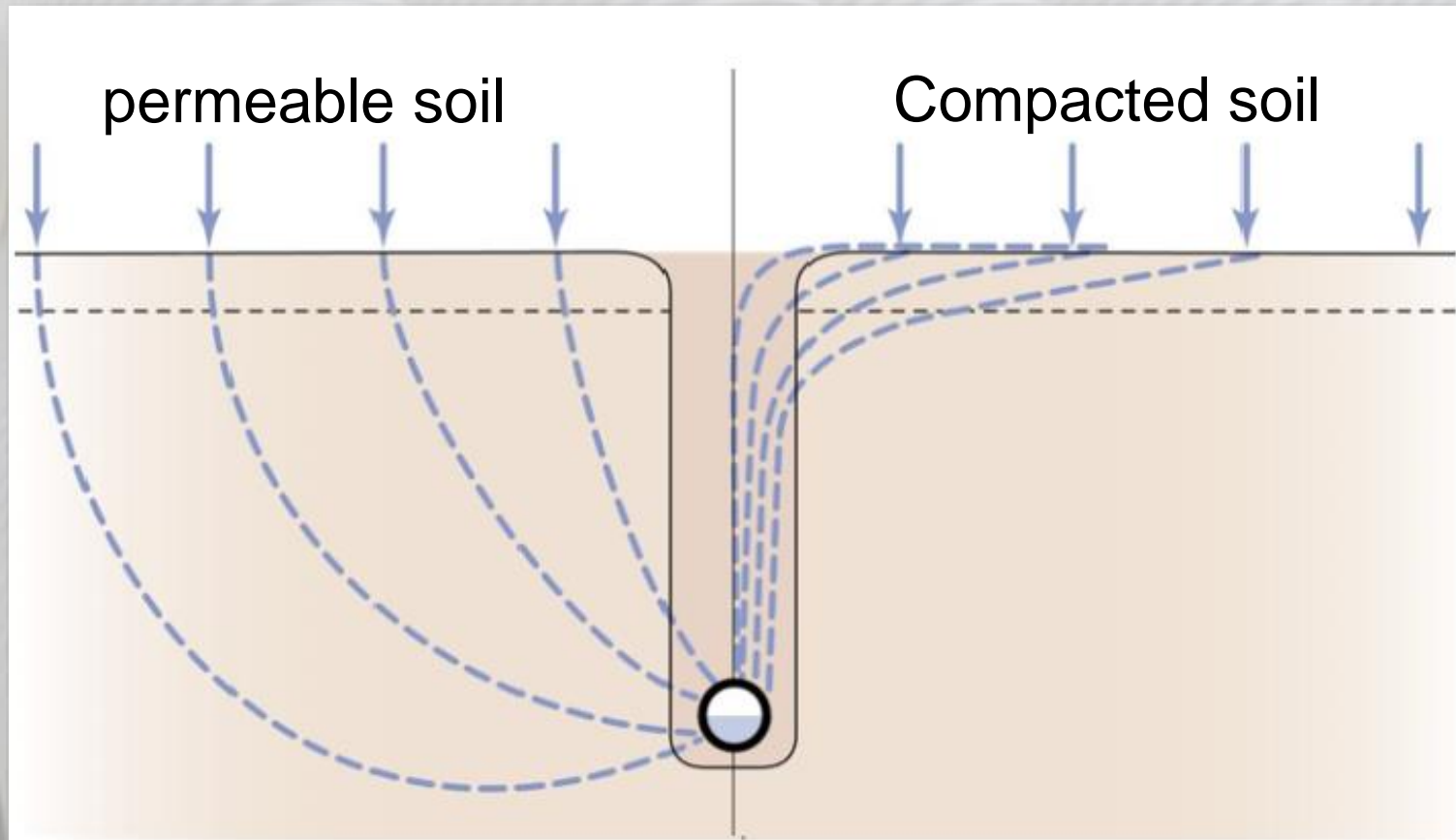


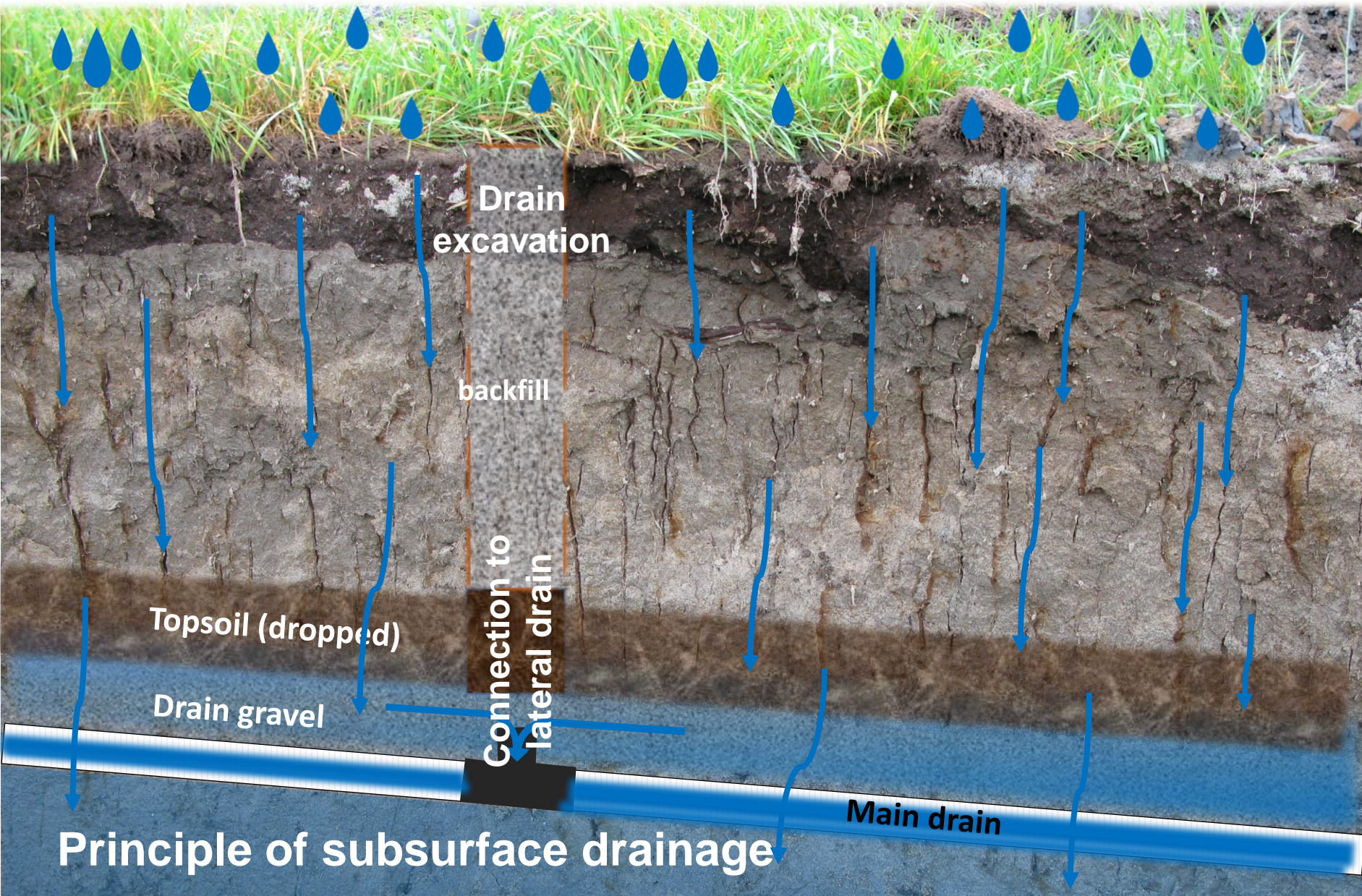
Cross section of water flow into the drains in permeable soil



