The following diagram shows the basics of our rainwater collection system. It is based on two buildings, one of which is our small home, and the other a small shed, both with galvanized steel, shed-style roofs at a 4:12 pitch. The house has a roof that covers 1300 square feet, counting the amount overhanging the exterior walls and the shed covers about 600 square feet. To find how many gallons you can collect in a 1-inch rain, just divide the roof square footage by 1.6 as shown below.

An example of the tubular upright filters in all of the downspouts can be seen here. The gutter is dirty but you can see a small piece of rolled-up stainless steel screen that traps debris but lets water flow over the top into the drain. We use a coarser mesh on the shed gutter.
When the left drain plug is removed and the other two are in place the water flows to our pond. When the right plug is removed and the others closed the water flows to two 1500-gallon, polyethylene tanks that are above ground, next to our shed. One tank can be switched offline using a metal gate-valve so that only the tank with the irrigation pump fills. This option is used when rains are sparse and we need to maintain water height in one tank. Water from the house can be switched to flow there or elsewhere, depending on our needs and the time of year.

These are the poly tanks. They are painted with plastic primer and a light colored paint to keep them cool and dark inside. This prevents the growth of algae.

Here you can see the pipes and valves used to connect the tanks and a close-up view of the overflow set-up (explained shortly) that either allows these tanks to fill or diverts all water to our pond, either when all tanks are filled or when we wish to drain these above-ground tanks before winter.
Water from the shed always flows first through a nylon mesh bag secured inside the lid of the 1500-gallon tank immediately behind it. It has a U-shaped group of poly-pipe tubing next to it that is the same height as the tank. When the gate-valve at its base is closed, water fills both the upright tube nearest the tank and the tank itself completely, then overflows into the second tube, proceeding downhill to the remaining poly tanks. In order to prevent siphoning of the upper tank into the lower ones, a 1/16” hole is drilled in the top of the tube that connects the upright tubes at their tops (detail in right photo). The same system is used next to the lower poly tanks.

When only the middle drain plug at the house is opened, after letting the roof rinse for 5 to 10 minutes during a heavy rainfall, and only in the early spring or late fall, the water from the house roof flows into an above-ground, stainless steel settling tank. This tank has a “standpipe” that overflows into the pipe that connects our house and our big 2500-gallon underground storage tank.
When we actually collect rain for our household needs the rain flows through a fine-mesh, stainless steel screen.

The white plastic “zip-tie” around the black poly pipe keeps trickling water from flowing back along the pipe and into the tank. But we have found that, when water is really pouring in, we need to use the tank opening’s cover and a brick to weigh it down or the incoming water will just shoot over the tank.

The overflow pipe for this tank allows the dust that’s found in every raindrop a little time to settle, keeping the big tank underground much cleaner. In ten years of use we have had to clean the settling tank every time we collect rain (twice each year), but we have not yet had to clean the big tank. The overflow pipe also has a stainless steel screen at the top to filter out any floating bugs that may have crawled in around the tank lid.

We (two adults using a composting toilet) only require about 2000 gallons of water per year for all of our household needs, including drinking, cooking, dishes, laundry, showers, and watering house plants, pets, and a couple of sheep. We collect in early spring and late fall to avoid rains with the highest concentrations of agricultural sprays and spray-containing dust. Data gathered in our state indicate that levels of pesticides in rainwater compared to groundwater are anywhere from 100 to 1000 times lower in rainwater. That, coupled with the lack of dissolved solids, like calcium and magnesium carbonates, and the hundreds of potential pollutants found in underground aquifer make rainwater a wise choice in many areas. Your area may be more industrial, you may get much less than the 22 inches per summer that we are blessed with, or your roof surface may not be smooth, chemical-free, and easily washed by the rain itself. So you may need bigger tanks, better filtration, or even a separate building (with a metal roof) from which to gather your rainfall. But if you choose not to drink or cook with the water and use it only for irrigation you can get by with less roof, less rain, a “dirtier” roof surface, and smaller tanks.

Below you can see what looks like a dirty, old, rust tank getting buried in a trench dug by a neighbor with a backhoe tractor. Another neighbor pulled it into the trench with his 4-wheel drive tractor, and a third neighbor lent me his skid-loader to back-fill the trench. A narrow trench, in the foreground, covers the poly pipe leading to the settling tank. The right photo shows 2-inch, extruded polystyrene
insulation being fit over crushed rock that covers the tank. This keeps the water from freezing even though our average frost depth is 6 feet. The tank is actually quarter-inch thick stainless steel on the inside and thin, rusty steel on the outside of a layer of foam insulation. It was a former milk hauling truck, dismantled and stuck in a ravine at a local metal scrap-yard for over 30 years. We got it for $400 including delivery.

