Pasture Watering Systems

CHOOSING THE BEST PASTURE WATERING SYSTEM FOR YOUR SITUATION

If you are choosing a pasture watering system, it's a good idea to make your choice through a process of elimination, starting from the most reliable and cost efficient system. Here are some typical system options and questions to consider:

Existing pressure system with an above ground or shallow-buried line

Is there an existing pressurized water system near the pasture (within a mile or so)? Does the existing system have good water and can it supply enough water to your livestock? If so, consider using an above ground line, placed along fence lines, or a shallow buried line (approximately 6 inches below the ground). A line one inch or one and one-fourth of an inch in diameter is typical. Be sure to use a trough to store enough water to be ready when the livestock come to drink.

Hydro-power or electric generator pump system

Is there hydro-power close to the water source (500 feet)? If so, set up a pressure system (jet pump, utility pump or submersible) to lift water that is ready to drink.

Gas pump: to pump water into a storage tank

Are you checking the cattle frequently and is the water source handy to access? A gas pump can be used to pump water up into a tank or storage basin, then gravity feeds it into a trough. You can also pump the water directly into a large trough and refill it on a regular basis.

Portable nose pumps

Are you willing to train your livestock to push a nose pump to get water? Set up no less than two pumps at any location. You will either like or hate this type of system. The main advantages of this system are portability and cost.

Solar power pump system

If no other power source is available, then consider using a solar pump system. Two days of backup water storage is required plus one day of pumping stored in the battery.

Windmill system

If there are no trees or obstructions within a half-mile of your water source, you may want to consider a windmill system. However, these systems are high maintenance, weather dependant, and usually the most expensive per head. Three days of water storage is also required for backup.

Other systems

Other systems that fit a particular situation may include: hydraulic ram pump, gravity feed from a reservoir, a sling pump, a combination of the above systems or others

Considerations and Limitations For:

Existing pressure system with an above ground or shallow-buried line

This may be the best setup for you, if you have an existing pressure system, located within a mile or so of the pasture, if the source provides good quality water and enough water to meet your daily demand.

Use an above ground line, placed along fence lines or shallow buried line, approximately 6 inches below the ground. The typical diameter is one inch for up to 1500 feet and one and one fourth of an inch for more.

Supply volume does not need to be large to meet your needs if the trough is sized properly. For example, a line providing 1 gallon per minute at the trough location can supply at least 1200 gallons per day. The limit would be approximately 120 feeder cattle, consuming 10 gallons per head per day.

Trough size should be calculated according to your water supply, your demand, and the cattle access space. There should be enough space to allow 20 to 30 per cent of the animals to drink at one time. The trough capacity should be between 50 to 100 per cent of your daily demand. This will change according to the volume of water supply and distance the cattle need to walk to the trough. For example, a herd of 50 feeder cattle that are walking more than 200 yards to get to the trough, tend to come for a drink as a large group all at the same time, typically twice a day, consuming approximately half of their water each time. If a 500-gallon trough is used, then the cattle will drink it down in the morning and return later to drink the same again. The line should supply enough to refill the trough within that lapsed time, approximately 6 hours, 500 gallons / (6 x 60) = approximately 1.5 gallons per minute minimum supply volume. If the line is not providing the minimum volume and it is not practical to increase the supply, then use a larger trough, or add a second trough to provide storage. For instance, if the line is supplying 1 gallon per minute into the trough, there is a shortage of 500 – (6 x 60 x 1) = 140 gallons. In this case, there should be at least 750 gallons of trough storage provided.

Elevation difference: If the trough is located uphill from the source, then there is a limit for how far pumps can push water upwards. For example, the typical pressure switch limits are between 30 to 50 pounds per

square inch (PSI). Use the lower limit (30 x 2.31 ft. / psi.) = approximately 70 feet of lift. Subtract from that the friction losses, at flows of two to three gallons per minute, over a distance of 1500 feet using a one-inch line, this is approximately six to 11 ft. or three to five PSI. And subtract losses at the float valve approximately 11 ft. or 5 psi. Leaving you with approximately 20 psi or 45 feet of elevation that a pump can lift water. There are ways to change this limit, and specific design help may be required for each situation.

Set the trough on an elevated pad, so spilled water and rain drains away quickly. Have at least a 15-foot radius around the trough sloping away, so the cattle are standing up on a rise (approximately 12 to 16 inches) to get a drink. Avoid having the area around the trough turn into a muck hole. If the cattle do go through a muck hole to get a drink, the conditions for disease transfer and hoof rot are still present. The pad can be made using several materials, such as gravel, shale fill or railway ties.

Use a good quality float valve in the trough to save headaches and frustration. A float valve with a large bore of three-quarters of an inch to one inch will reduce flow restriction. If the water source is from a dugout or similar source, a large bore will have fewer problems with algae and bugs getting caught in the valve.

