Drainage & wet soil management

Dr Bill Cotching
Rule No. 1
Design your drainage in the winter, install drains in the summer
Rule No. 2 – check the outfall

Check the levels to ensure water will flow off your farm otherwise drainage can create flooding.
Rule No. 3

Isolate and Elevate

Isolate lower lying areas from up-slope water

Elevate topsoil by lowering the water table
Rule No. 4
Staged drainage development is recommended.

Outfall
Main arterial drains
Paddock drains – trench or surface
Underground drains
Benefits of investing in farm drainage have been researched in Tasmania

- 20% increase in pasture growth & utilisation (conservative estimate of the benefit)

- 100% return on investment likely in the first year after installation.
Wet soils

- mud
- farmer discomfort – grumpy farmers!
- pugged soil and pasture damage
- slow grass growth
- late start to seasonal growth
- slow stock movement
- restricted machinery access (bogged)
- low pasture utilisation rate
- poor shed hygiene (mastitis, high cell counts)
- bogged laneways
Causes of wet soils

- high regional water table
- landscape position - seepage
- slow permeability
- perched water table
- degraded structure
- non-wetting sands
- surface mat
- intense rainfall exceeds drainage capacity.
Poor soil drainage may be limiting plant growth to the extent that no responses are gained from increased fertiliser use.
40 cm of free draining soil?
Drainage aims to:

- Prevent surface ponding

- Create an unsaturated zone in the surface 40 cm of soil that increases aeration allowing for improved plant growth
Rule No. 1
Design your drainage in the winter, install drains in the summer
You need to know the source of the water, and where it is moving in the soil.
Diagnosing the problem

What to look for when digging soil pits:

* Soil colours

* Where does the water flow into the pit from?
  
  from the bottom; indicates a ground water problem
  from a particular layer; indicates perched water
  from the surface; indicates surface sealing or perching.

* Layers of contrasting texture or hardness, eg. sand over clay,

* Hard concretions of various sizes and shapes,
  
  or soft black segregations often indicate poor drainage.
Do your holes fill with water from the bottom - even slowly?

- yes, deep open surface drains or subsurface drainage is a solution
- no, options are limited to shallow surface drains or hump & hollow
Soil colour & drainage

• Red or yellow spots or streaks (known as mottles) indicate the presence of a fluctuating watertable.
• Blueish-grey colours (Gleyed) indicate permanently waterlogged soils.
Planning

The first step in farm drainage design

Planning for your whole farm is essential because water draining off one part of your farm can flood lower lying areas, or cause serious problems for your neighbours. Drainage can dominate your farm layout.
Drainage influences location of:

fences,

shelterbelts,

laneways and

the shape of paddocks.

Use an aerial photograph/Google image
Beaufield — main arterial drains

Key
- Existing main drains
- Main drains to be constructed
- Main drains to be cleaned
- Outfall

X
Rule No. 2 – check the outfall

Check the levels to ensure water will flow off your farm otherwise drainage can create flooding.

Arterial drains
These major open drains must be the first part of any drainage system.

These ensure that the water can get away.

A minimum grade of 30 cm in 100m will ensure water will flow.
Arterial drain
Rule No. 3

Isolate and Elevate

Isolate lower lying areas from up-slope water

Elevate topsoil by lowering the water table
Isolate different areas for drainage
Elevate!
Surface spoon drain

Trench drain

1.2 m deep
Underground pipe drain

- Perforated polydrain pipe
- Gravel backfill
- Topsoil
- 700 mm deep
- Upslope
Different soil types require different solutions to drainage problems.

**Duplex soils**

Use shallow open drains that feed into main arterial drains.
Duplex soils

* Place cutoff drains at the base of slope - to intercept water before it gets to the flats
* Install broad shallow drains with a road grader or blade
* Spread the soil wide with extra passes
* Clean out every second year with a spinner drainer
* Deep ripping won’t improve drainage.
Duplex soils

Raised beds work well on duplex soils but drainage must have an outfall!
From little things big things grow!
Sandy plains soils
Lappa, Taroona & Nugara sands
Clay soils

Use deep open drains to provide the arteries to get the volume of water away.

- Place 60 - 100 m apart
- Install with an excavator
- Use open or underground drains to connect up with the main drains
- Deep ripping subsoils may help (not in cracking clays).
Clay soils
Peat soils

Open drains 0.5 - 1 m deep work best
Don’t over-drain as peat shrinks & difficult to rewet
Check for acid drainage & don’t let water table drop.
Hump and hollow drains work best on soils without contrasting subsoil layers.
Mole drains

Work only on soils with > 35% clay
Rule No. 4
Staged drainage development is recommended.

- Outfall
- Main arterial drains
- Paddock drains – trench or surface
- Underground drains
Drain management
Drain management

Deep open ditches need to be fenced on both sides to keep the stock out and to minimise maintenance.
Drain maintenance
Drain maintenance

* Spray out plant growth in the spring & autumn

* Machine clean when the drain becomes clogged with growth or silt
Laneways
Laneways

- *Cambered surface with metal topping to shed water sideways*

- *Provide side drains to stop water entering paddocks fences on lane side of drain.*

- *New metal / regrade/ compact in the summer*
Gateways

- *Use wider gateways to take the pressure off narrow access*

- *Drop a section of electric fence to use as a temporary gateway*

- *keep the trough well away from the gate*
Salinity management

"The four main salinity problems on King Island are:

1. Waterlogging
2. Waterlogging
3. Waterlogging
4. A little salinity

The three main things that must be done to manage salinity on King Island are

- drainage,
- drainage and drainage.

Costs

- Open drains
  excavator digging 80 - 100 m/hr ($80 – 100 /hr)

- Shallow surface drains
  grader $80 /hr

- Subsoil drains
  backhoe, slotted agpipe, gravel backfill
  $ 3/m for pipe total = $7 - 8 /m
Tim Terry
Tasmanian Land Drainage Pty Ltd
844 Mole Creek Rd
Needles, TAS 7304, Australia
Phone: 0418 130 464

Low cost options for grazing

- Start the winter with more grass cover
gives more flexibility & greater soil protection
- Low-lying wet paddocks should be grazed early
to save having to graze them on a long round in winter.
- Known dry paddocks should be targeted for later grazing.
- Try a later calving date
Low cost options for grazing

- Back fence so that cows can’t pug grazed areas
- On-off grazing; Cows can eat their daily ration within 3 hours. Remove the cows onto a sandy bank, lane way or sacrifice paddock for the remainder of the day.
- Feed out hay/silage on sandy banks
- Sacrifice paddock – follow up with a spring turnip crop & new pasture
- Give the cows a bigger break in wet weather
Low cost options for grazing

✶ Ignore the cows; Don’t ignore the problem.
   Do not go visiting the cows
giving them an excuse to walk up and down the fence.

✶ Adopt more than one strategy and remain flexible.
Longer term alternatives

- Agistment
- Feedpad
- Install drainage
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Rule No.1: Design in the wet, install in the dry
Rule No. 2: Check the outfall
Rule No. 3: Isolate & elevate
Rule No. 4: Stage drainage development
Thank You!