Mineral Soil Drainage

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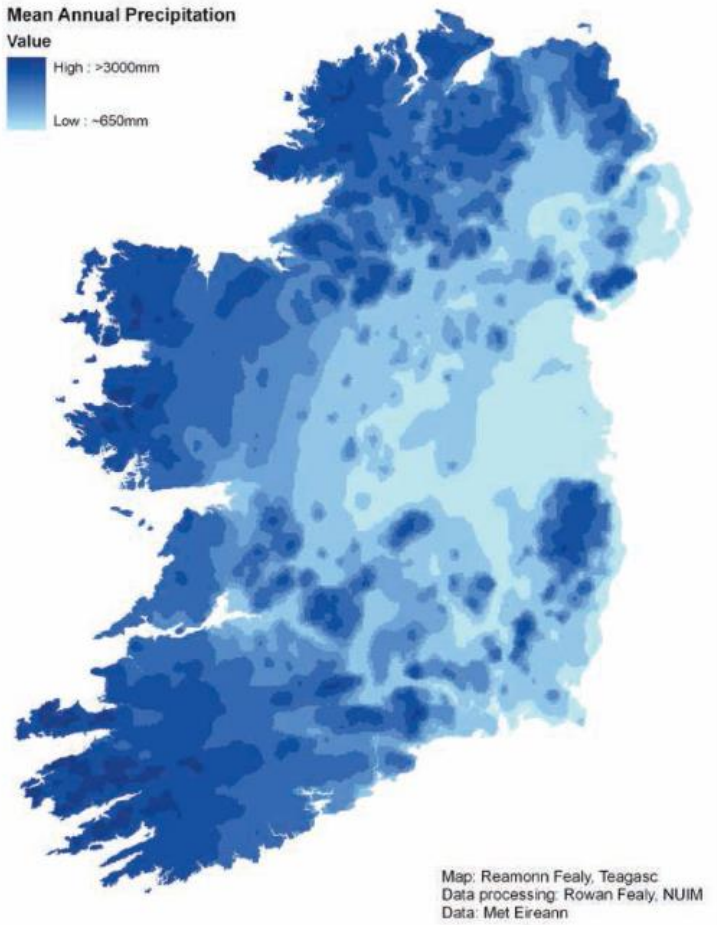
Tillage Forum 2024

Wednesday, 11th September | Keadeen Hotel, Newbridge

(Acknowledgements: Owen Fenton & Pat Tuohy)

Background

- Heavy texture soils occupies just under 50% of Irish land area
- Trafficability for machinery and livestock is a major limitation in wet conditions
- On tillage farms, although soil drainage might be better there may be still a need to control the water table



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Drainage Problems

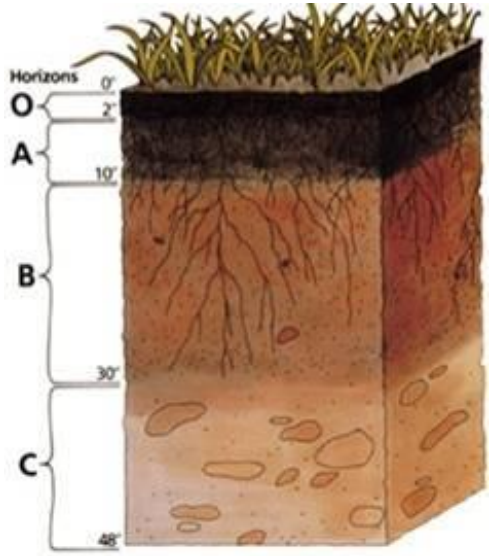
- In free draining soils the rate of water flow through the soil will be higher than all bar very extreme rainfall rates.

- In moderate to poorly drained soil the rate of water flow can be regularly exceeded by rainfall rate due to:

  - Low permeability
  - High Water table due to low lying position and poor out-fall
  - Upward movement of water from seepage and springs

Drainage Investigations

- **Before planning a drainage system, the causes of poor drainage must be understood**



- Are there old maps? Memory of where drains are?

- Walk the site:
  - How does the outfall look?
  - How do the open drains look?
  - Can you find pipes, are they blocked?