If you are concerned about the shallow buried line reducing pressure to the rest of your utilities, install a three-quarter inch ball valve on the line to restrict the flow and reduce pressure loss. Set the flow coming into the trough close to the minimum that your cattle will require. You will probably need to size the trough to 100 per cent of your daily demand for this situation.

There are several ways you can connect the trough to the buried line. One fairly simple method is to set a vertical post in the ground by the buried line. Then insert a tee or elbow to bring a short piece of line up the post. Strap the line to the post, and at the end of the line, connect a half-inch drain valve or sediment faucet. Use a section (between five to 20 feet) of half-inch or five by eight inch garden hose, to connect into the float valve at the trough.

The line should be buried for two reasons, to shade from the sun and protect the line from damage. On a hot sunny day, the water in a black poly line will heat up enough to turn cattle away at the trough. A line under pressure exposed to the sun is also susceptible to bursting apart. The main concern is the water quality provided to the trough. There are situations where the line is not easily buried or where the line location is experimental and the line can be buried later. If the line can be shaded by grass or other vegetation, this may suffice.

A shallow buried line is based on using the system during the frost-free part of pasture season. A depth of six inches is recommended, so the ground and line will be thawed out by the time you want to use it. The cost of burying the line can be minimal. There may be shallow bury plows available through your local Conservation District. A trencher can also be used, but keep it shallow.

A frost-free hydrant is an excellent way to hook in a source for the shallow buried line. It is simple and very easy to disconnect to prepare for winter. Use a check valve in the line to prevent possible contamination of your source.

To prepare for winter, the line should be blown out with an air compressor and the ends should be capped to keep bugs and mice out.

Use Nylon fittings (white) for all underground connections for low and medium-density polyethylene pipe. High density pipe requires fused connections or compression fittings specific to the type of pipe.

Hydro-power or electric generator pump system

Do you have hydro-power close to the water source? Is it affordable to drop a new meter and set up hydro-power close to the water source? Or can a new water source be set up close to the hydro-power? If so, you have several options available for your pasture water system.

If the water source is a well, set up a pressure system using a submersible pump or a jet pump to provide water to the location you need. A shallow buried line with a trough and float valve at the end will work quite well

If the source of water is a dugout or similar type, then set up a pressure system using a jet pump with a floating intake to use the best water available from the source. Avoid using a foot valve as algae and bugs can cause you a lot of headaches. Instead, use a good quality spring-loaded check valve just before the pump. There are easy ways to prime a system without a foot valve.

Different types of pumps can be used, depending on the demand volume, the distance to the trough or storage tank, and the amount of lift required. For example, an inexpensive submersible utility pump (must be capable of pumping continuously) can be suspended in the water source by a float and rope combination. Pump the water up to a trough or storage tank, and the water level can be controlled by a PIL switch to turn the pump on and off. Be aware that there are limits to this system and design help may be required for each situation.

Set the trough on an elevated pad, so spilled water and rain drains away quickly. Have at least a 15-foot radius around the trough sloping away, so the cattle are standing up on a rise (approximately 12 to 16 inches) to get a drink. Avoid having the area around the trough turn into a muck hole. If the cattle do go through a muck hole to get a drink, the conditions for disease transfer and hoof rot are still present. The pad can be made using several materials, such as gravel or shale fill or railway ties.

Gas pump: to pump water into a storage tank

If you are checking your cattle frequently, and pumping the water up into a storage tank or basin is not too much hassle, then this system may suit you. It can be very economical to set up and is easily changed to match your demand. This system can be a time commitment.

A two-inch gas pump, along with a three-inch lay-flat hose, is typical for most situations. Other power sources can include a hydraulic motor, a 12 volt electrical that taps power off a tractor or truck.

The amount of storage required is based on the number of head you are supplying, how frequently you check your herd, plus some extra storage to allow for problems. For example, a herd of 25 cow calf pairs will consume approximately 375 gallons per day (25 x 15 = 375). If you are checking your herd every 3 days, then approximately 1,200 gallons of storage should be required.

Different types of storage can be used, such as:

- a poly tank or other materials
- a large constructed trough, such as a grain bin ring, embedded in concrete
- a raised lined basin built up on a dugout bank

If the storage tank is a poly tank or similar type, then set the tank on an elevated platform made of earth fill or crisscross rail way ties. The bottom of the tank should be approximately one to two feet above the float shut-off level in the trough.

Use a good quality float valve in the trough to save headaches and frustration. A float valve with a large bore of three-quarters of an inch to one inch, will reduce flow restriction. If the water is from a dugout or similar source, a large bore will have fewer problems with algae and bugs getting caught in the valve.

