Water Harvesting: An Alternative Irrigation Method for Desert Gardeners

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People inhabiting semiarid environments before the advent of modern irrigation practices adapted in many ways to survive within desert ecosystems granting them but meager precipitation (Bowden, 1977). Dark thunderheads rising above the mountains brought flowing water to the desert which nourished them. It meant life. Yet to modern desert dwellers, these fleeting moments of rain often seem more like a nuisance than a blessing. Driving becomes hazardous and legions of weeds burst forth for combat. Small areas around the home may flood and adobe foundations deteriorate more rapidly in the presence of this excess moisture. If only we could direct a portion of the vast amount of hydroenergy received during thundershowers to better serve our purposes, we would become constructive participants, rather than mere spectators in these events.

Water harvesting, a form of irrigation utilizing natural precipitation as practiced by ancient agriculturalists, provides means whereby we may harness the power of seasonal rains and put them to work in our gardens and landscapes. In water harvesting, our objective is to concentrate the rain striking a larger surface area onto a smaller plant growing area. This same rainfall, striking a wide area would be insufficient to sustain many desirable plants, but when it is "multiplied" in this manner it allows these same plants to flourish. Water harvesting systems can even generate more water than the plants can immediately utilize, thus providing reserves which can be stored for future use. However, since it is dependent upon variable rainfall, water harvesting systems cannot provide a continual, completely dependable source of irrigation water.

Native inhabitants of the Southwest practiced water harvesting over 1000 years ago. Their flash-flood farming systems whereby arroyo runoff was diverted by varous means to nearby fields, produced crops such as tepary beans, blue maize, pima squash and devil's claw which are well adapted to desert conditions (Nabhan and Felger, 1977). These water harvesting methods are still employed for food production to a limited extent today.

Many water harvesting systems were also constructed over extensive areas in the Negev Desert of Southern Israel. Hillsides were cleared of loose stones and gravel to increase surface runoff which then flooded terraced valley fields below. Large cisterns (storage reservoirs) enabled life to continue through long dry periods (Evenari et al., 1971).

By rediscovering the techniques of ancient and traditional water harvesters and combining them with new skills and modern materials, we can create

