Earth-Kind®

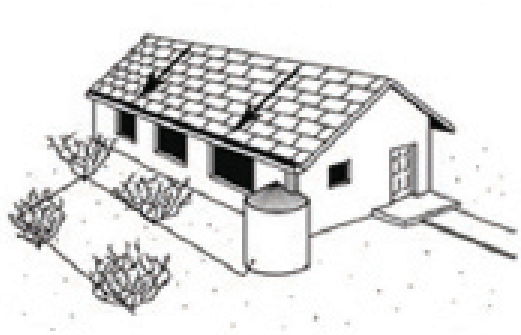
Texas AgriLife Extension Service

Rainfall Harvesting:

In many Texas communities between 30% - 50% of the total water supply is used for landscape irrigation. Even if you live where annual rainfall averages only 12 inches, you can save money by collecting and storing rainwater and using it to irrigate trees, shrubs and lawns.

Efficient water use is increasingly important throughout Texas. With the growing population and limited supply of both groundwater and surface water, homeowners must use water wisely. Rainwater harvesting is an innovative Earth-Kind approach to this important environmental issue. Harvesting rainwater for home landscape use…

- ✓ Saves money by reducing your water bill
- ✓ Reduces demand on municipal water supplies
- ✓ Makes efficient use of valuable natural resource
- ✓ Reduces flooding, erosion and the contamination of surface water with sediments, fertilizers and pesticides in rainfall run-off



System Design:

To maximize the benefits of rainwater harvesting, some systems build in storage to provide water between rainfall events. But can such systems collect and store enough rainwater in an average year to irrigate an entire landscape? Yes, if the amount of water harvested (the supply) equals the amount of water needed for irrigation (the demand). Complex water harvesting systems use stored water to balance the supply-demand equation during limited rainfall periods.

Rainwater harvesting systems with storage cost more to build but yields greater water savings than systems without storage. Consider the following factors when deciding whether to invest in this type of system.

- Availability of other water supplies for irrigation
- Need for professional assistance to design and construct a storage system
- Cost of storage, including the storage container, excavation, pumps, wiring and on-going maintenance
- Long investment payback period (sometimes several years)
- Personal commitment to “water conservation ethic”

To reduce the cost of a storage system you can (1) build a smaller storage container, harvesting less than the total irrigation water your landscape needs; (2) limit landscape area or reduce plant densities, lessening water demand; or (3) replace high-water-use plants with medium or low-water-use ones, also reducing the amount of irrigation water needed.

How Does It Work?

Rainwater harvesting systems with storage capacity include catchments, conveyance systems (connecting catchments to storage containers), storage, and distribution systems (directing water where it is needed).

Catchments. The amount of water or "yield" that a catchment provides depends on its size and surface texture. Examples of various surface textures include:

High Yield: Concrete, asphalt or brick paving and smooth-surfaced roofing materials as such as metal.

Medium yield: Bare soil (compacted clay soils yield the most).

Low yield: Areas with plants, such as grass or groundcover (plants hold water longer, allowing it to infiltrate into the soil rather than run off).

Conveyance Systems: Conveyance systems direct water from catchments to storage containers. Roof catchment systems use canals, from which water flows by gravity into storage containers, or gutters and downspouts, which should be sized to collect as much rainfall as possible.

Storage. Storage makes rainwater available when needed.

Filtration. Before water is stored, it should be filtered to remove particles and debris. Filtration considerations include:

Table 1. Annual approximate supply from roof catchment.

Rainfall (Inches)	Gallons/ Square Foot	Rainfall (Inches)	Gallons/ Square Foot
0	0	8	5.0
1	0.6	9	5.6
2	1.3	10	6.2
3	1.9	11	6.8
4	2.5	12	7.5
5	3.1	13	8.1
6	3.7	14	8.7
7	4.4	15	9.3

Degree of filtration: Depends on the size of the distribution tubing and on the emission devices used. For example, microirrigation drip systems require more and finer filtering, with an additional filter at the system inlet, than do hose distribution systems.

Type of filter: (1) In-line; (2) Leaf screens, placed over gutters at the top of the downspout; (3) Diversion by roofwashing with a 4-to-6-inch PVC standpipe (with a valve and bottom cleanout) connected to a gutter downspout. The first rainfall that falls, at a rate of 10 gallons for every 1,000 sq.ft. fills the standpipe, and the rest flows to the downspout connected to the cistern. When the rain stops, the standpipe is drained in preparation for the next rain.

Containers. Storage containers may be made of polyethylene, fiberglass, wood, concrete or metal. Underground containers cost more to excavate, to maintain or to remove, and the need to pump water out of them adds to their costs. Swimming pools, stock tanks, septic tanks, ferro-cement culverts or containers built from concrete blocks, poured-in-place concrete or building rocks can be used for underground storage.

Costs for above-ground storage containers depend on the type of catchment and conveyance system, the degree of filtration and the distance between the container and the area irrigated. Examples of containers that can be used for above-ground storage includes 55-gallon plastic or steel drums, barrels, tanks, cisterns, stock tanks, fiberglass fish ponds, stone, plastic bags filled with sand, or rammed earth. Look under “Tanks,” “Feed Dealers,” “Septic Tanks” or “Swimming Pools” in a telephone directory to find sources of storage containers. You may be able to salvage a 55-gallon drums from local businesses, but only drums free of toxic residues.

Tips for storage container placement and use include:

Elevate above-ground storage containers to take advantage of gravity flow; for example the high end of a sloped lot.

Put storage containers near plants and near or at the end of downspouts

Build concave planted areas to allow rainwater to percolate slowly into soil

Hide unsightly containers in an unobtrusive place or behind a structure, screen and/or plants

Because smaller cisterns are easy to handle and camouflage, place several near the irrigated site

For large landscaped areas, connect several tanks to increase storage capacity

If rainfall exceeds storage capacity, provide alternative storage for the excess or allow it to spill out. Make sure storage container inlets and overflow outlets are the same size

Distribution. The distribution system channels water to plants from storage containers, using garden hoses, constructed channels, solid or perforated pipes or manual drip systems, plus (for some systems) gates and diverters to control flow rate and direction. If your system is gravity-fed, you may need to put a manual or an electric valve near the bottom of your storage container. If your system is not gravity-fed, connect an electric pump to a garden hose to transport water to the irrigation site. Drip and other types of integrated distribution systems need pumps to provide necessary pressure for system operation.

If there is not enough rainfall to meet your irrigation demands, add water to your container from an auxiliary source to avoid building an alternative system. If you connect your system to a municipal or private water supply, you must use an “air gap” or other approved backflow prevention device. If you decide not to use a supplemental water source, make sure any pumps turn off automatically when the tank is empty. (Integrated distribution systems are complex; make sure to comply with local plumbing and building codes.)

For more information visit Rainfall Harvesting website at:

http://rainwaterharvesting.tamu.edu