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Algae build up in the tank may cause problems with the float valve. Use one cup of bleach per 1,000 gallons once a week, shade the tank using a tarp or paint the tank with an aluminum type paint to reduce sunlight and heat.

Portable Nose Pumps

If you are willing to train your cattle or horses to push a nose pump to get water, this system can be economical and portable. You will either like it or hate it.

Set up no less than two pumps at any location for the livestock. This will reduce fighting and give you backup if one pump stops working. Each pump can handle 25 to 30 cattle. Keep the pumps a minimum of 20 feet apart. Set up a panel or frame to mount the pumps on, solid enough that the cattle won't move it around, and use the frame to encourage the livestock to approach the pump from the front.

A nose pump can lift up to 25 feet, but a more practical maximum lift of 18 feet is recommended. The higher and further away the pump is from the source makes the plunger harder to push.

Calves may not be able to operate the pump and go short of water. Setting a catch pan below the pump may help, or use a separate trough just for the calves, with creep panels to keep the cows out and provide the most water possible.

The intake and line should be large enough to supply water with little restriction. Use a floating intake with a one and a half-inch diameter line and a check valve just before the pump. This can supply up to 4 nose pumps with one intake, provided the length of intake line is less than 75 feet.

Shade the intake line or shallow bury it up to the pump to help keep the water cool. If the cattle get a shot of hot water on the nose when they push, they may be shy about using the nose pump.

Avoid using a foot valve because algae and bugs can cause you a lot of headaches. Instead, use a good quality spring-loaded check valve just before the pump.

Avoid training animals during hot weather or during calving. Plan to spend two or three days helping the herd learn how to use the pumps. Stand behind the panel frame and pump a bit of water until the cow catches on.

Solar Power Pump System

If you have eliminated all other options, and there are no other power sources that are available or practical, then a solar powered pump may be your best option.

There are two types of pumps most commonly sold for these systems: a floating pump and a suction pump. Each have their advantages and disadvantages. Your supplier will help you decide what is best for your situation. Each system must be sized according to the demand (type and herd size) and the lift.

Both battery storage and water storage are required. Allow 1 day of battery life and two days worth of water storage in a tank and trough system. For example, a herd of 50 feeder cattle will consume 500 gallons per day and the tank and trough should store 1,000 gallons. The water storage is for when something goes wrong and depends on regular checks.

The minimum lift required for most situations is approximately 15 feet. This allows for water level variation in the dugout and for lifting the water into an elevated storage tank, so it will gravity feed into a trough.

For suction pumps, avoid using a foot valve as algae and bugs can cause you a lot of headaches. Instead, use a good quality spring-loaded check valve just before the pump. There are easy ways to prime a system with out a foot valve.

A PIL switch is a common way to turn the pump on and off, but there is a maximum distance between the pump and the PIL switch. Check with your supplier for that distance. Using 10-gauge wire will also help.

Avoid any shadows on the panel. Even a fence wire in front of the panel can drastically cut the power output. Clean dust and debris off the panel regularly. Focus the angle of the panel regularly (every 2 weeks) to the angle of the sun. Use a pin or bolt on the panel frame and adjust it so the shadow is across the pin, not above or below it. Use Marine or Deep Cycle type batteries for best results.

A regulator is used to prevent over charging the battery. The regulator must be properly sized for your system and should compensate for temperature. There will be an upper and a lower limit. The lower limit can shut the system down if it is not set correctly, or it may not be needed at all. Some panels produce a maximum of 13.5 volts and a regulator is not needed.

Sun trackers change the angle of the solar panel to face the sun. Typically, increasing the size of the panel is more economical and reliable than using a tracker.

Do not hook the electric fencer to the solar water system. Doing this will more than double your chances of something going wrong, and when something goes wrong, everything will shut down.

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Use a good quality float valve in the trough to save headaches and frustration. A float valve with a large bore of three-quarters of an inch to one inch will reduce flow restriction. If the water source is from a dugout or similar source, a large bore will have fewer problems with algae and bugs getting caught in the valve. Algae build up in the tank may cause problems with the float valve. To avoid this, use one cup of bleach per 1,000 gallons once a week, or shade the tank using a tarp or other means.

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Windmill System

If there are no obstructions within approximately a half-mile of the windmill location, such as trees, buildings or hills, then a wind mill pump may be an option for you. Be aware that these systems are high maintenance, weather dependant, and usually cost the most per head supplied. Most people choose a windmill because of nostalgia.

There are two types of pumps most commonly sold for these systems and each have their advantages and disadvantages. Your supplier will help you decide what is best for your situation. Each system must be sized according to the demand (type and herd size) and the lift.

The floating air-activated pumps are typically small units, using 9 to 12 foot towers. This type of pump can supply enough water for 30 to 35 cattle. If more cattle require water, then additional windmills and pumps must be installed to meet the demand.

