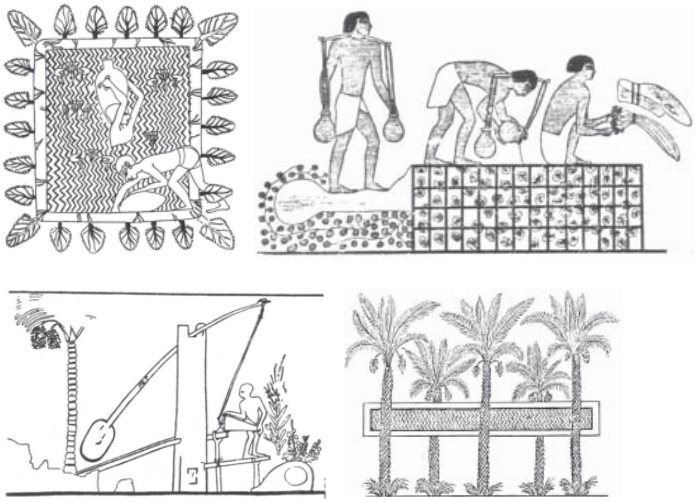
Irrigation Technology

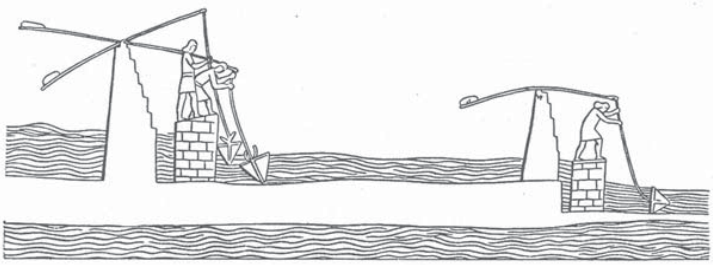
Egyptian



Hand watering of cabbage seedlings in Sumatra, 1973.

Assyrian

Assyrian Dam of rough masonry and mortared rubble, curved to withstand the flow of the river Khosr, Nineveh. Source: Singer, 1954.



Raising water from the river with shaduf by Assyrians. Three men operate a double lift. The shadufs, on mud uprights, stand at two levels on the river bank, and in front of each a brick platform is built out into the river for the men who fill and empty the buckets. From the palace of Sennacherib at Nineveh, Mesopotamia 7th century BCE. Source: Singer, 1954.

Roman Aqueducts

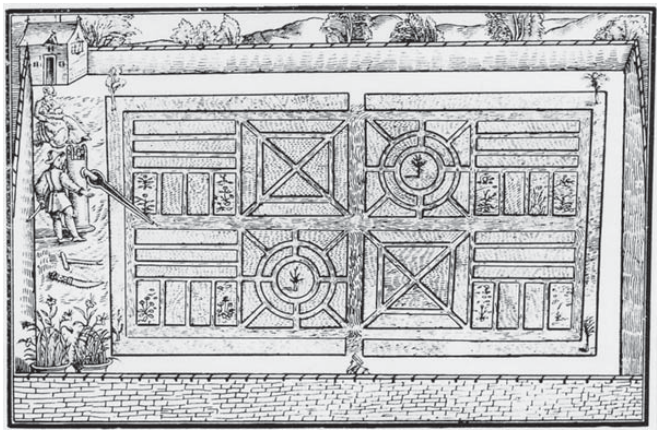
Caesaria, Israel.

Acco.

Furrow Irrigation

Furrow irrigation from an Inca garden.

Furrow irrigation from a Renaissance garden.



Furrow Irrigation using a pump, 1571.

Garden operations, Persian miniature. Source: Hyams, p. 142–143.

Contour furrows can be used for irrigation, as for this potato crop, if slopes are carefully controlled. [Courtesy: USDA Soil Conservation Service.]

This crop of pinto beans is being furrow-irrigated with water from a feeder canal lined with concrete. Note: use of siphons. [Photograph by H. Bryan courtesy USDA Soil Conservation Service.]

Archimedes Screw

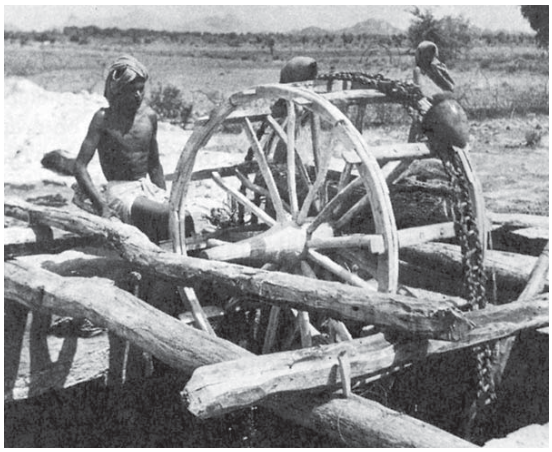
An Egyptian terracotta figurine from about 30 BCE showing a man driving an Archimedes screw as a treadmill. British Museum, Department of Egyptian Antiquities, London, England.

