

SOIL 5110 Section 379

Cropland Irrigation Management

- Book:
- Irrigation of Agricultural Crops
- <https://dl.sciencesocieties.org/publications/books/tocs/agronomymonogra/irrigationofagr2>
- http://dasnr.adobeconnect.com/soil5110_379/

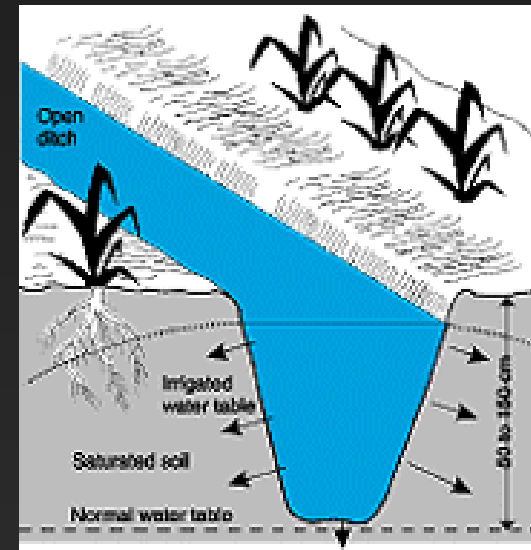
Irrigation systems

Basic Types of Irrigation Systems

- ◉ Surface irrigation
- ◉ Subsurface irrigation
- ◉ Sprinkler irrigation
- ◉ Drip/trickle irrigation

Subsurface Irrigation

- Also call subirrigation
- Artificial regulation of groundwater table elevation
- Can be used where water table is naturally shallow or where impermeable layer is overlaid by highly permeable soil
- Very uncommon irrigation technique



Surface Irrigation

- ⦿ Water flows across the soil surface to the point of infiltration
- ⦿ Oldest irrigation method and most widely used world-wide (90%) and in U.S. (60%)
- ⦿ Used primarily on agricultural or orchard crops

Types of Systems

◎ Water Spreading or Wild Flooding

- > Relatively flat fields -- allow water to find its own way across the surface
- > Minimal preparation and investment
- > Rather inefficient

◎ Basin

- > Dikes used to surround an area and allow for water ponding (no runoff)
- > Basins are usually level





Basin irrigation soil needs

- ◉ Nearly level or artificially leveled
- ◉ Uniform infiltration rates
- ◉ Moderate to low infiltration rates

Basin irrigation water needs

- ◉ Applications depths
 - > 2-4 inches (50-100 mm)
- ◉ Application Rates
 - > >20 gpm/foot of width (2 L/s/m of width)
- ◉ Because there is no runoff, application depth is equal to
 - > inflow rate * time
- ◉ Water can be applied from
 - > Ditches by cutting ditches or siphons
 - > Or piped from reservoirs or pumped from ground water