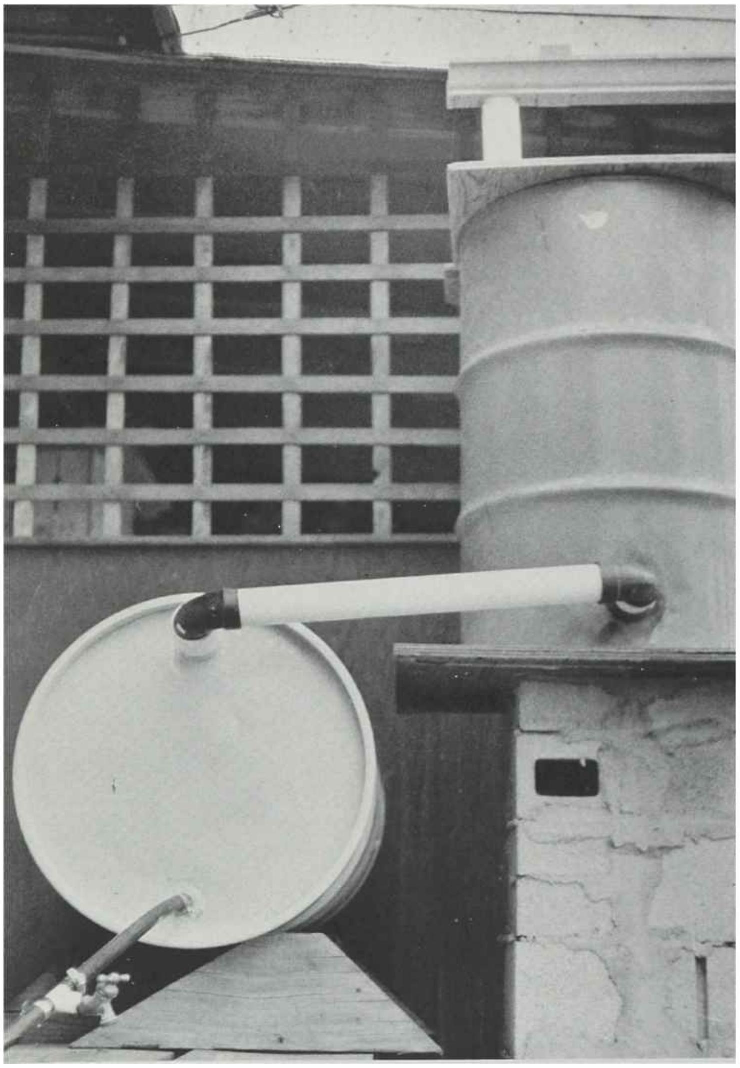

Figure 1. Storage components of a small home water harvesting system. Water can be drawn into watering cans or can be distributed through the irrigation system by gravity flow. Note that the barrels are closed so that mosquitos and debris can not enter.

highly efficient, inexpensive harvesting systems that provide our gardens with pure, salt-free rainwater, which has been delivered free of charge. Directing this water to specially selected plants will enable us to produce food and beautify our environment without unnecessarily tapping our diminishing groundwater resources.

Components of water harvesting systems include the catchment or collector area, distribution and storage, the cropped area, cultivated plants and hopefully sufficient rainfall. Catchments intercept rainfall and must encourage runoff rather than infiltration. Runoff then flows through distribution systems to growing plants or to storage facilities. If a catchment does not induce runoff well, or is too small, insufficient water will reach the plants. Catchments which induce too much runoff for the cultivated area may cause overflow or permit erosion to occur. Since large volumes of water are delivered quickly, soil in the cropped area must be of suitable texture and organic matter content to allow storm runoff to infiltrate and percolate readily. Such soil conditions will also encourage deep, penetrating root systems to form so that the plants will be better able to withstand drought episodes.

Roofs of most houses provide a unique, efficient catchment area that can be readily put to use by installing guttering on those portions of the roof where the dripline is most troublesome. We have all seen water gushing from downspouts, often without a plant in sight to utilize this water. By directing the flow of the downspout to storage containers, its flow can be arrested and then distributed where it will be converted into useful vegetation. Matching the catchment to the rest of the system is important so that overflow will not occur frequently. As a rule of thumb approximately fifty gallons of storage capacity will be required for each ten feet of gutter in regions with ten inches of annual precipitation. The storage components usually require the greatest monetary investment so their construction should be considered carefully. It is also important that they be placed in an area where they will not be visually distracting.

Recycled fifty-five gallon drums and whisky barrels (available at salvage yards and hardware stores respectively) make excellent storage containers. They can be interconnected to further increase a system's storage capacity. Elevating the storage units so that the head of the water is at least six feet high generates enough pressure to effectively irrigate through a one-half inch polyethylene line. Just how to attach the poly lines can be approached in various ways. Perhaps the easiest is to find an experienced plumbing or irrigation salesperson and use barrels with prethreaded orifices. Spitter type emitters are preferable to drip emitters because pressure regulation and filtration are not essential to proper operation. If elevation of the storage units is impractical then small in-line pumps will work for smaller systems. On larger, more extensive designs (over approximately 150 gallons storage capacity) submersible pumps allow the use of virtually any container or even underground, cement lined cisterns for water storage.

Another method of utilizing the dripline, but without guttering or storage facilities, is through the use of a microcatchment running parallel to the roof's dripline. It is really just an extension of the larger roof catchment. With a slope of from two to four percent and a breadth of from six to twenty feet, it will move water away from the house and spread it evenly over a growing area directly adjoining it. If the slope of the catchment is too steep, water will flow too rapidly, harming small annual plants and causing erosion. If it is too shallow, runoff will be induced only during heavy thundershowers.

Many soil surface treatments have been employed to increase the runoff potential of soils. Most are still experimental and are not suitable for our purposes, although a few treatments will work very well. Microcatchments can be constructed by compacting the soil if it has a clay content of from five to thirty-five percent. The soil must be cleared, smoothed, and then graded to a slight incline. Watering, followed by compacting with a roller, destroys soil structure and tends to induce runoff rather than infiltration.

Soils with an excessive amount of clay are too easily eroded, whereas sandy soils can not be sufficiently compacted. Under these conditions artificial materials can be used to cover the soil and generate even higher levels of runoff than could be expected from a compacted earth microcatchment. Six mil black plastic covered with 3/16 to 1/2 inch gravel works well and blends in nicely with many landscape designs. The plastic induces runoff while the gravel protects it from ultra-violet rays. The life of such a catchment is highly variable, but when placed in an area free of traffic it may function for many years (Cluff, 1967).

