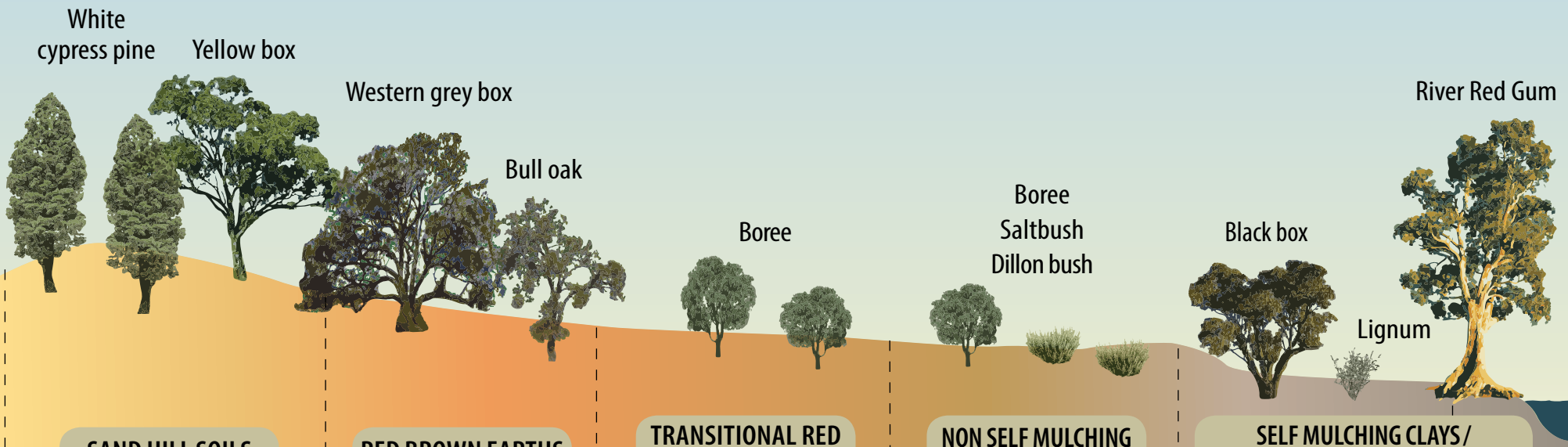
MATCH IRRIGATION SYSTEMS TO SOIL TYPE
RIVERINE PLAINS SOUTH-EAST AUSTRALIA



SPRINKLER IRRIGATION

Increasingly marginal →

- Sprinkler application of small, precise depths (15-30 mm) with a generally high instantaneous application rate.
- Best suited to - soils with low water holding capacity and high final infiltration rates (> 5 mm/hr) – i.e. sands and loams.
- Not suited to heavy clay soils particularly sodic soils.
- Application rate determined by machine capacity: recommend 15-20 mm/day.
- Irrigation scheduling is essential to maximise yield and minimise operating cost.

BORDER CHECK IRRIGATION

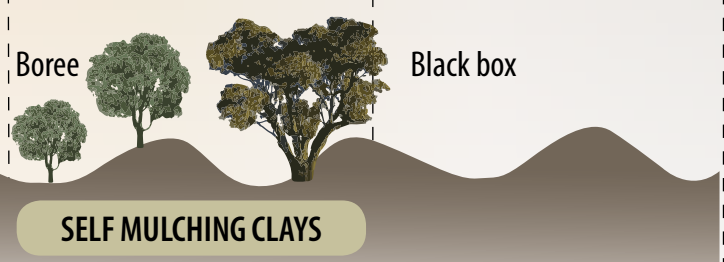
Increasingly marginal →

- Surface irrigation down the grade between borders. Soils with higher infiltration rates require shorter bays.
- Best suited to – soils with moderate final infiltration rates (3-5 mm/hr).
- Not suited to – very high infiltration rate soils (i.e. sands) where deep drainage losses will be severe; or long bays on flat terrain (< 1:1,500) and heavy clay soils where poor surface drainage will cause waterlogging.
- Application rate determined by soil type, dryness prior to irrigating, bay length and flow rate per meter width.

