Watering Options for Grazing Systems

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One of the challenges of designing a grazing system is providing an abundant supply of clean drinking water to cattle that are located in multiple areas (paddocks or pastures.) The use of surface water (creeks) has multiple drawbacks. Fencing across a creek is always a challenge because of storm flows damaging the fence, and the fence preventing debris from flowing down the creek. Also, cattle tend to degrade the banks of the creek increasing sediment loading and decreasing water quality.

Mechanical watering systems have many advantages, but also present some challenges of their own. 1. They cost money to install and operate. 2. Many times, there is no electricity available for pumping at remote locations. 3. Multiple pastures or paddocks mean multiple waterers that are not fully utilized when the cows are in a different paddock. 4. Cows tend to congregate around waterers, the waterers tend often leak, and cows spill water, all of which leads to a muddy area around many waterers. Some of these challenges can be addressed and costs minimized by proper planning. This document will describe some of the strategies that have been used to overcome these potential obstacles.

Reducing the number of waterers required

Placing a waterer through a fence enables one waterer to be used from two paddocks. (See Figure 1.)

Figure 1: Waterer between two paddocks.
(Picture Courtesy of NRCS)

Care must be exercised to provide enough watering space for cows from each side of the fence, however. For waterers where only one cow can drink at a time, it is recommended to have at least **one cup or bowl for each 15 cows**. (Beef Housing and Equipment Handbook) For a drinking tank, it is recommended to provide **one foot** of accessible tank perimeter **per 10 cows**. That means one ft/10 head on each side of the fence for a split installation. Cows tend to drink as a group, so adequate access to the waterers is important.

Another option for reducing the number of waterers required is to place a waterer in a lane or a common area that can be shared by a number of paddocks. A waterer can also be placed in a working pen that can be accessed from a number of paddocks. This not only provides a common watering site, but accustoms the cows to going into the working pen. Care must be exercised to not allow the working pens to become too muddy however.

Availability of Power

If electricity is unavailable at a remote site, water can be pumped by solar power or a ram pump. (For more information on ram pumps, see http://www.tifton.uga.edu/eng/Publications/rampump3.pdf and http://www.tifton.uga.edu/eng/Publications/homeram.pdf) Solar energy can be used to pump water, and in some cases, may be the most economical choice.

In general, solar pumps are most efficient when pumping from surface water or shallow ground water (less than 50 ft deep.) Pumping from deep ground water requires more energy and considerably more investment in solar panels. Due to the intermittent availability of solar power (nights and cloudy days) a solar powered watering system requires considerable reserve storage, either in the waterer itself or in a tank that feeds the waterers. Another alternative is to have backup batteries that store solar power for use during those times when solar is not available. The batteries and required sensing and switching mechanism for this system are usually more expensive than providing extra water storage. I would recommend 2 to 3 days of storage capacity. A typical 1,000 lb cow would drink up to 18 gallons of water per day in hot weather, but on rainy or cloudy days, would drink considerably less, so I would use a figure of 12 gallons/head/day. This reserve storage could be in the drinkers, the tank, or a combination of the two.

Stream crossings are still an option for livestock watering, although they have the drawbacks mentioned above, and precautions should be used.

Mud around waterers

"Heavy Use Areas" can be installed around waterers to minimize mud problems. An excellent publication on these surfaces is available from the University of Kentucky at: (http://www.ca.uky.edu/agc/pubs/aen/aen79/aen79.pdf) The idea originated in the road construction industry for stabilizing dirt roads. The principle of heavy use area construction is to stabilize the soil underneath the top layer so that it does not move, settle, and form mud holes.

Figure 2: Prefabricated Concrete Watering Tank on Heavy Use Area
(Picture Courtesy of NRCS)

Basically by putting down a layer of geotech fabric, the rock placed on top of the fabric cannot move from side to side, and thus depressions are prevented from forming. Typically this type of construction costs about ½ that of a concrete pad. When choosing the site for waterers, it is wise to choose a site that is high and well drained. In addition, regular checking and maintenance of valves and pipes is important in preventing excess mud as well as wasted water. The stabilized area should extend at least 15 ft from the waterer for cows and 8 ft for goats or sheep.

The same strategy can be used to stabilize travel lanes to prevent erosion. Travel lanes should be fairly narrow (12-15 ft) and crowned in the center to promote drainage. Lanes should be fenced to force animals to stay on the stabilized area. If they have a choice, they will go back and forth between muddy and stabilized areas which can cause foot problems due to rocks being picked up by muddy feet.