The importance of selecting the proper plants to match the environment they will occupy in a water harvesting system can not be over emphasized. Plants which utilize each flooding to the fullest and possess some inherent means of drought tolerance are most desirable. Many such plants also have aesthetic or productive characters but no one plant is perfect. The suitability of each plant must be considered not only by its adaptability, but also in terms of what it can provide us in sustenance, beauty, and shade. Even with a well designed harvesting system, to achieve these attributes to their fullest, supplemental irrigation from conventional sources may be necessary during prolonged drought periods.

Many perennials lend themselves well to planting on the South or West exposures of patios or houses. Figs, apricots, plums, grapes (will require support) and peaches (excellent drainage vital), provide cooling shade in the summer, yet as cold weather approaches they shed their leaves allowing the sun's warming rays to pass.

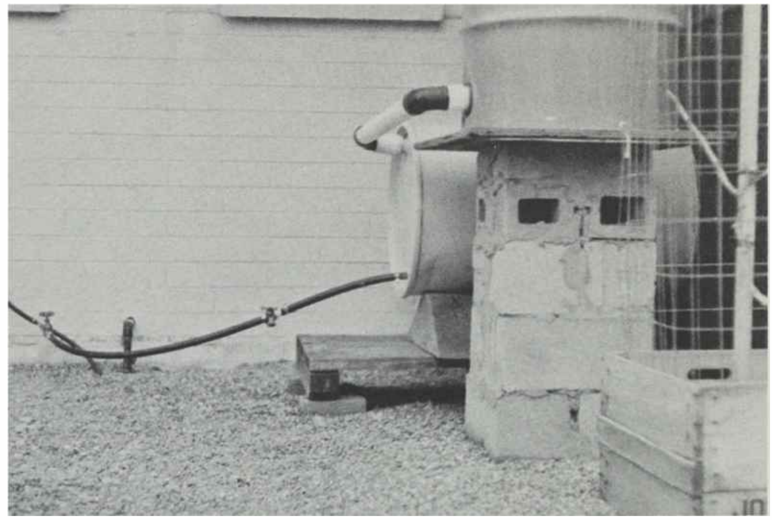

Figure 2. Water flows through one-half inch polyethylene line to plantings located on the west and south sides of the house.

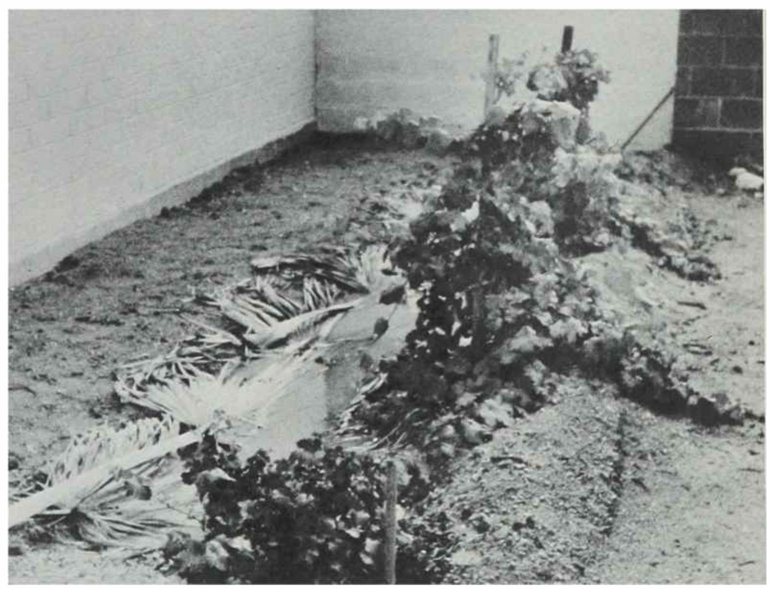

Figure 3. Grapevines in their first year make excellent growth when irrigated with rainwater. These vines receive water from the storage containers in Figures 1 and 2, or from the microcatchment directly adjacent to them. In this photograph a compacted earth microcatchment was under construction when a monsoon storm arrived. Note the water within the cropped area contained by the retaining bank.