REMEMBER: No “one size fits all” solution

You need to dig one or more test pits

- Test pits are dug within the area of concern (1.5 to 2 m if possible)
- After pit is dug, observe water seepage over a number of hours
- Where is water impeded and where is water moving?
- You install a pipe only in a permeable seepage layer where water can move to the pipe.

Examples of water seepage

Types of Drainage System in Mineral Soils

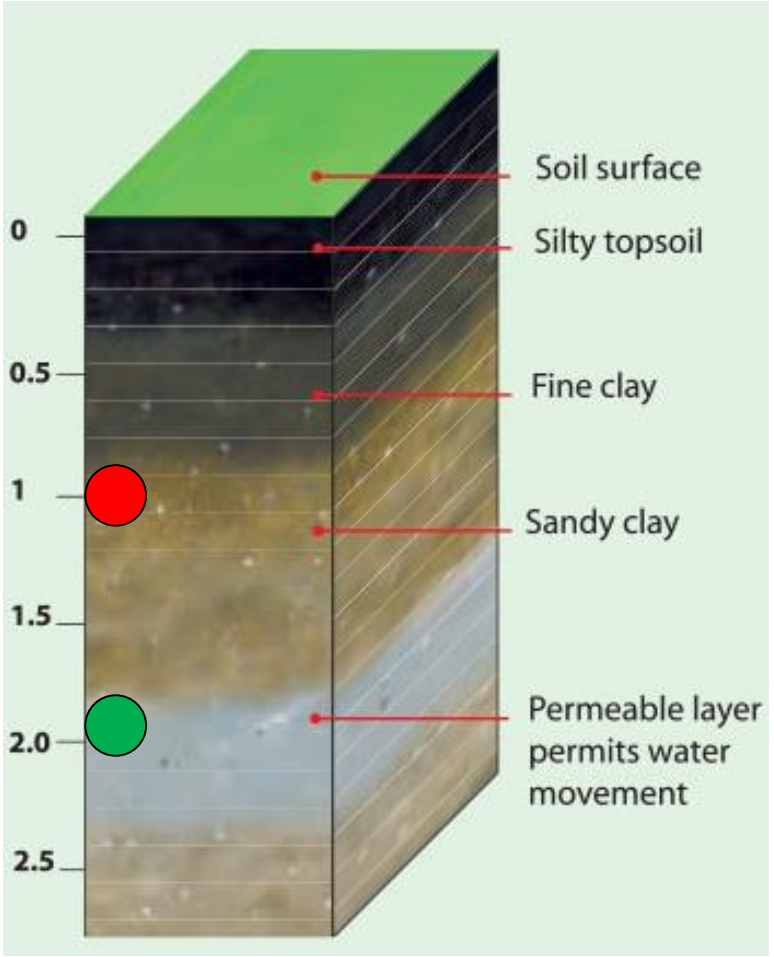
Two principle types are distinguished:

- **Groundwater drainage system:** A network of piped drains exploiting permeable layers.
- In tillage mineral soils

- **Shallow Drainage system:** Where movement of water is impeded at all depths
- In heavy textured tillage mineral soils