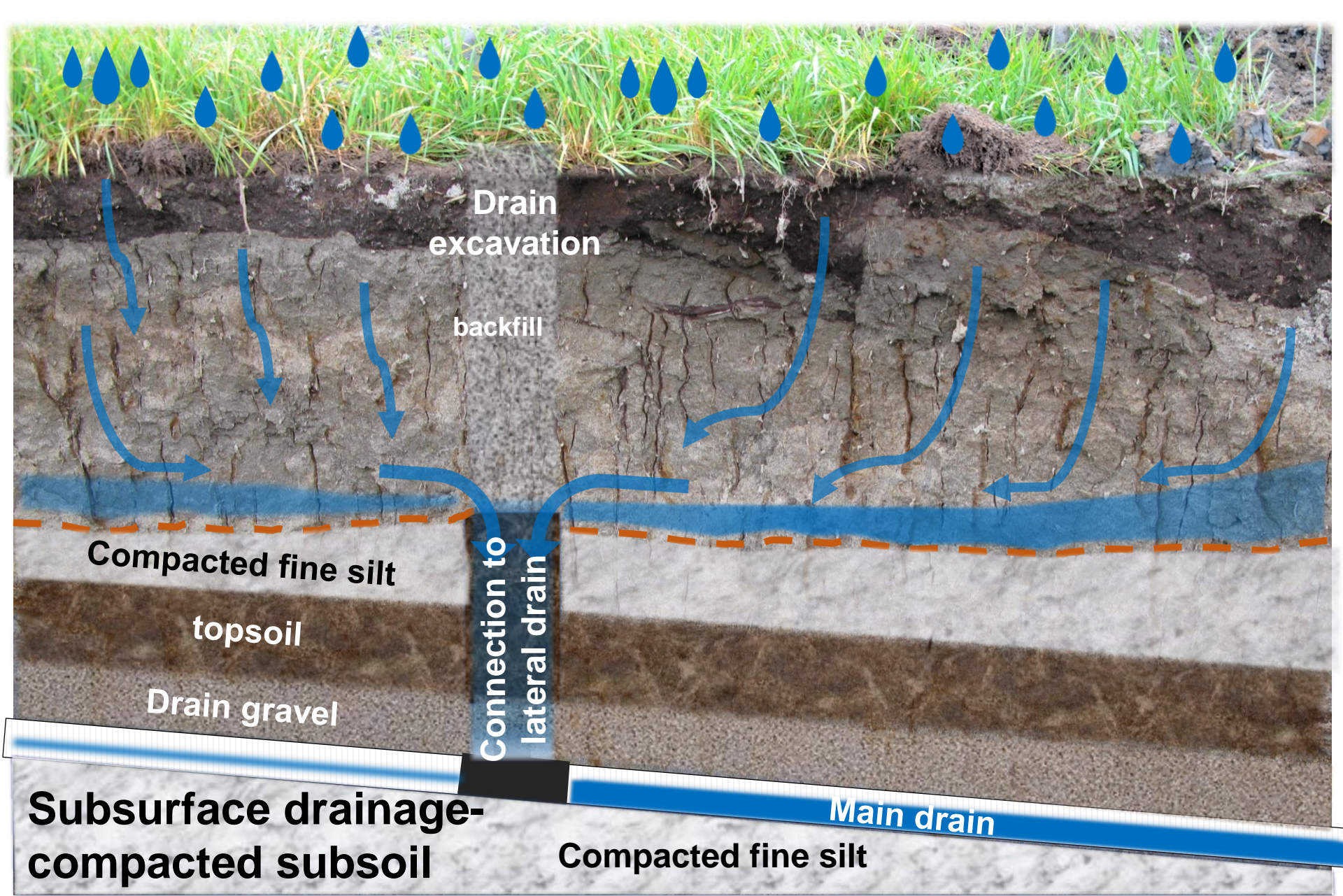
Drain profile

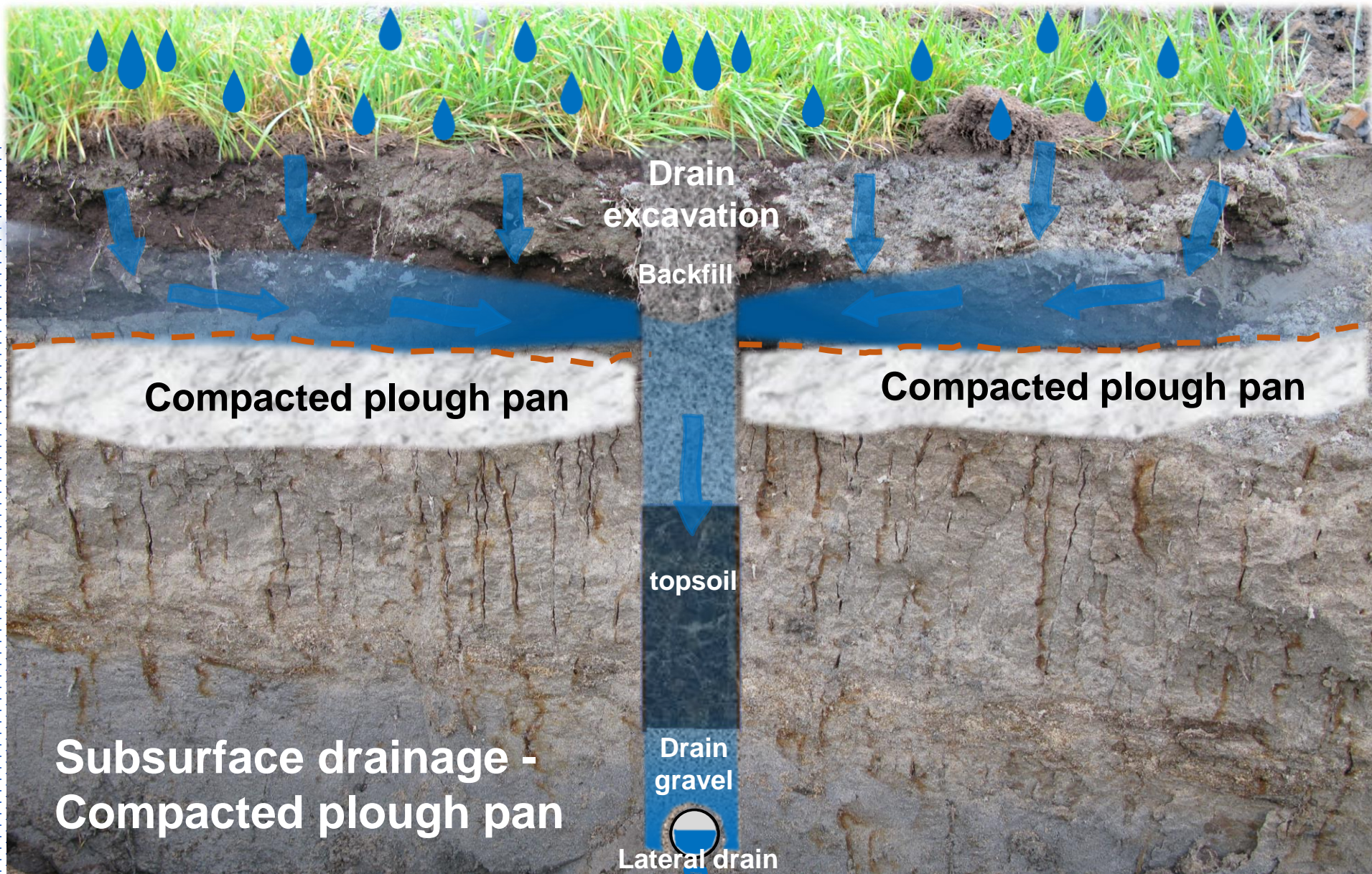
EFFECT OF SOIL STRUCTURE ON WATER FLOW

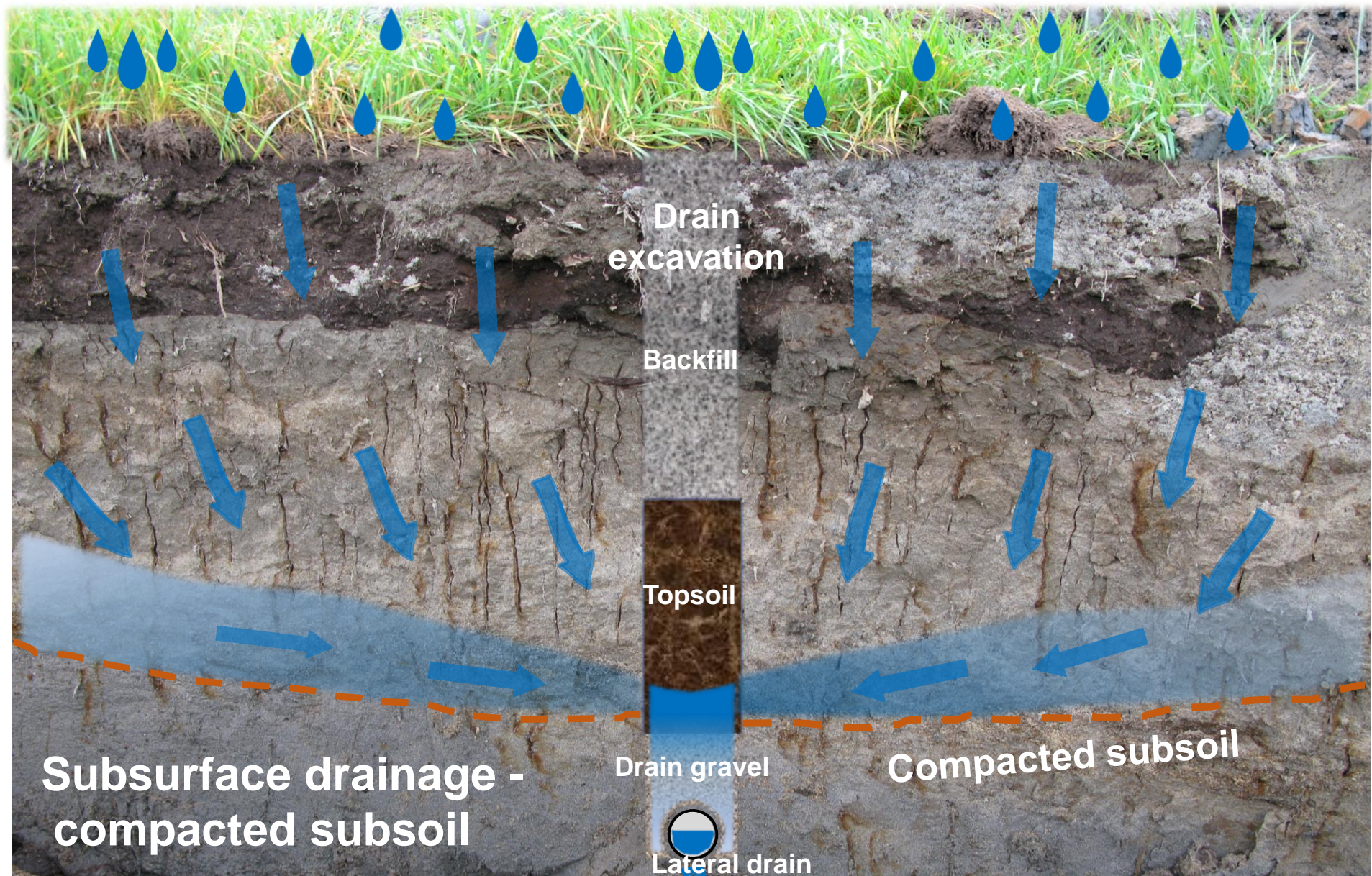




Principle of subsurface drainage





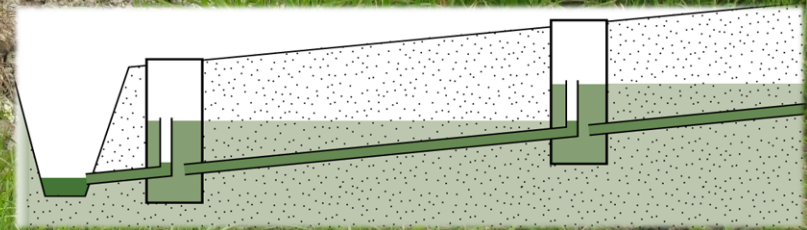


Controlled drainage and sub-irrigation

In controlled drainage, outflow from the field is controlled by means of damming devices installed into control wells

When the drainage network is used to direct water into the soil, it is called sub-irrigation