A fresco recovered from a villa in Pompeii showing a man driving an Archimedes screw as a treadmill. National Museum in Naples, Italy. Pompeii was destroyed by a volcanic eruption in 79 CE.

An Egyptian farmer turning an Archimedes screw by hand to irrigate a field. Photograph by Helen and Frank Schreider of the *National Geographic* staff.

Archimedes screws pump wastewater in a treatment plant in Memphis, Tennessee, USA. Each of these screws is 96 inches (2.44 meters) in diameter and can lift 19,900 gallons per minute. Manufactured by Lakeside Equipment Company of Bartlett, Illinois, USA.

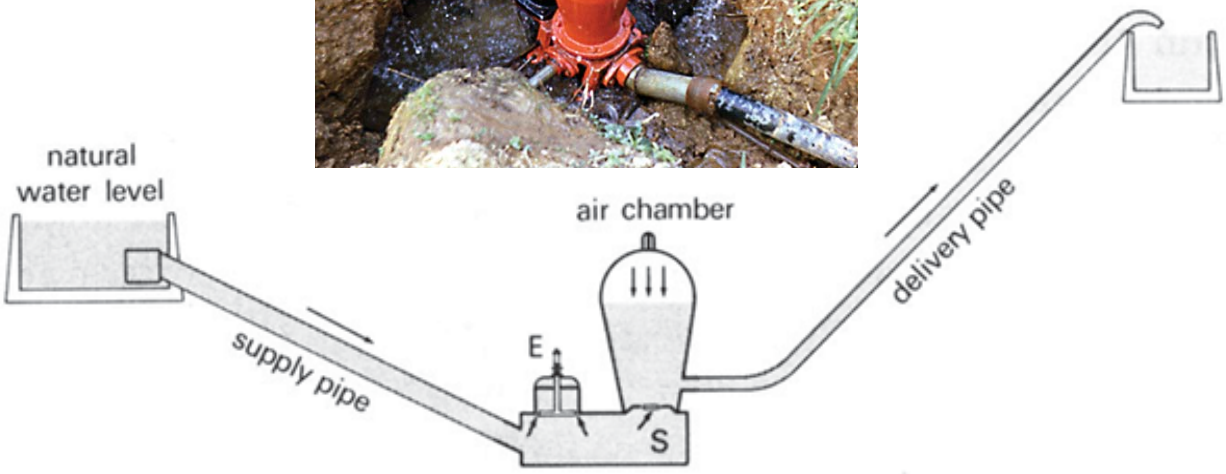
Sakeih (Wheel of Pots)



A Persian water wheel powered by a man's legs. Courtesy Food and Agriculture Organization of the United Nations.

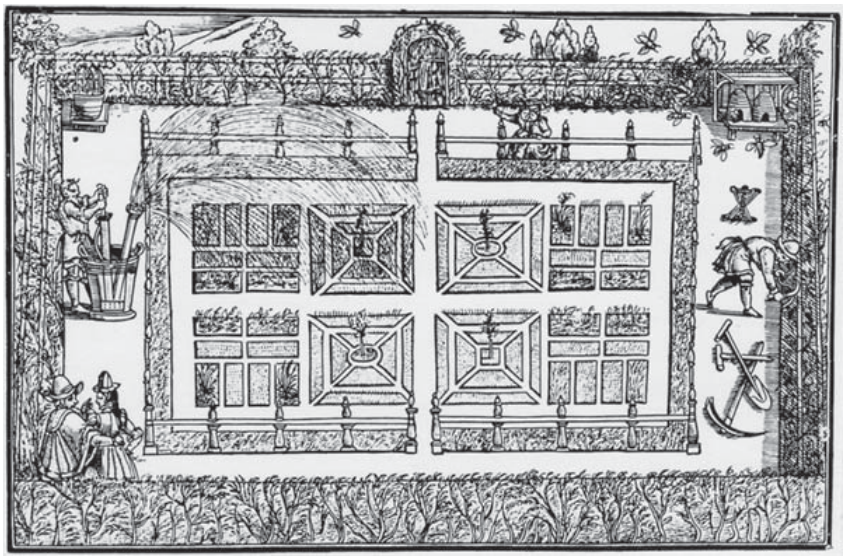
Source: Syria.