Irrigation Uniformity

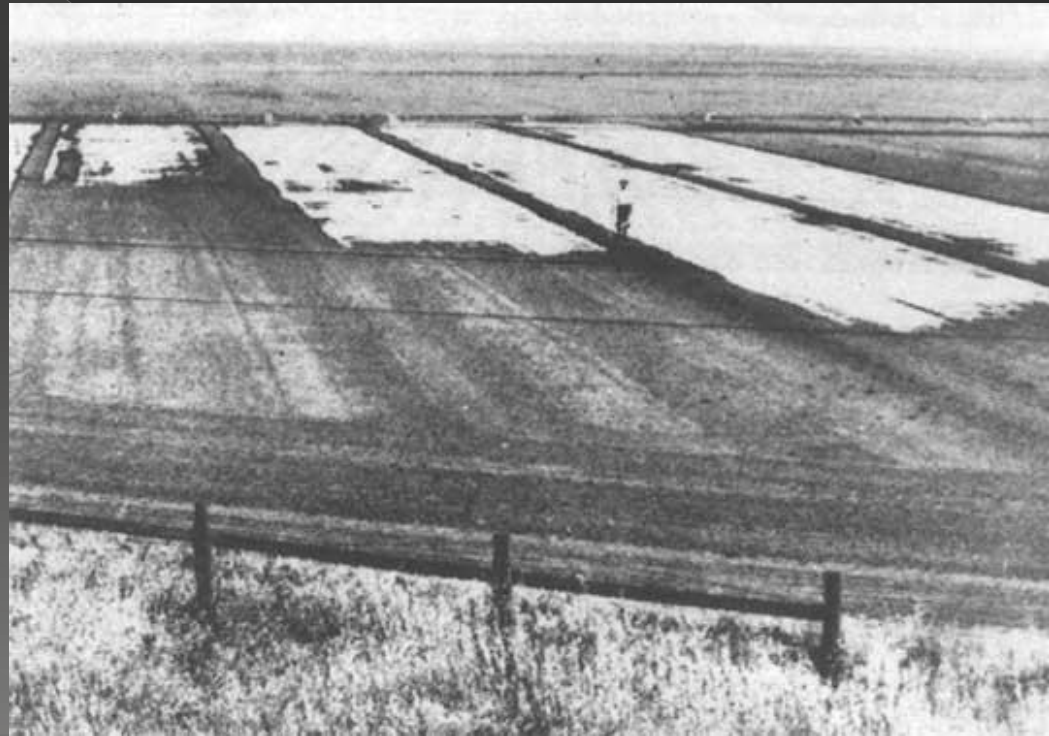
- ◎ Uniform elevations is critical
 - > Stdev of elevation must be $<30\%$
 - > Low areas will be over watered
- ◎ Uniformity of application can be estimated by relative ponding times
 - > If application is fast enough relative to water infiltration.

Flex pipe applying water to rice basin on Arkansas



Border Irrigation

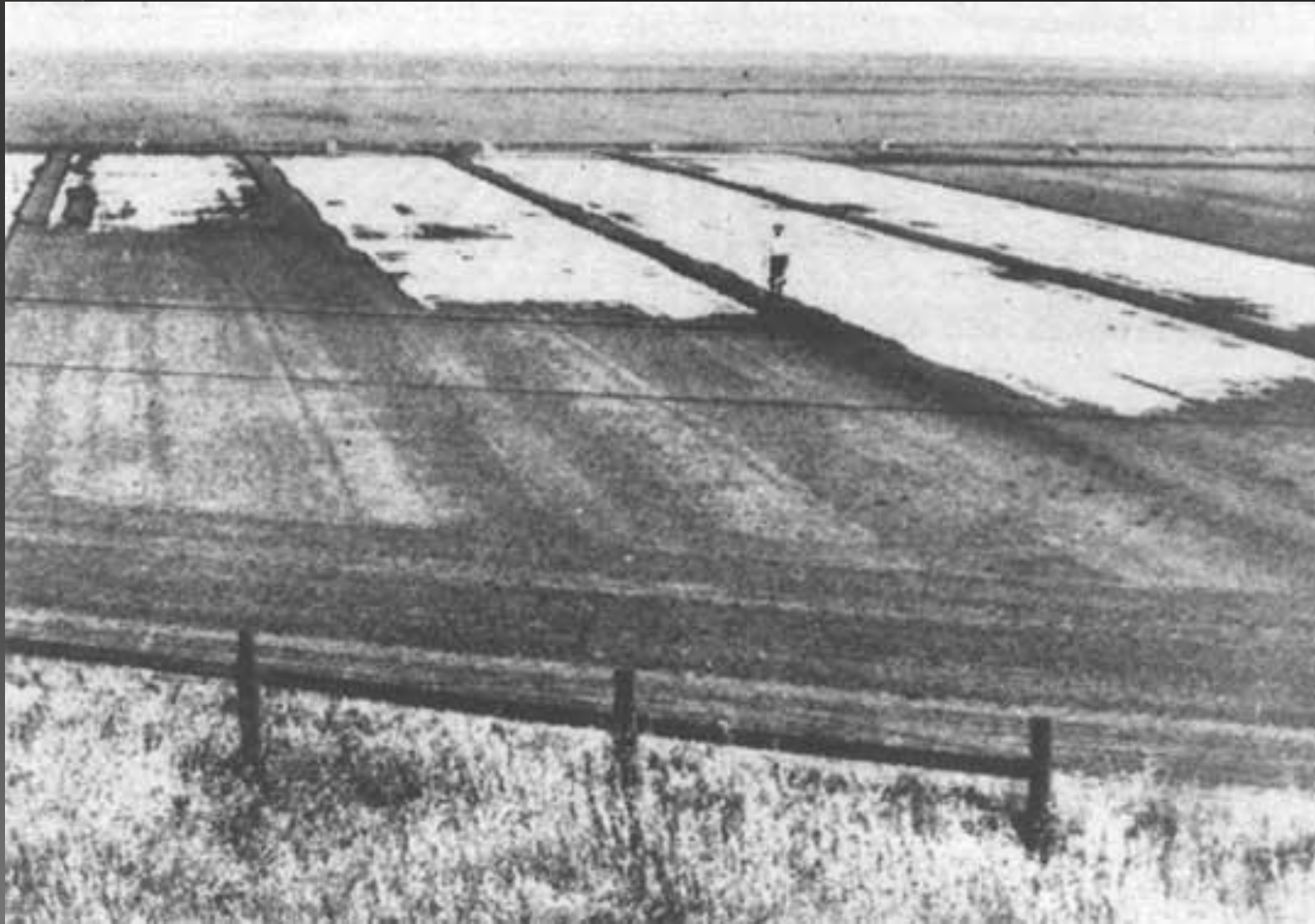
- ◎ Strips of land with dikes on the sides
- ◎ Strips are graded to provide a uniform slope
- ◎ Downstream end may be diked, or have outlet
- ◎ Used for narrow row crops, pastures, and forage crops