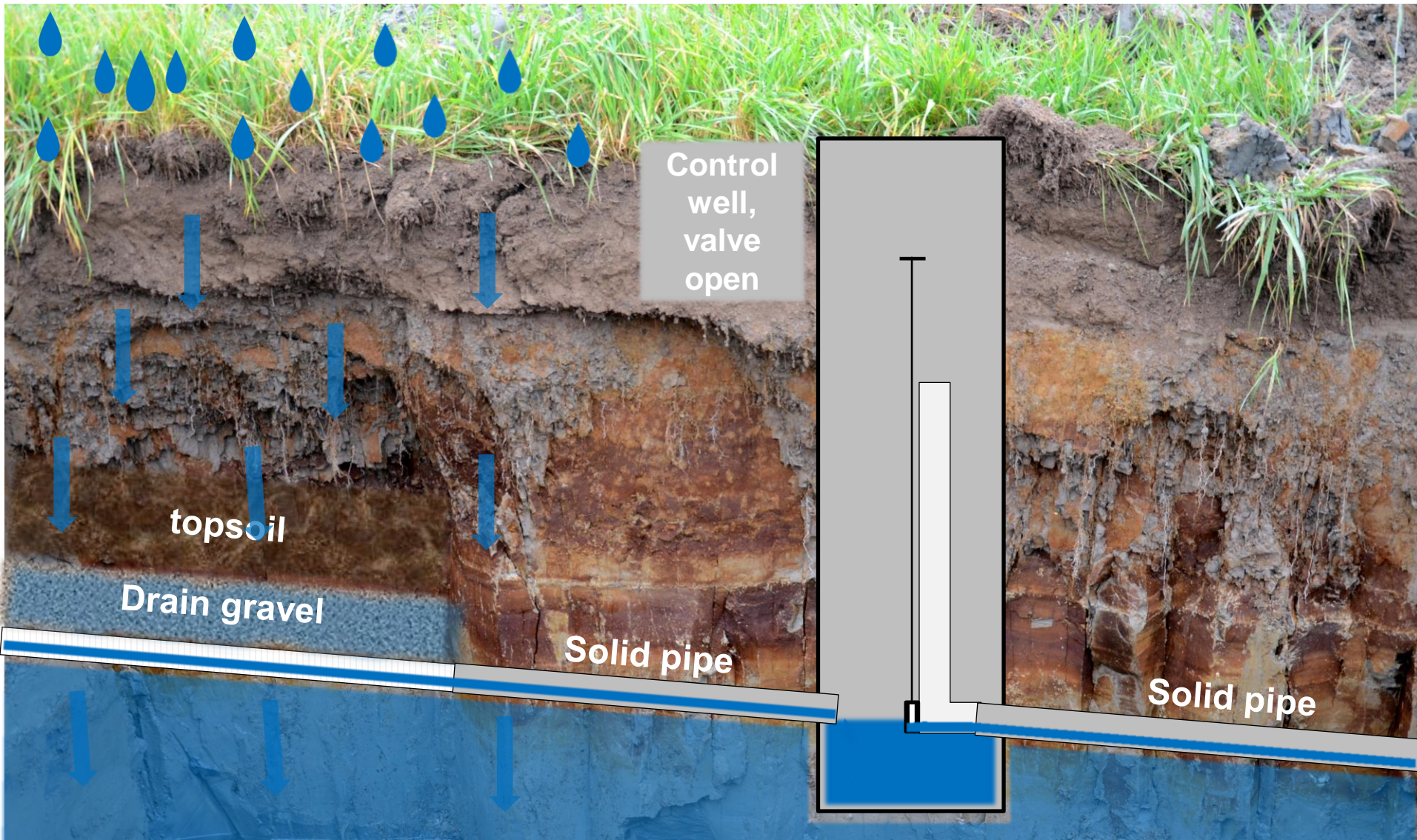
Controlled drainage and sub-irrigation are best suited for level and well draining fields



