

CHARACTERISTICS OF DIFFERENT SPRINKLER SYSTEMS¹

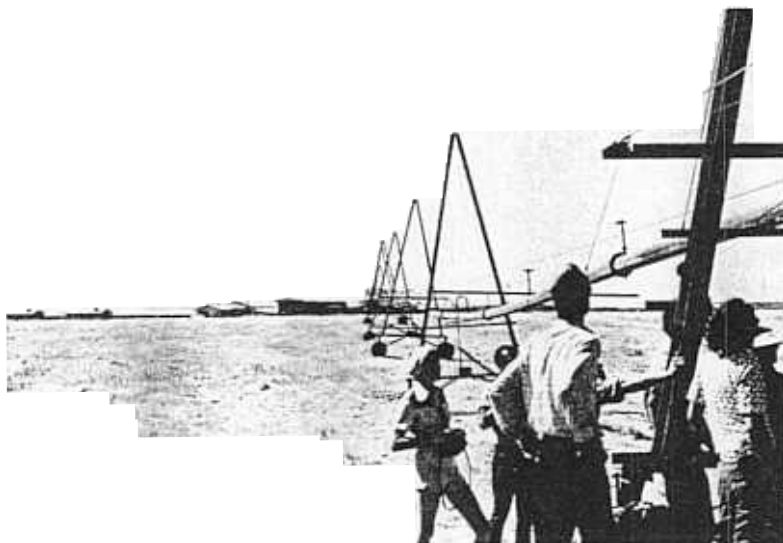
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Sprinkler systems can be divided into portable, semi-portable, and permanent types.

Portable systems are made entirely of movable pipe from the water source to the lateral. The pipes have manual couplers for ease of set up and disassembly. These systems can be further divided into continuous mechanical move, intermittent mechanical move, and hand move.

The center pivot is an example of the continuous mechanical move system. This is a circular self-propelled lateral that pivots about a central point. Water is supplied at a central point to the pipeline suspended between adjacent towers along the lateral at intervals. The lateral support between towers is by cable or truss arrangement. Each support tower has wheels, tracks, or skids together with a means of driving them. The application rate increases outward along the lateral to compensate for the increased area of coverage as the radius lengthens. It is the higher application rates at the outer ends which limits this type of system to coarser, high infiltration rate soils. Placed on soils with intake rates of less than one inch per hour, these high pressure systems may lead to severe runoff problems. Low pressure systems with spray nozzles are restricted to soils of even higher intake rates, some requiring up to three inches per hour soil intake rate.

A straight line continuous move system removes water from a ditch while moving down a field. The application rate is constant along the lateral so that it can be used on considerably tighter soils than the center pivots by reducing the sprinkler application rates. Another type is equipped with a flexible hose to supply water. The hose is wound up by a cable winch.



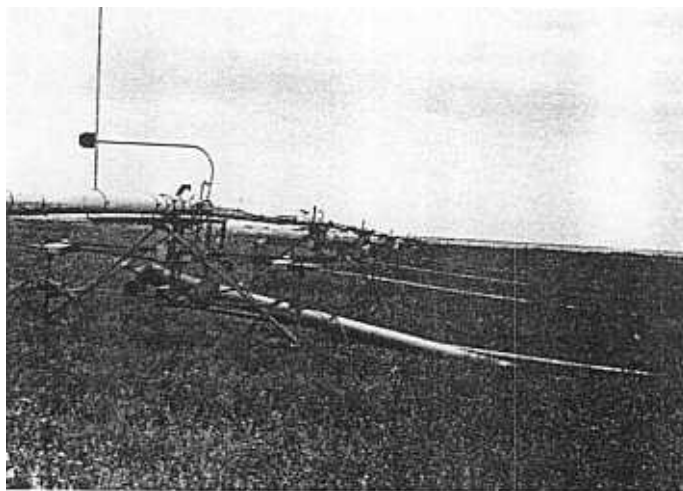
Continuous mechanical
move - center pivot

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The semi-portable systems have permanent mains and submains and portable laterals. The mains might be bolted together and left above ground to facilitate movement after the crop is mature. One type is the intermittent mechanical move sprinklers moved to a desired position, connected to a pipeline for water application, and then drained for movement to the next site. An example of this type is the side roll wheel move. It uses the pipe as an axis which is supported on wheels that are large enough to allow the axis to pass over the crop. These units can be driven with electric or hydraulic systems on tractors. Some have a shaft extending the length of the lateral which is driven from one end by a portable gasoline motor that can be used to move several laterals. These units need drain valves for drainage before moving, wind breaks to prevent wind movement, balanced sprinkler heads, and hose connections or telescoping pipe connectors. These units may have trailer lines at 40 to 50 foot intervals with from one to three sprinklers.