Boarder Irrigation

- Used on fine textured soils to allow for surface drainage
 - > Avoids soil aeration and salinity problems
- Requires large water supply rates
 - > But less than basin irrigation
 - > Can irrigation individual basins
- Slopes should be less that 0.5%
- Steeper slopes will cause erosion and crop damage

Boarder Irrigation



Furrow

- ⦿ Small channels carry the water (entire surface is not wet)
- ⦿ Commonly used on row crops
- ⦿ Lateral as well as vertical infiltration
- ⦿ Furrows are usually graded





Furrow Irrigation

- ◉ Water is often applied to each inter-row space
- ◉ Can use skip row applications in fine textured soils
 - > Decreases water requirement
- ◉ Wide beds can be used in narrow row crops

Furrow irrigation

- ◉ Uniform slope of 0.1-3%
- ◉ However, Steep slopes will result in erosion but can be beneficial on coarse textured soils
- ◉ System designs are dictated by soil type and slope

Furrow irrigation

- Furrow lengths are generally 600-1200 ft long
- Short runs may be needed for
 - high infiltration rates
 - to allow for low inflow rates
- Prevent erosion on steep slopes

Furrow irrigation

- Uniform water distribution depends on rapid movement of water across the field
- Inflow rates range from 2-12 gpm/ft (0.2-1.2 L/s/m)
- Soil infiltration is a critical factor in the relationship between inflow rate and application uniformity
- Rapid flow is often followed by a reduction in flow

Water Supply

◎ Methods of water supply

- > Head ditch with siphon tubes or side-opening gates
- > Gated pipe (aluminum or plastic pipe with small gates that can be opened and closed)
- > Buried pipeline with periodically spaced valves at the surface







Water Management

◎ Runoff recovery systems

- > Drainage ditches for collecting and conveying runoff to the reservoir
- > Reservoir for storing the runoff water
- > Inlet facilities to the reservoir (including desilting basin)
- > Pump and power unit
- > Conveyance system for transporting water (to same or different field)