BASIN IRRIGATION (CONTOUR, V-BAYS, BEDS-IN-BAYS)

- Surface irrigation into a basin with a complete border dyke.
- Best suited to – "rice" soils with very low final infiltration rates (0.5-2 mm/ hr with, typically, an EM38 reading > 150 mS/m); flat terrain (< 1:1,500) ; and beds in bay systems on non-subbing soils.
- Not suited to – soils with moderate to high infiltration rates where deep drainage will be severe and application uniformity very low.
- Application rate determined by soil dryness prior to irrigating, degree of soil cracking and bay size and flow rate.
- Good surface drainage is needed if yield loss through waterlogging is to be avoided.

SPRINKLER SYSTEMS ARE ALSO SUITED TO SELF MULCHING CLAYS →



FURROW IRRIGATION

- Surface irrigation of furrows (beds or hills) running down the slope.
- Best suited to – soils with good "subbing" properties (i.e. self-mulching clays).
- Not suited to – soils with very low infiltration rates and where slaking and/or dispersion limit subbing and water entry.
- Application rate determined by soil dryness prior to irrigating, degree of soil cracking, and run length and flow rate.

LOW ← WATER HOLDING CAPACITY / DEPTH OF WATER APPLIED PER IRRIGATION → HIGH

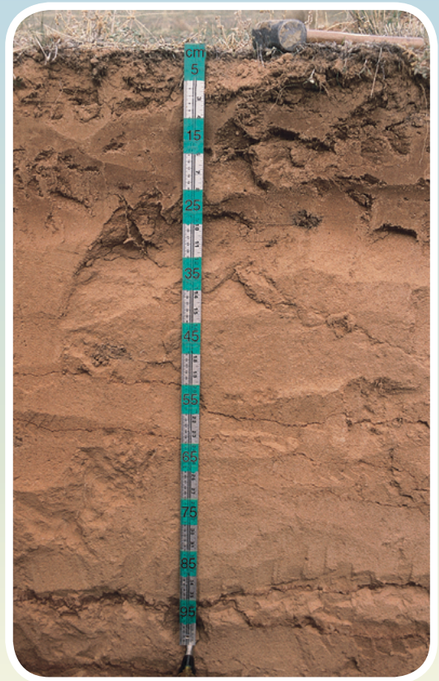
HIGH ← INFILTRATION RATE / FREQUENCY OF IRRIGATIONS → LOW ← MEDIUM

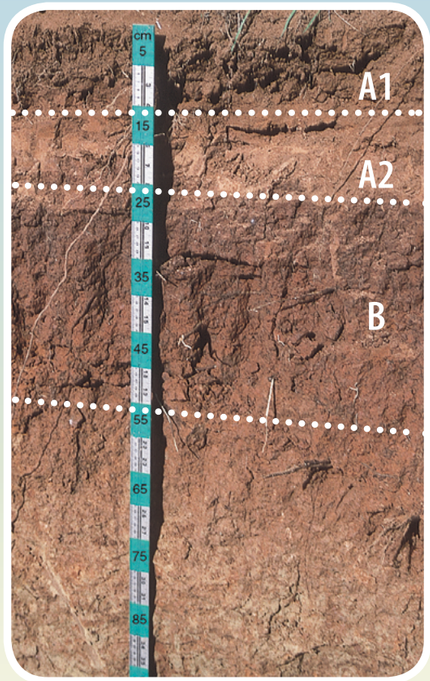
Surface drainage and supply are BOTH important

