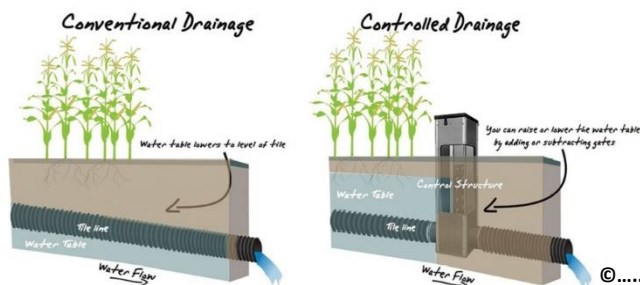


1.4.1. Controlled Drainage



Summary: Major advantages of the controlled drainage system to compare conventional drainage system is a chance to adjust groundwater level to occasionally higher than by normal drainage thereby soil moisture increases especially during dry season and the drainage run is reduced. Enhanced plant water and nutrient intake, thus increasing yield. By controlled drainage farmer can affect fields water economy through out the year and diminish nutrient impact into watercourses.

Operation and maintenance: Initial costs includes proper planning and implementation of drainage pipes, wells and irrigation supplies. Maintaining costs include adjusting of wells, cleaning of wells and drainage pipes and possible cost of repairs.

Efficiency: Decrease in overall flow also means reduced leaching of phosphorus, nitrogen and possible pesticides. Controlled water economy of the field enable irrigation with nutritious water.

Efficiency and functionality  Costs of the Practice  Ease of Operation  Potential for nutrient recovery 

Basics of the good practice

- The controlled drainage is best suited for fields with slope up to 2 %. But it is recommended to use on fields with a slope of less than 1 %.
- Best benefit on good permeability soils.
- Conventional drainage system can be updated to controlled drainage. Requires to assess condition of existing drainage system and efficiency of drainage pipes.
- Controlled drainage requires proper adjustment to avoid adverse effect during a rainy season such as surface runoff, soil degradation and crop losses.
- It is called subsurface irrigation or control irrigation when additional water is applied through the subsurface drain.
- When recirculating the drying water, the drainage water is discharged into the storage tank and pumped back to the drainage or open ditches during the growing season.

Controlled drainage:

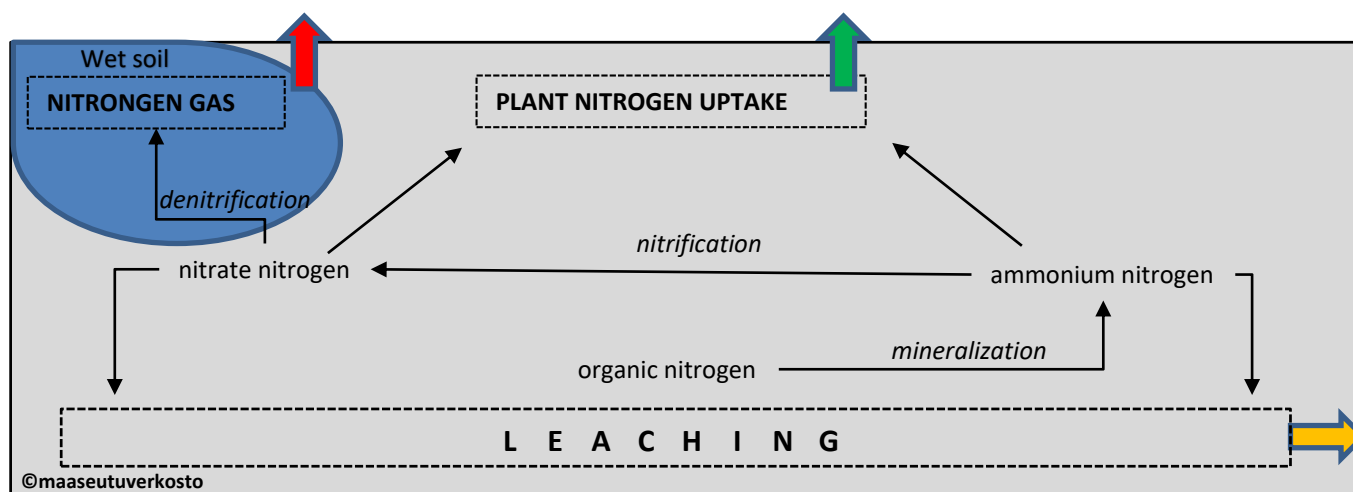
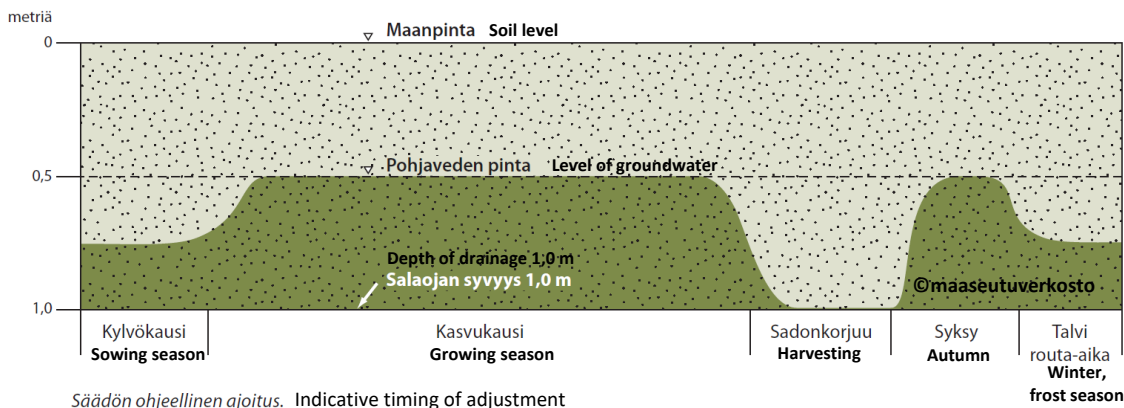
- is aimed to prevent nutrient leaching and therefore diminish the eutrophication of water courses.
- system can intensify irrigation compared to a sprinkling irrigation and consumes far less energy.
- benefits for the soil structure are same like with conventional drainage system. It's advantage is the better control of the water management of the field.
- is useful during mild winters and dry summers that are outcome of the climate change, when the need to control water management in the field is increased.
- gives a change to dam ground water and therefore prevent oxygen transport deeper to possible acidic soil layers. Therefore acidity is formed less than a conventionally drainage fields and dissolution of metal compounds decreases.

Costs of the good practice: In Finland The cost varies between 3000 and 4000€/ha (VAT 0%) for the conventional drainage system. In addition adjustment well and ground water observation well including supplies and work cost around 650€ (2009).

Ability for climate chance mitigation: By controlled drainage can be affected primarily in nitrogen leaching into waterways.

Potential for nutrient recovery: Controlled drainage combined with controlled irrigation might have, but this would need more studies.

Evidence of Success: Soil drainage benefits



The benefits of the controlled drainage compare for the conventional drainage system

- The total runoff decreases, resulting in nutrient leaching is reduced
- Nitrate nitrogen is reduced to nitrogen gas and therefore concentration in the drainage is reduced. Though some of the denitrificated nitrate nitrogen might end up being N_2O , which is one of the greenhouse gas.
- Acidification and leaching of metal compounds with acid sulphate lands are reduced.
- The leaching time can be schedule
- Less rust occurs
- The harvest increases and its quality improves
- Controlled drainage irrigation is a sprinkling water compared to less expensive and consumes less energy

MORE INFORMATION

<https://icid2015.sciencesconf.org/76198/document>
http://agro-technology-atlas.eu/docs/ppt_drainage.pdf
<https://transformingdrainage.org/practices/controlled-drainage/>