Groundwater Drainage System

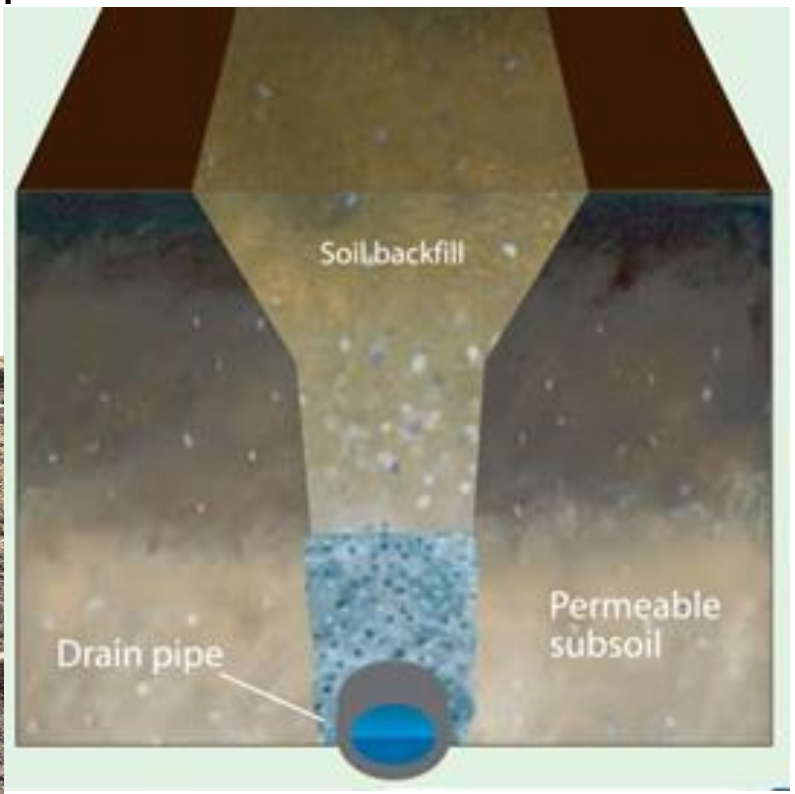
- **Where is the inflow of water to the test pit**
- Controls the watertable by discharging groundwater
- Exploit layers of high permeability → wide spacing's
- Lower watertable allows for natural (cracking, root penetration) or artificial (sub-soiling/ripping)
- Improvements in permeability in the shallower layers



Backfilling Groundwater Drains

Drainage stone should:

- be filled to a minimum depth of 300mm from the drain bottom
- provide connectivity with layer of high permeability
- be **clean** aggregate (10-40 mm / 0.4 -1.5 inch)



Notes on Drainage Pipe and Stone

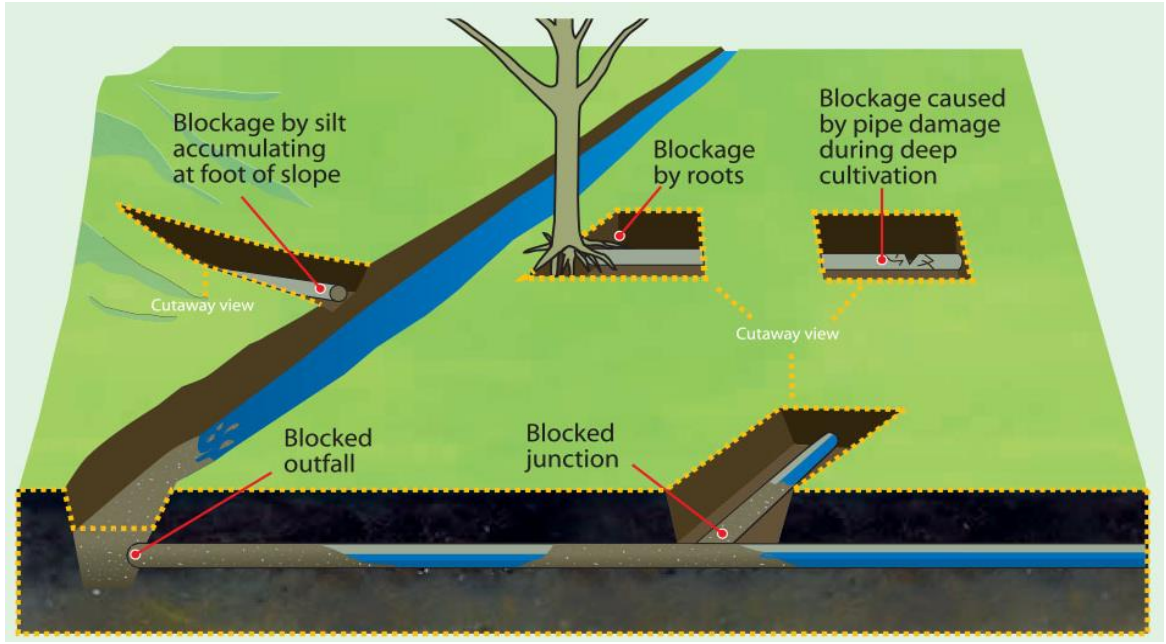
- The drainage pipe facilitates an un-obstructed flow path from the field drain.