And the final shot in this series shows the tank insulation getting covered with a polyethylene tarp to keep water shedding around it. This keeps the crushed rock drier, helping prevent freezing. The tarp was covered with another 4 inches of crushed rock, leaving just the insulated access cover above ground.
Irrigation of our garden is sometimes necessary since we often get no rain for weeks at a time. The three 1500-gallon plastic tanks that store our irrigation water are below the level of our garden. We use a 120-volt, ½ HP, 1400 gallon per minute “utility pump” that uses centrifugal force to push water up to the garden under pressure.

The pump is mounted on one of the tanks with its 1-inch, polyethylene suction hose draped down to the bottom of the tank, ending in a “foot valve” that prevents the backflow of water, maintaining the pump’s “prime”. 1-inch poly pipe takes the water up to the garden where it branches off into lines for each wide garden bed. Each branch has a valve and a “quick link” to Connect a short hose and “watering wand”. Two of these are used at a time, each easily reaching 15 feet outward.

This is one of the watering wands that we use to irrigate the garden. The orange “Dramm” fan-head sprinkler is not my favorite since the holes are a bit small. But I drilled them out to match the cheap plastic spray heads I prefer. Each spray wand has a valve and a hose section with a “quick-link” so that we can move easily from one section of the garden to another without shutting off the pump. We only need two spray wands for two people watering but, to avoid overheating the pump, we always maintain one operating sprayer while the other is being moved.

Although water flows by gravity from the house and shed into the various tanks, and by gravity from the big underground tank to our house, we use pumps to increase its pressure both in the irrigation system and in our home. Below you can see the root-cellar pit in our pantry floor that also houses our 12-volt household pressure pump and 20-gallon pressure tank. The close-up shows the pressure switch, running from 12 volts instead of its standard 120 volts, and brass impeller driven “Slow-Pump”, purchased used from a neighbor.
At the kitchen and bathroom sinks we use below-sink filters to further clean the water. These are easily found and most are a standard size to fit carbon block filter cartridges. We use 0.5-micron (1/50,800 of an inch pore size) filters for about 4 to 6 months in a stretch, then replace them. The used filters get their end caps and outer filtration layers removed, are allowed to dry, then are stored to use as firewood in the winter. Carbon filtration removes bacteria, cysts, many chemicals, including those that shed from all the plastic pipes, and off-flavors from dust and debris that might end up in the tanks.

And to make sure that the water is biologically sterile before it flows into the carbon filters we use 35%, food-grade hydrogen peroxide to “shock” the big water tank when we are finished collecting for the season. Hydrogen peroxide is water with an extra oxygen molecule that attaches to and kills bacteria. When the oxygen detaches you are left with ordinary water. A cup of H₂O₂ diluted into some water and poured into the 2500-gallon tank seems to be just right. A pint proved to be too much since excess oxygen bubbles built up in the pipes causing the pressure pump to “cavitate”, sucking air instead of water. A similar option involves using an ultraviolet light filter. It exposes water to UV light that creates ozone, or O₃, which reacts with water to form hydrogen peroxide. I am told, however, that the UV lamps are short-lived and expensive while food grade H₂O₂ is relatively cheap. Peroxide is routinely used in milk processing plants to clean and sterilize the pipelines.
And finally, as a footnote, if you are going to use valves in your water pipes, and they are subjected to freezing temperatures, be certain that they are gate valves, not ball valves. Gate valves are basically a sliding wall. Ball valves have a column of water running through a sphere that traps that water when they are turned off. The trapped water will expand 10% when it freezes, cracking the valve body apart. We drain our above-ground tanks in the fall and drain all water from the irrigation pump and its suction tube to prevent just this sort of damage.

And here are some of the simplest means for storing water in our greenhouse. One is an above-ground, 20-gallon stainless steel drum from a washing machine. The other is a 55-gallon polyethylene tank buried in the greenhouse walk-way. When temperatures remain near freezing at night, we can continue to use the stainless tank, filled by hose from the main irrigation tanks, until December. Before we drain all of the big plastic tanks we fill these up for winter watering of hardy greens. When temperatures get even lower we drain the last of the stainless tank and rely on the buried supply to keep up with meager frigid-weather plant growth and maintenance. We remove the round center cover and lower a small bucket to retrieve the water inside.

That’s about it, except to remind you that for each 2.3 feet that water is above a “tap”, you will have 1 pound per square inch of water pressure. So 23 feet of height gives you 10 psi and it would require a tank 80 feet in the air to give you the minimal 35 psi that our pressure pump and tank maintain. Gravity-fed water works fine if the pipes have a big diameter, slippery material (like PVC or polyethylene) and as few sharp bends as possible. Regular 3/8” and ½” plumbing pipes don’t work well at low pressures. Neither do carbon filters unless you use the cheaper, high-flow, large pore, carbonized paper filters. What you gain in low cost and simplicity at the tank you can lose in design flexibility and higher pipe cost at the house.