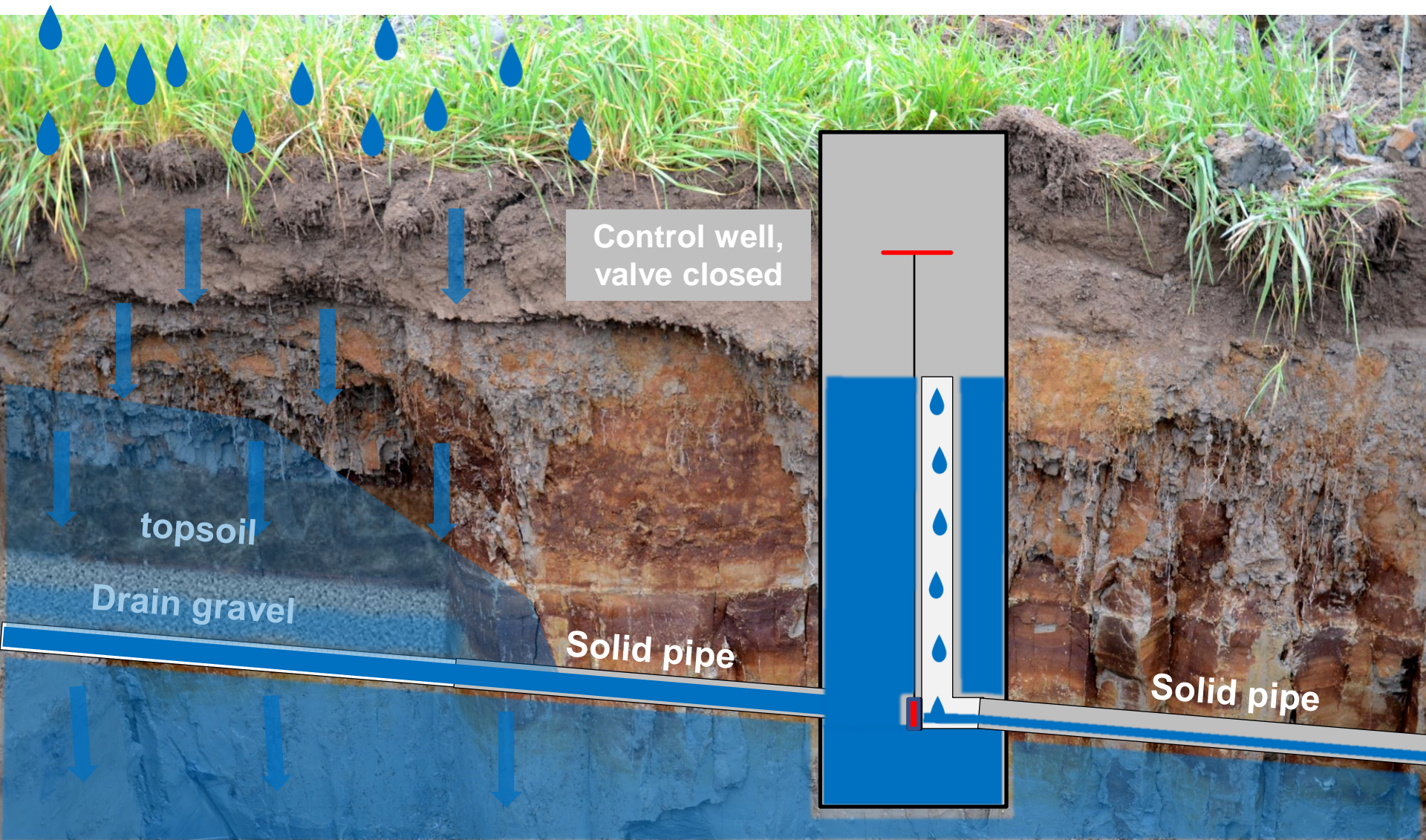
With long dry periods becoming more common, the significance of controlled drainage and sub-irrigation are emphasized.

Benefits of controlled drainage in agriculture

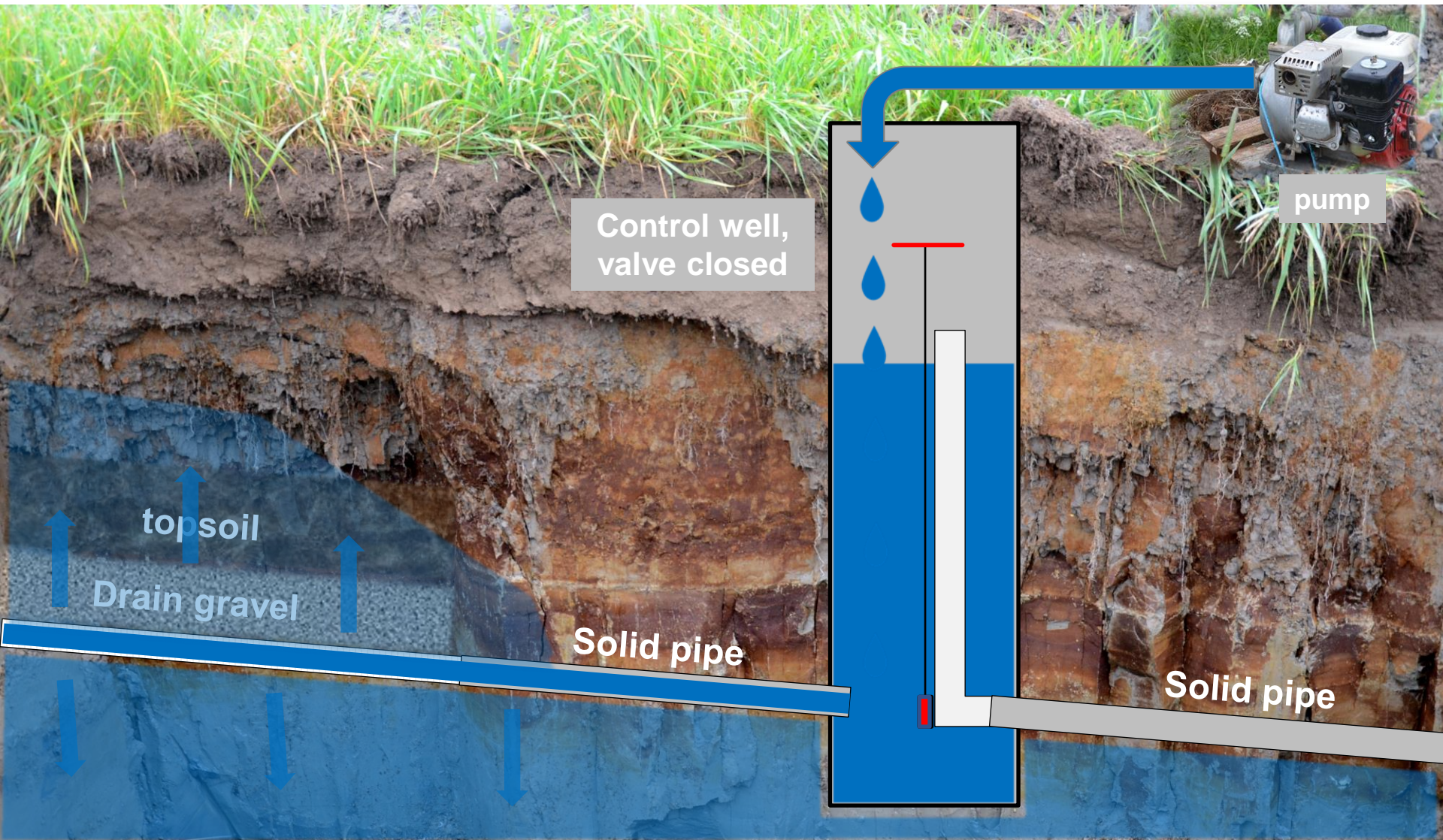
- Storing water and sub-irrigation can be used to regulate the field's water balance.
- Decreased nutrient runoff (nitrate reducing to gaseous nitrogen).
- The formation of acidity and leaching of metals on acid sulphate soils are reduced. Any leaching that does occur, can be evened out to avoid peaks.
- The subsidence of peat soils and decomposition of organic matter are slowed down.
- Greenhouse gas emissions on peat soils are decreased.
- There is less formation of rust.