- Only short drain lengths (less than 30 m) are capable of operating at full efficiency without a pipe. (also allows maintenance)

- Perforated corrugated pipe is the cheapest and most convenient

- Drainage stone has three functions
  - Hydraulic: facilitate water flow to the pipe
  - Filter: prevent the entry of fine particles to the pipe
  - Bedding: provide support for the pipe and prevent collapse

Maintenance



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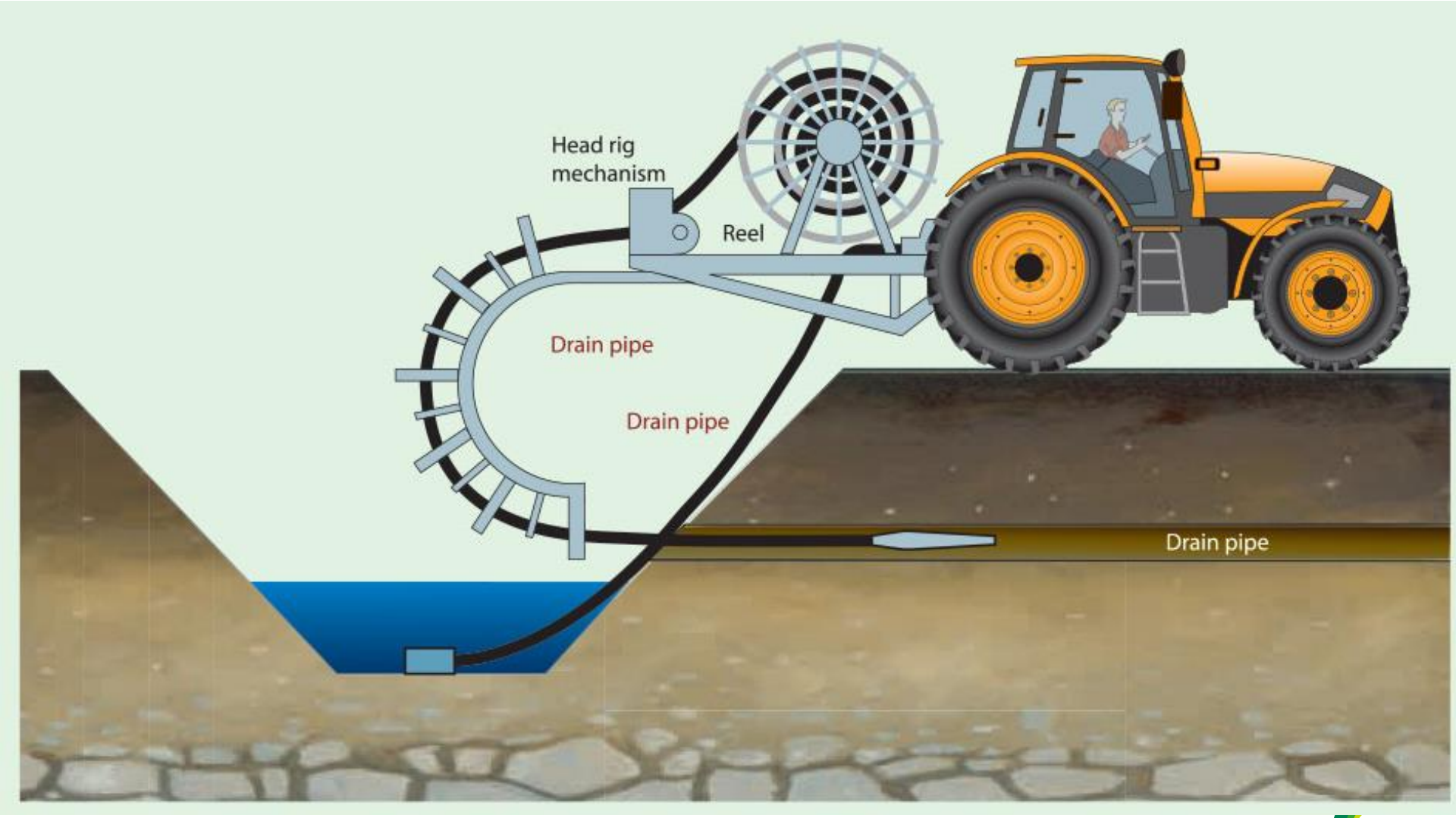
Maintenance