Another example of intermittent move is the drag line or trailer line. This has a pipeline supported on a tandem wheel carriage. Sprinklers may or may not be located on the main pipeline while laterals are connected underneath. The trailing laterals may have from two to 11 sprinklers at 40-foot intervals. Stabilizers may be provided to help hold the risers in an upright position. The lateral is driven from a motorized shaft that drives each wheel by chains or gears or belts. Some of these units have wheels that can turn 90 degrees for end towing.



Semi-portable - Intermittent move - Lateral drag

Large volume sprinklers have the sprinkler mounted on a wheeled cart or trailer and are moved from set to set by hand or tractor. A similar volume application can be made by sprinkling machines that are motor driven wheel or track vehicles. They straddle an open ditch or tow high pressure flexible hoses. In some instances the units are towed by cable. These units apply water at a generally high instantaneous rate and are restricted to soils that have high aggregate strength and high intake rates. Difficulty will be encountered in seedling stages due to crust formation at the outer reaches of the sprinkler jet on the tighter and weak aggregate strength soils of Imperial Valley.

Hand move lateral systems are one of the oldest types. They are supplied with quick coupling joints and rotary head sprinklers. The light weight aluminum pipe in today's systems range from 20 to 40 feet in length. These may be used in paired laterals which apply irrigation to a strip of crop and are then moved to the next strip. This allows a much smaller pump than if the entire field were sprinkled at once. Labor is substituted for capital cost.

A solid set portable system uses the same type of pipe as the hand move, but covers an entire field. The irrigation of a field can then be completed without entering the wet soil. The entire field may be sprinkled at one time or the lines can be sequenced in pairs using valves to turn laterals on and off. This system is most common in Imperial Valley to germinate many crops, including alfalfa.



Solid set portable

The permanent solid set system has pipes permanently installed below ground and risers permanently in place. These systems are characterized by a high initial cost but low labor requirement. Injection of chemicals into the system can replace infield traffic compaction and aerial spraying costs.



Permanent solid set

The following table compares these examples with flood irrigation costs. There are many other types of sprinkler systems available which can be placed in the categories described. The readers are referred to the third edition of Sprinkler Irrigation published by the Sprinkler Irrigation Association and edited by C. H. Pair, W. W. Hinz, C. Reid, and K. R. Frost, 1975, for a more comprehensive discussion of sprinkler systems.

Comparative Cost Estimates of Irrigation Systems for Alfalfa Culture in Imperial Valley, California, in Dollars per Acre¹

	Center pivot with cornering at high pressure	Wheel line	Hand move	Permanent solid set	Flood
Investment/acre.	533	420	360	935	425
Depreciation	43.25	35.25	29.25	46.75	9.25
Interest	20.25	16.80	14.40	37.40	26.60
Taxes	10.10	8.40	7.20	18.70	8.50
Total overhead	73.60	60.45	50.85	102.85	44.35
Irrigation prep.	-	-	-	-	10.00
Labor	10.35	62.10	124.20	20.70	45.00
Power	108.50	82.60	82.60	82.60	-
Water	28.00	28.00	28.00	28.00	28.00
Repair	15.35	12.60	14.70	25.20	4.20
Total operating	162.20	185.30	249.50	128.50	87.20
Total cost	235.80	245.75	300.35	231.35	131.55

1 Data based upon Elias Fereras, et al (1978) Irrigation Costs. Div. Agric. Sci. Leaflet 2875. University of California. Corrected to 7 feet of water from district ditches at \$4/acre foot and power at \$.03/kilowatt hour.