Subsurface drainage + control well - well draining soil



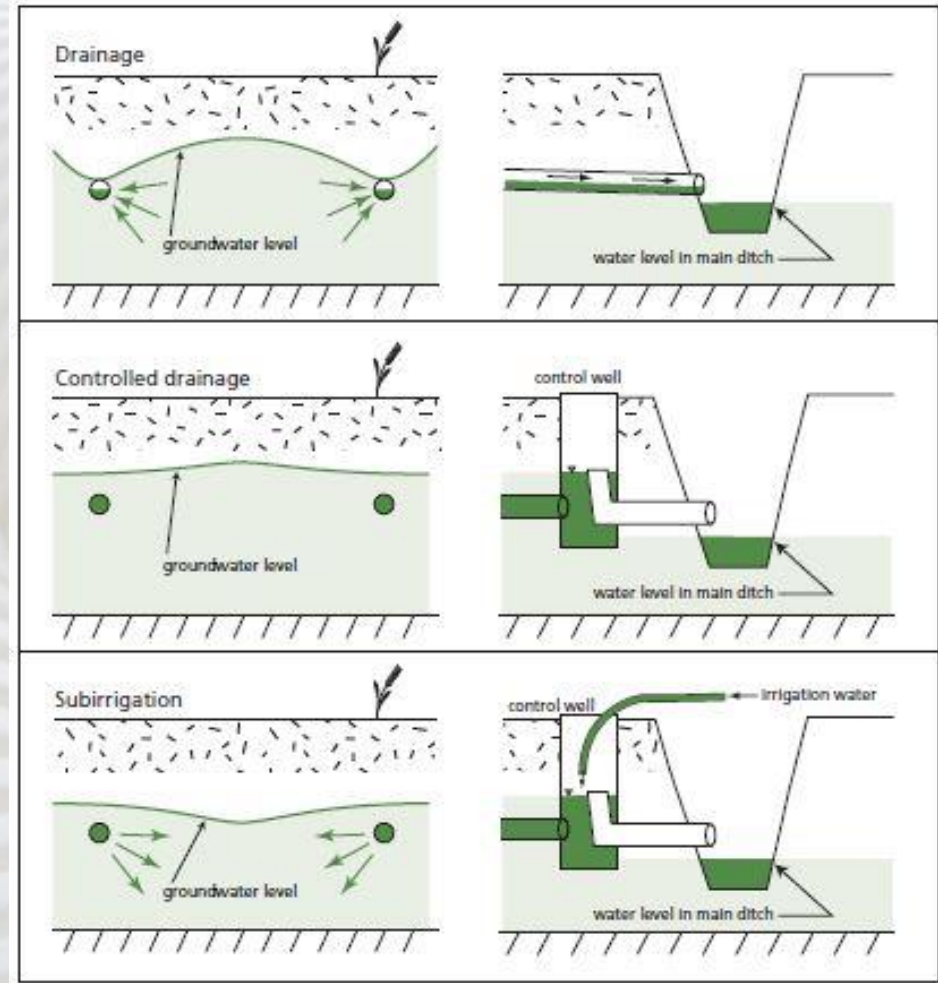
Controlled drainage -well draining soil



Controlled drainage + sub-irrigation - well draining soil

SUITABLE CONDITIONS FOR CONTROLLED DRAINAGE AND SUB-IRRIGATION

- Well draining soil: fine silt and coarser soil types
- Poorly draining subsoil below drainage pipes
- Slope no greater than 2 % for controlled drainage
- Slope no greater than 1 % for sub-irrigation
- Drain spacing smaller than usual