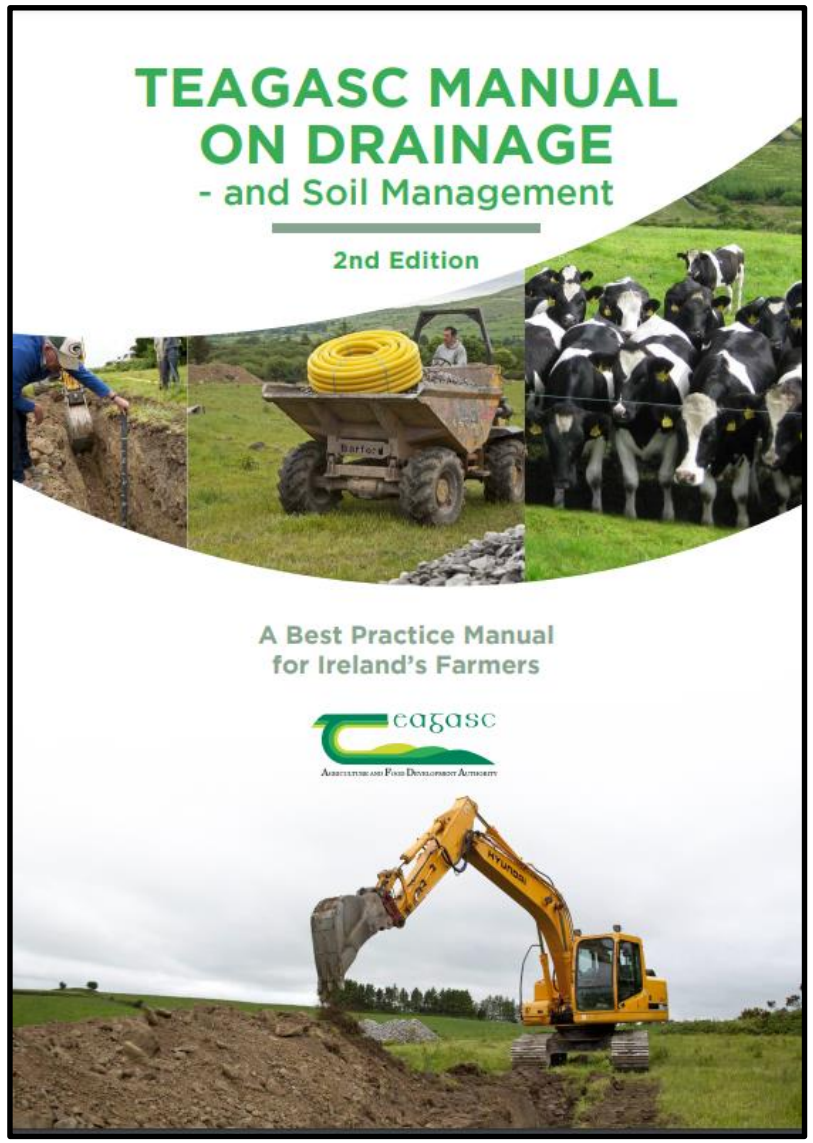
Approximate costs

Piped Drainage System

Drainage System	Spacing(m)	Depth (m)	Cost/m (€)	Cost/Acre (€)	Cost/hectare (€)
Conventional System **(Costly and ineffective)**	8	0.8 - 1.5	5-7	2500-3500	**6200-8600**
Groundwater Drainage	15 - 50	1.0 - 2.5	8-11	1500-2500	**3700-6200**
Mole Drainage	1 - 1.5	0.45 - 0.6	-	50	**125**
Gravel Mole Drainage	1.5 - 2.5	0.35 - 0.5	-	600	**1480**
Collector Drains	20	0.75	5-7	1000-1400	**2500-3500**
Collector Drains	**40**	**0.75**	**5-7**	**500-700**	**1200-1700**

Summary Video

Resources



- Free Manual pdf online

- Hardcopy can be purchased for €40. To order please contact Oakpark Reception on +353 (0)59 9170200 or Email to info@teagasc.ie Discount available to Teagasc Clients

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