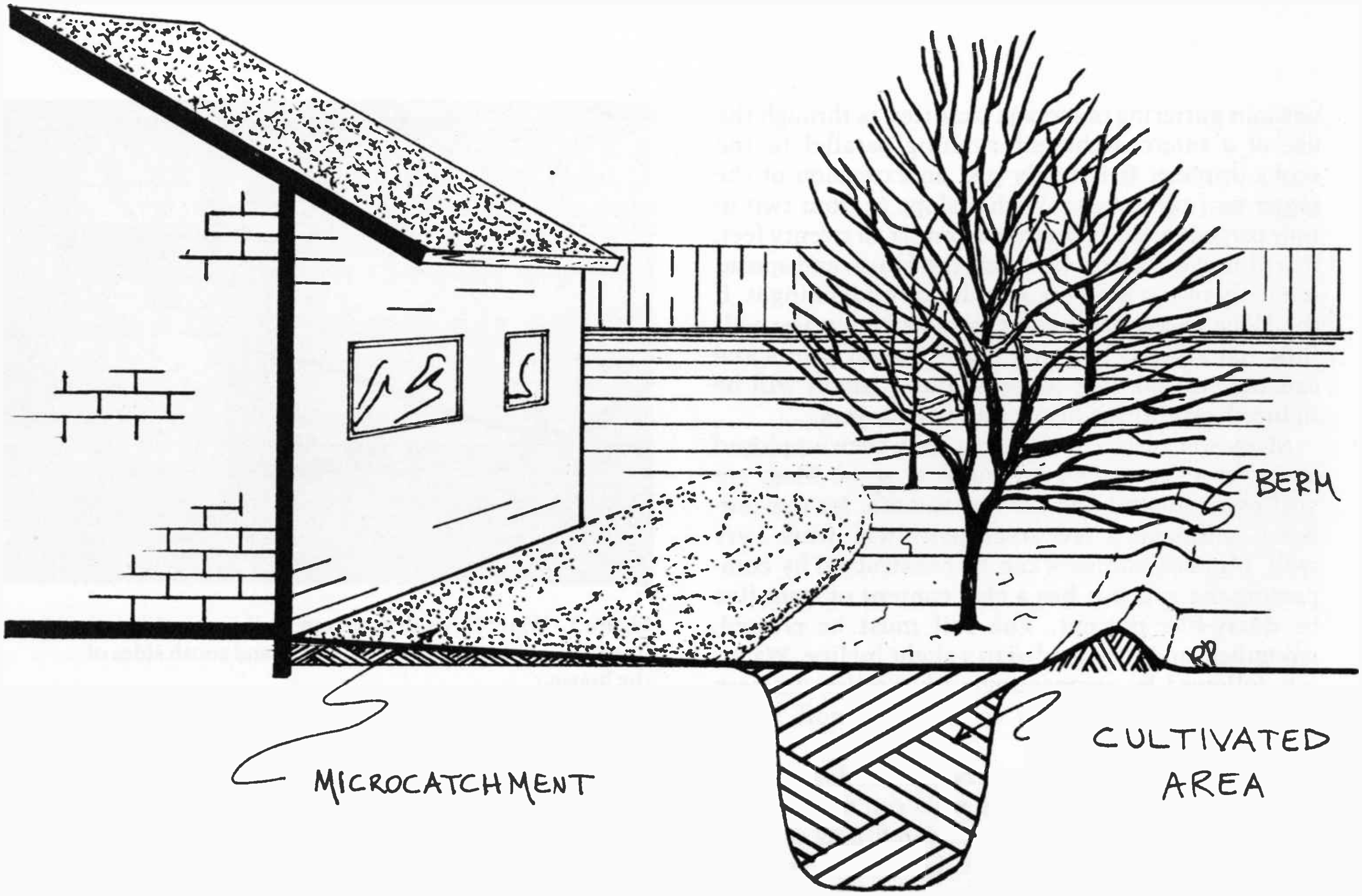

Figure 4. A microcatchment running parallel to the roof's dripline.

Many native and nonnative ornamentals usually considered to be non-thirsty, will benefit greatly from additional water. They offer beauty and climate control without the reward or additional responsibilities of food producing plants. A few suggestions would include pomegranate, olive, mesquite, acacia, jojoba, dodonea, and Arizona rosewood.

Certain "vegetables" are proven performers however the risk factor increases with them due to germinability problems and their reduced ability to endure drought between rains. Ones to try would be melons, squash, asparagus, tepary beans and sunflowers.

Literature

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