BENEFITS OF DRAINAGE 1/2

- Creates good growing conditions in the field and increases yields
- Effective growing area is increased by 10-25 %
- Plot shape is improved
 - Decreased losses due to headland
 - Decreased labor costs
- Improves soil structure
- Decreases nutrient and particle runoff

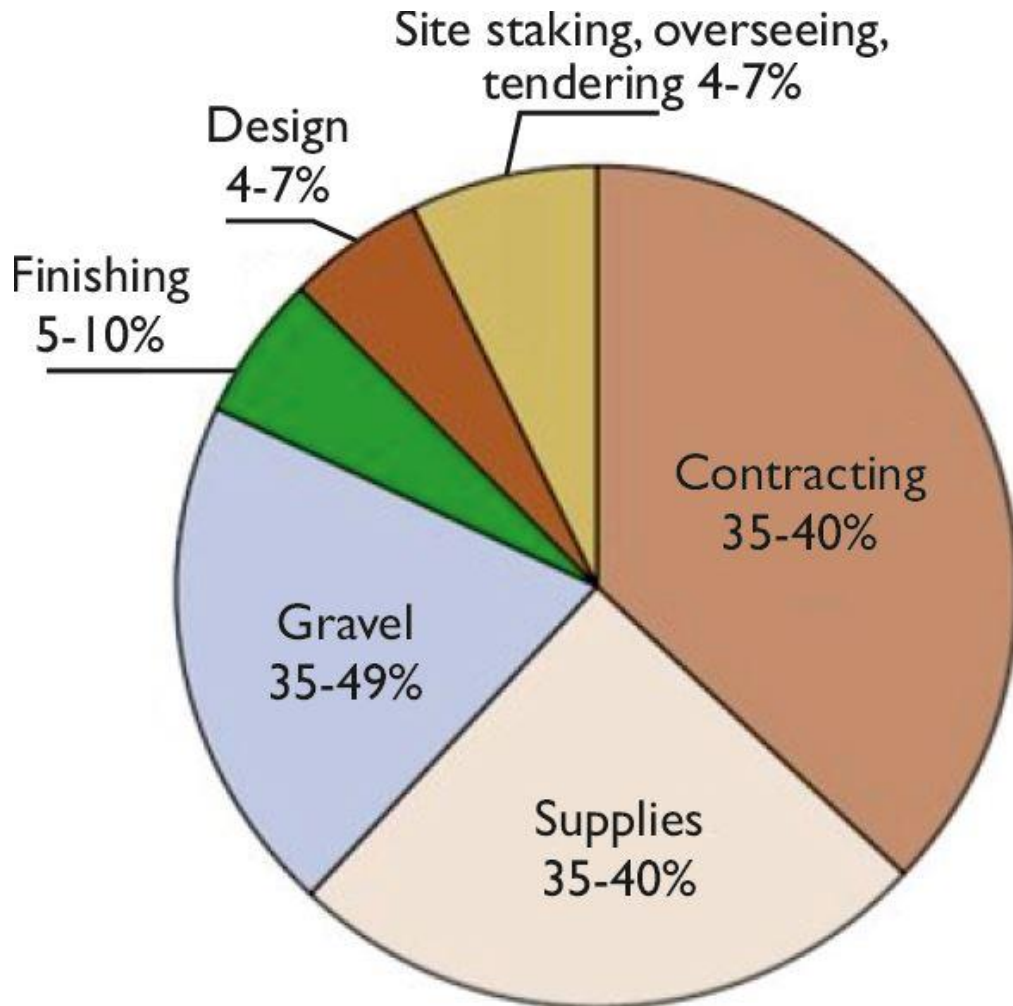


BENEFITS OF DRAINAGE 2/2

- On a drained field, the growing season is longer, and the field dries out more evenly.
- ➔ Enables earlier sowing and later harvest.
- ➔ Provides more leeway for the timing of field work.
- No maintenance of open ditches



COST OF DRAINAGE



Cost of drainage in Finland is 3000-4000 € / ha (VAT 0%)

Soil type, amount and cost of gravel etc. affect costs.

SUBSIDY GRANTED FOR DRAINAGE

The farmer can apply for an investment subsidy to cover a part of drainage cost



35 % for subsurface drainage
40 % for controlled drainage (2020)

A professionally drawn drainage plan is a prerequisite of the subsidy



Plan as map
Written plan
Work report
Cost estimate

The application is submitted to the local ELY- centre

More

information:

<https://www.salaojayhdistys.fi/fi/rahoitus/>

<https://www.finlex.fi/fi/laki/alkup/2019/20190262>

PROGRESS OF THE DRAINAGE PROJECT



Choosing your planner and ordering the plan

Financing - Applying for investment subsidy

Choosing your contractor

Filling in open field ditches and applying finishes

Implementation and overseeing

Site staking

Implementation-schedule

Certificate of completion

Applying for payment





It is important for the farmer to participate in all stages of the project from the beginning of planning to the final inspection.

This way, the farmer makes sure that both the planner and the contractor have access to the best local knowledge on field conditions.

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FIELD DRAINAGE ASSOCIATION

Waterdrive

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