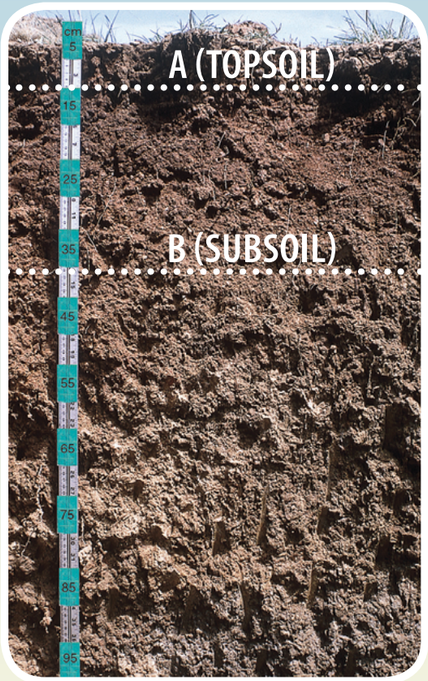
A good irrigation system gets water on and off in 10–12 hours

MATCH IRRIGATION SYSTEMS TO SOIL TYPE

SOIL GROUPS OF THE RIVERINE PLAINS SOUTH-EAST AUSTRALIA







SAND HILL SOILS

Readily available water: 20–30mm
Final infiltration rate: > 120mm daily

- Sandhill soils have a topsoil of loose sand greater then 15 cm in depth.
- Some sands have a dense clay subsoil. This sub-soil can restrict root growth and water entry and lead to waterlogging from perched watertables.
- These soils are best suited to frequent irrigation of small application depths using sprinkler irrigation because of their low water holding capacity and high permeability.
- Irrigation scheduling is strongly recommended to avoid both under and over watering
- These soils are NOT suited to surface irrigation

RED BROWN EARTHS

Readily available water: 45–60mm
Final infiltration rate: 30–120mm/day

- Red-brown earths are texture contrast soils. They have a topsoil of sandy-loam to light clay loam overlying a clay subsoil. The lighter (coarser) textured topsoil is between 10 and 40 cm thick and varies in colour from red to grey/brown. The lower topsoil is called the A2 horizon and it may be bleached. Subsoil varies in colour from yellow to red to grey.
- These soils are well suited to both sprinkler and border check irrigation because of their good surface slope and fair internal drainage.
- These soils are NOT suited to basin irrigation because their infiltration rates are too high.

TRANSITIONAL RED BROWN EARTHS

Readily available water: 45–70mm
Final infiltration rate: 10–30mm/day

- Transitional red-brown earths are texture contrast soils that have shallower and usually heavier textured topsoil and deeper and heavier textured, often sodic, subsoils compared to red-brown earths.
- These soils are best suited to surface irrigation; both border check and basin. They are well suited to rice production in basin systems, particularly where sub-soils are sodic.
- High clay content and sodicity result in very low infiltration rates, so soil moisture monitoring is recommended under sprinkler systems to check that soils are wet deeply enough with each irrigation.
- These soils are NOT suited to furrow irrigation down the slope if slaking and hardsetting restricts subbing. Poor subbing is overcome in terraced beds-in-bays systems by over-topping the beds.

NON SELF MULCHING CLAYS

Readily available water: 50–75mm
Final infiltration rate: 1–10mm/day

- Non self-mulching clays have a uniform clay content through the profile (i.e. no abrupt texture change between top-soil and sub-soil) with a shallow crust like topsoil. They are sodic and this leads to dispersion, poor structure and very low infiltration rates.
- These soils are well suited to rice production in basin systems.
- Sodicity and low slope combine to predispose these soils to waterlogging. To minimize this risk, keep bays less than 400 m long. For basin systems, either have a minimum grade of 1:2000 on contour bays OR use beds in terraced bays.
- These soils are NOT suited to sprinkler irrigation.

SELF MULCHING CLAYS

Readily available water: 85–90mm
Final infiltration rate: 20–80mm/day

- Self-mulching clays are uniform clays with a crumbly, well developed surface structure. They often occur as the 'mound' in gilgai formations.
- These soils are well suited to most forms of irrigation because of their stable structure and good internal drainage.
- They may NOT be suited to ponded rice production because their macro-pore stability can result in high water use.

Department of Primary Industries
Local Land Services – Murray

Prepared by Sam North and Alex Schultz, NSW Department of Primary Industries - Deniliquin