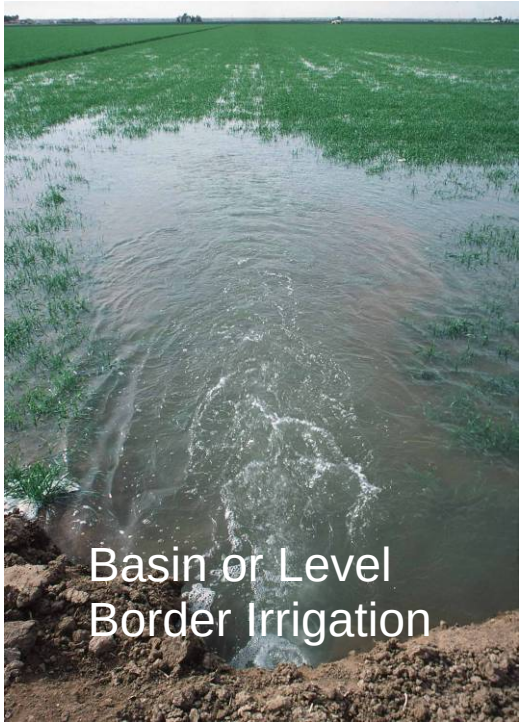
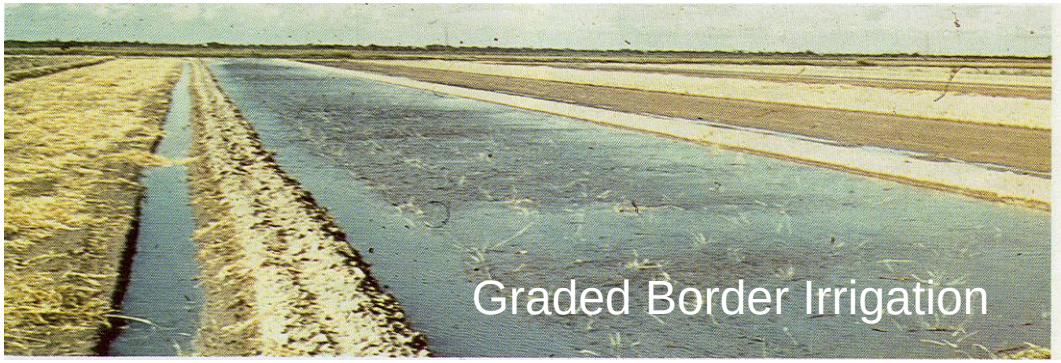
This Chapter Includes:

- Methods of applying water
- Effect of land slope
- Requirements, Considerations, Advantages/Disadvantages

Surface Irrigation Methods





Surface Irrigation Systems

Method	Adapted to	Conservation Features	Eff. %
Basins or Level Border	Close-growing crops on flat land with sandy soils.	Provides good control of water applied. Good for alkali control.	60-80
Graded Borders	Hay or grain on uniform slopes up to 3%; established pasture on uniform slopes up to 6%. Best adapted to light soils.	Provides uniform wetting and efficient water use. Utilizes large water streams safely and thus less time is required to cover area.	60-80
Corrugations	Close-growing crops on sloping land with soil slow to take water. Extreme care is needed in applying water to slopes of more than 2%.	Provides uniform wetting and prevents erosive water accumulation on land too rolling or steep for borders or basins. Makes use of small streams.	40-55
Furrows	Row crops, truck crops, orchards, vineyards and berries on gentle slopes with all but coarse-textured soils.	Provides no conservation features unless furrows laid on nearly level land on the contour and water applied with extreme care.	60-80
Controlled Flooding	Close-growing crops on rolling land; pasture sod established by corrugations or sprinkler.	Provides water control and fairly uniform wetting where land cannot be used for other methods.	65-80
Wild Flood	Water is allowed to flow over the land without the use of furrows, borders or other structures.	Provides little to no water control and non uniform wetting on sloping and rolling lands.	25-40

Factors Affecting the Selection of Surface Irrigation Systems

TYPE OF SYSTEM	MAX. SLOPE		WATER APPLICATION RATE OF INTAKE FAMILY		SHAPE OF FIELD	ROW CROPS	ADAPTABLE TO SOWN DRILLED OR SODDED CROPS	ORCHARDS AND VINEYARDS	LABOR REQUIRED (min/acre)	APPROXIMATE COST ($/ac)
	Non-Sodded Crops	Sod Crops	MIN	MAX						
Basins, Level Border	Less than .1% Slope		0.1	2	Any Shape	Yes	Yes	Yes	6-30	2.7-4
Graded Borders	Greater than 0.1% Slope		0.1	2	Any Shape	Yes	Yes	Yes	6-30	2.7-4
Corrugations	4.00%	8.00%	0.1	1.5	Any shape	No	Yes	Yes	25-72	1.4-2.7
Furrows	3.00%	NA	0.1	3	Rows should be equal in length	Yes	Yes	Yes	25-72	2.7-8.1
Controlled Flooding	0.10%	NA	0.3	2	Rectangular	No	Yes	Yes	12-60	2.7-8.1