Choice of Drinker Type

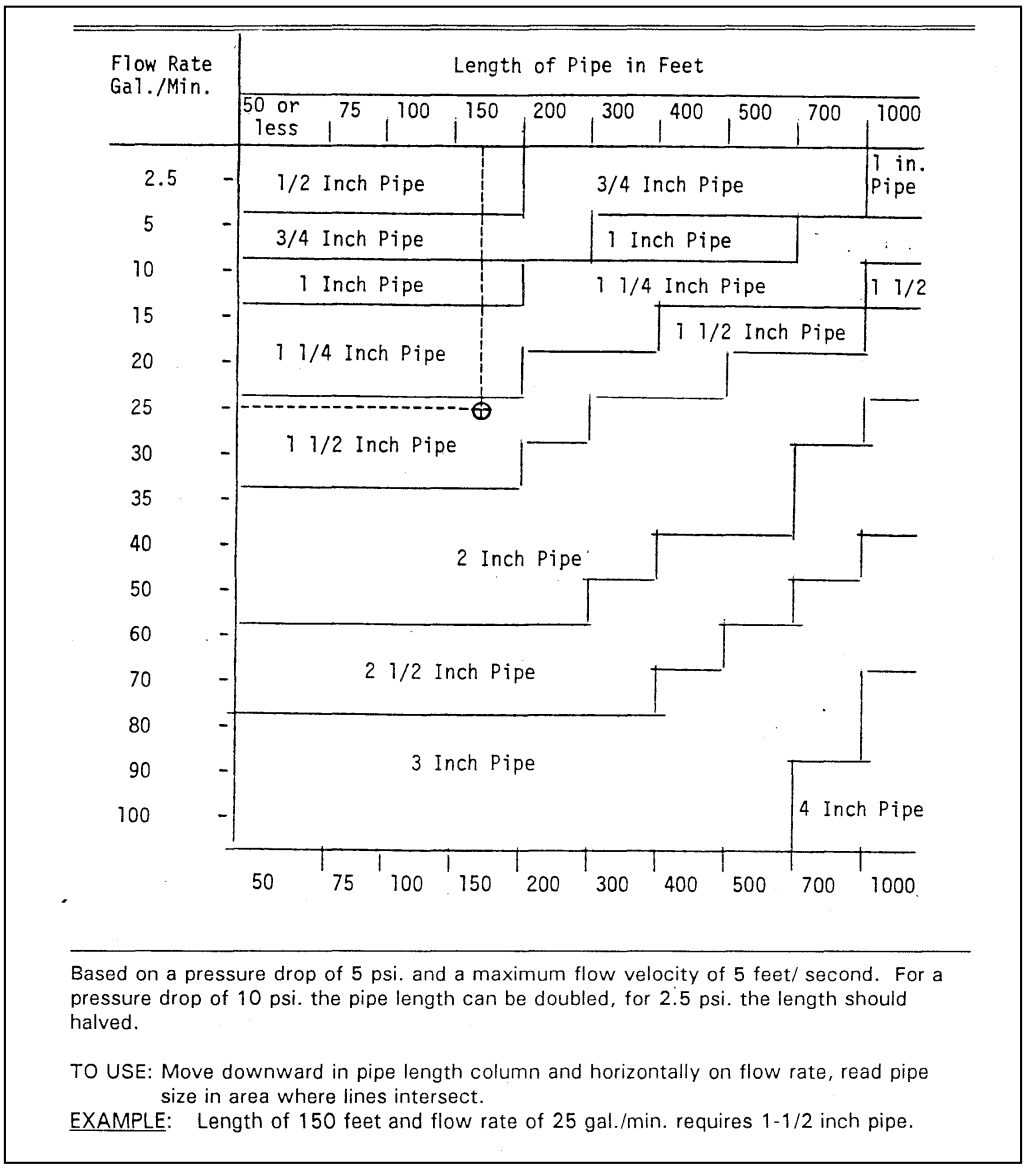
Individual drinkers like the one shown in Figure 1 have the advantage that they help keep the water cooler and cleaner in hot weather and that they are virtually freeze proof in cold weather. Tank waterers (Figure 2) which can be made of galvanized steel, plastic, or concrete; have the advantage of greater accessibility to a number of animals and more water storage in the waterer itself. Individual waterers must have water provided to them at all times because the water would be quickly depleted if the supply were cut off. That is especially a consideration when solar pumps are used to supply the waterers.

Note that the concrete waterer in Figure 2 has the control valve mounted in the bottom middle of the tank. That protects it from both mechanical damage (cows rubbing against it or running into it) and freezing and eliminates many of the maintenance problems associated with top mounted valves.

Sizing the Supply System

Whether using solar or conventional electric power to pump water, it is important to size the pump and pipe to deliver the maximum needed flow of water without excessive friction loss in the pipe. Three things potentially contribute to pressure drop in water pipes, the length of the pipe, the flow rate of water, and the elevation change from one end to the other. If we try to force too much water through a small pipe, friction loss will reduce the pressure at the waterer reducing the flow rate and sometimes causing the valve not to operate properly. The supply system should be able to pump water for a day in about 4 hours since cows tend to drink as a herd. With a maximum rate of 18 gal/day, 100 cows would need 1800 gallons of water. To pump that in 4 hours, the flow rate would be 7.5 gal/min.

Figure 3 may be helpful in sizing the pipe needed to supply the waterer(s). In the above example, if the flow rate is 10 gal/min, and the watering site is 300 ft from the pump, a 1 ¼ inch pvc pipe would be needed to limit the pressure drop to 5 psi. If sufficient pressure exists to allow 10 psi pressure drop, a 1 inch pipe would suffice.



Based on a pressure drop of 5 psi. and a maximum flow velocity of 5 feet/ second. For a pressure drop of 10 psi. the pipe length can be doubled, for 2.5 psi. the length should halved.

TO USE: Move downward in pipe length column and horizontally on flow rate, read pipe size in area where lines intersect.
EXAMPLE: Length of 150 feet and flow rate of 25 gal./min. requires 1-1/2 inch pipe.

Figure 3: Recommended Size for PVC or Plastic Pipe

Generally, most home water systems operate around 40 psi, and the drinker valve should have at least 10 psi of pressure at all times. Also, remember that if you are pumping up hill, you will lose pressure as well. For every 10 ft of elevation, the pressure drops (or increases if going down hill) by approximately 4.3 psi. The pump needs to be sized to deliver the needed flow rate at the total pressure it will be working against, including elevation from the water level (bottom of the well or surface of a pond), friction loss in the pipe, and the operating pressure in the system.

Sanitation

Waterer control valves should always be fitted with anti-siphoning devices. This prevents contaminated water from being sucked from the trough down into the well or water source when the pump shuts off.

References:

Beef Housing and Equipment Handbook, Fourth Edition. Publication MWPS-6, Midwest Plan Service, Ames, Iowa (www.mwps.org)