Hydro Ram



The hydraulic ram is an interesting pump that uses water power to move water to a greater height. The principle of operation is as follows: water moving down a supply pipe closes an escape valve (E) controlled by a spring. The momentum of the moving water causes a ramming action that forces water through a supply valve (S) at the base of an air chamber. The force of the water compresses the air in the chamber. Then the air pressure equals the pressure of the moving water in the supply pipe, the supply valve closes, and the trapped water is forced out of the delivery pipe at a higher elevation. Immediately after the supply valve is closed, there is a rebound or backward flow of water that causes the escape valve to open. Then the water starts to move again down the supply pipe, builds up momentum, and the cycle repeats. The efficiency of this device may be as high as 75% under ideal conditions. The hydraulic ram, with only 2 moving parts, can operate for years without attention. It is especially valuable for providing irrigation where power is unavailable, and it should have wider use in underdeveloped areas.

Sprinkler Irrigation

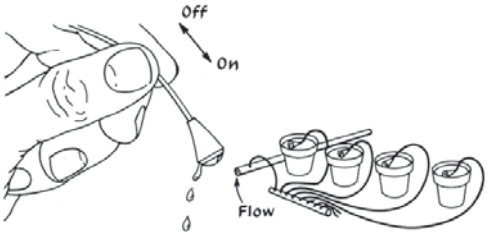


Watering with pump and sprinkler, 1571.

Sprinkler irrigation is practical as a result of portable, lightweight, aluminum pipe. The sprinkler pattern must be overlapped by about 40% in order to achieve uniform application of water. Photograph courtesy USDA.

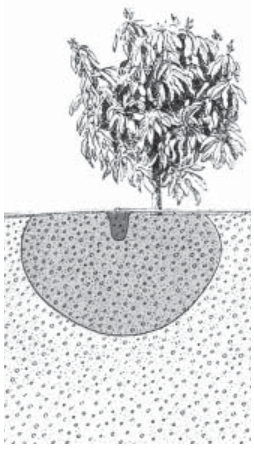
Pivot irrigation of cotton in Mississippi. Photo: USDA, Tim McCabe.

Trickle Irrigation

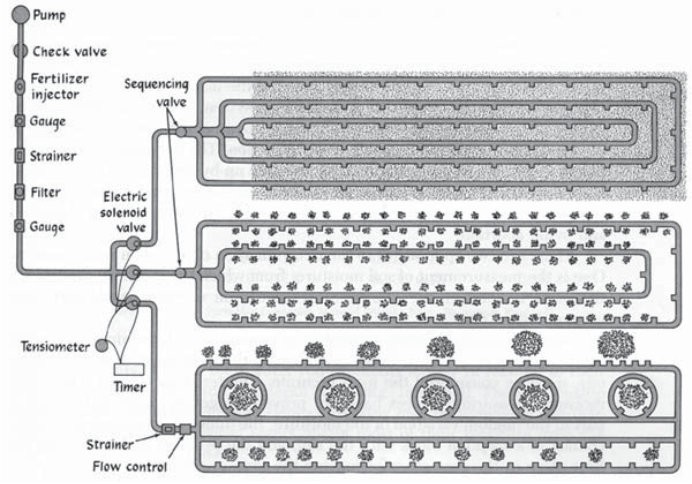


The Chapin System of trickle irrigation for greenhouse watering uses wieghted valves (left) to deliver water to individual pots (right and bottom).

Trickle irrigation in Israel, 1975.

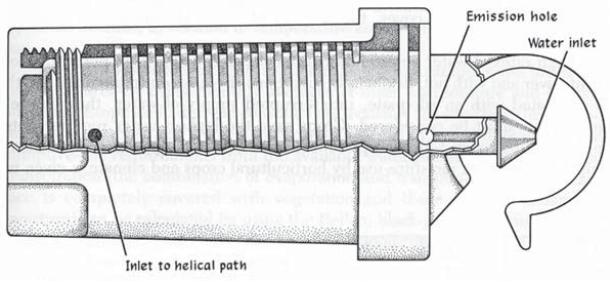


The wet zone around the roots of a tree or a plant irrigated by the drip method.



Trickle irrigation systems used in the field.

Concept of drip irrigation from Louis XI garden of 1470. Source: Hyams, p. 95.



This nozzlelike emitter is designed to reduce water pressure by causing the water to move along an elongated helical path. With low pressure, the emission hole can by larger, so that its tendency to become clogged is diminished. An emitter of this design is preset at the factory to emit 1, 1.5, or 2 gallons of water per hour. The hook at the right attaches the emitter to the drop-irrigation pipe at a right angle; water enters the conical tip from the center of the pipe. From K. Shoji, “Drip Irrigation.” Copyright 1977 by Scientific American, Inc. All rights reserved.