Sprinkler Irrigation Methods

Sprinkler Irrigation Systems

Method	Adapted To	Conservation Features	Eff. %
Linear Move	Nearly all crops on any irrigable soils, except in very windy hot climates.	Provides good control of water applied. Good for rectangular fields, may be equipped with drop tubes and various spray heads to reduce wind drift and evaporative losses and can operate on low pressures.	75-90
Center Pivot		Application uniformity is usually high, labor requirements are low and pressure requirements are often low. Results can be accomplished on fields which are less than a full circle.	75-90
Fixed Solid Set		Labor requirements are low, easily automated and application uniformity is usually high.	60-75
Side Rolls		Good for rectangular fields, not adapted to tall crops, alignment may be difficult on undulating topography.	60-75
Hand Move		Good for irregular shaped hills and rolling terrain, not suited for tall crops. More labor intensive than a side roll system.	60-75
Big Gun (Traveling or Stationary)		Good for irregular shaped fields, suited for high intake rate soils, wind greatly affects water distribution pattern. Manual labor minimized.	55-65

Factors Affecting the Selection of Sprinkler Irrigation Systems

Type of System	Max. Slope (%)	Water Application Rate. Min. (in./hr)	Water Application Rate. Max. (in./hr)	Shape of Field	Field Surface Conditions	Max. Height of Crop (ft.)	Labor Required (hrs/ac.)	Size of Single System (ac.)	Approx. Cost ($/ac)	Adaptable To: Cooling and Frost Protection	Adaptable To: Chemical Application	Adaptable To: Fertilizer Application	Adaptable To: Liquid Animal Waste Distribution
Linear Move	20	0.2	1	Circular,	Clear of obstructions and path for towers	8-10	.05-.15	40-160		No	Yes	Yes	Yes
Center Pivot	20	0.2	1.5	Square, or Rectangular				40-320					
Fixed Solid Set	No limit	0.05	2	Any shape	No limit	No limit	.2-.5	1 or more		Yes			
Side Rolls	10	0.1	2	Rectangular	Reasonably smooth	4	1-3	20-80		No			
Hand Move	20	0.1	2		No limit	No limit	.5-1.5	10-40					
Big Gun (Traveling or Stationary)	5	0.25	1	Any shape	Safe operation for tractor and lane for boom and hose	8-10	.1-.5	20-40					

*** Irrigation water shall be available on demand or if on rotation sufficient water storage is required! ***

Trickle Irrigation Methods

Subsurface Trickle

Micro Spray or Mist

Trickle Irrigation Systems

Method	Adapted To	Conservation Features	Eff. %
Surface Trickle	All terrains and most agricultural crops and soils including steep or rocky ground that is unsuitable for other forms of irrigation.	Permits storage of water in lower part of soil profile, good control over timing and water application, less water required, chemicals and fertilizer are efficiently applied, runoff and deep percolation are controlled, can be used on soils with low infiltration rates and low water-holding capacity. Easily automated.	85-95
Subsurface Trickle			
Micro Spray or Mist			85-90

Factors Affecting the Selection of Trickle Irrigation Systems

Type of System	Max. Slope (%)	Max. Water Intake Rate Soils (in./hr)	Shape of Field	Adaptable to		Sown, Drilled or Sodded Crops	Labor Requirements (hrs/ac)	Approx. Cost ($/ac)
				Orchards and Vineyards	Row Crops (row or bedded)			
Surface Trickle	No Limit	Any	Any Shape	Yes	No	No	0.06	
Subsurface Trickle	5	1.5		No	Yes	Yes		
Micro Spray or Mist	No Limit	Any		Yes	No	No		

Improving Efficiencies of Existing Irrigation Systems

Irrigation System	Ways to Improve Efficiencies
Surface	➢ Decrease the set time or irrigation frequency ➢ Land level fields or modify the slope ➢ Use gated pipe or cablegation ➢ Use surge irrigation ➢ Cutback inflow ➢ Use furrow diking ➢ Reuse tailwater
Sprinkler	➢ Check for leaks in the system ➢ Change out worn sprinkler heads or nozzles ➢ Use an irrigation timer ➢ Decrease set time or irrigation frequency
Trickle	➢ Check for plugged filters ➢ Don’t over estimate water requirements ➢ Address plugging problems in emitters ➢ Avoid excessive backflushing