The reciprocal type pump, usually with a 30 to 40 foot tower, can supply water to 75 to 100 cattle. This type can lift water from a deep well by extending the pump down near the water level. Again for larger herds, additional windmills and pumps must be installed to meet the demand.

Three days worth of water storage is required. For example, a herd of 30 feeder cattle require 300 gallons per day. The storage required is (3 x 300 = 900 gallons). This can be a combination of tank or trough storage. This water storage is to allow for weather changes or when something goes wrong that depends on regular checks. Extended periods of not enough wind will require a backup water source, such as a gas pump or hauling water.

Algae build up in the tank may cause problems with the float valve. Use one cup of bleach per 1,000 gallons once a week, shade the tank using a tarp or paint the tank with an aluminum type paint to reduce sunlight and heat.

Set the trough on an elevated pad, so spilled water and rain drains away quickly. Have at least a 15-foot radius around the trough sloping away, so the cattle are standing up on a rise (approximately 12 to 16 inches) to get a drink. Avoid having the area around the trough turn into a muck hole. If the cattle do go through a muck hole to get a drink, the conditions for disease transfer and hoof rot are still present. The pad can be made of several materials, such as gravel, shale fill or railway ties.

Use a good quality float valve in the trough. A float valve with a large bore of three-quarters of an inch to one inch will reduce flow restriction. If the water source is from a dugout or similar source, a large bore will have fewer problems with algae and bugs getting caught in the valve.

Other Systems

There is almost no limit to the number of ways you can provide water to your livestock, using a particular situation to your advantage. In some cases, the alternative means are not as reliable, and backups should always be taken into account.

A hydraulic ram pump uses the energy from falling water. A part of the falling water is directed for use in your system. The part used can range from 1 to 20 per cent and the rest will be wasted downstream. The waste to yield ratio and the yield volume depend on the drop, size and efficiency of the pump.

Generally, a ram pump can lift water 3 feet for every foot of fall. The pump requires clean or filtered water. If the water is not clean, the pump may malfunction. This pump system is very site dependent, and will require storage.

Gravity Feed: This is taken from a man made reservoir, where there is enough head to push water through a hose into a trough and float valve system. Use at least a 1-day supply of storage.

Sling pump: This requires a fast-flowing body of water (four feet per second), such as a stream, to propel the pump. The stream rotates a plastic drum, a hose wound around inside the drum picks up a small amount of water, and then a small amount of air. The air pushes the water up the hose, to a three to four day supply storage tank and trough system.

Wind generator: There are some very reliable, low maintenance wind generation systems available. Cost is still high, and a way to store energy over a longer term (one week) is needed. A Wind generator may not be practical or it may be too expensive. You may also need a backup power source, such as a solar panel, which adds more cost.

Anything that can be done to improve the quality of the water delivered to your livestock will return your investment in the form of healthier and better yielding livestock. An idea such as aerating the water in the storage tank or dugout can improve palatability, which will increase the volume of water your animals drink, which also improves health. Using Barley Straw mats to improve water quality in the dugout is also a possibility.

Type of System	Advantages	Disadvantages	Capacity/Comment
Pipeline	Usually water source from well, system is simple and reliable, multiple troughs and locations can be set up	Limited amount of elevation lift, not very portable, need reliable water source	1" poly $0.30/ft. up to 1500 ft. approx. 1 ¼ poly line approx. Proper sizing of trough & line for distance & elevation & size of herd very important.
Hydro-power pump (or electric generator)	Reliable power source, easy to setup, easy to maintain	Initial costs high, water source needs to be close, ongoing hydro bills	Meter drop, pressure system, available water source, Generator
Gas pump into storage	Easy to match large changes in water demand, simple to setup,	Labour intensive, must be there to fill storage	Storage tanks, Trough & fittings, pump
Nose pumps	Easy to setup as portable, economical for small herds,	Need to train cattle, need alternate water source for calves	Set up no less than 2 pumps, two pumps, supply 25 cattle
Solar Power pump system	Fairly reliable power source, easy to setup, easy to maintain, many systems available for different situations	Need two days storage,	Need to match system to herd size, water source & conditions
Windmill system	Looks nice, reciprocal pump can lift water from a deep well	High maintenance, high cost per head, need 3 days storage and backup supply for extended calm periods, need open area, no trees	Match system to number of livestock
Access Ramp	Simple to build, less monitoring required	Reduced water quality, animal health concerns, yearly maintenance required	Use geotextile to hold base together, allow room for cattle to enter, turn and exit
Other systems	Each system will fit the right particular situation	Need the right particular situation for that system	

For further information or assistance, please contact Manitoba Agriculture at:
agriculture@gov.mb.ca or toll-free 1-844-769-6224