



## COST THE CHANGES

### PASTURE WATERING SYSTEMS: A COST COMPARISON

When selecting a pasture watering system, a producer considers various factors. These usually include:

- water quality protection,
- equipment reliability,
- equipment maintenance,
- labour requirements,
- equipment lifespan,
- access to a reliable energy source, and cost.

This factsheet briefly outlines the characteristics of three off-site watering systems and then details their estimated capital costs. For further technical information on these and other watering systems and on preventing water contamination, refer to the information sources listed at the end of this factsheet.

#### COMPARISON OF THREE WATERING SYSTEMS

Off-site watering systems are used in this comparison because they provide several benefits. Most importantly, they keep livestock out of the water source. This prevents contamination by livestock manure and damage to the riparian areas (the zone of water-loving plants along the edges of streams and lakes). Good water quality and a healthy riparian area are important for biodiversity, human uses and improved livestock weight gains and better animal health. These systems also minimize foot rot problems and reduce the risk of cattle drowning.

Three commonly used renewable-energy systems are compared: nose pumping, solar pumping and wind pumping. Renewable-energy systems are used in the comparison because many pastures do not have easy access to electricity for pumping.

Each system pumps water from a nearby water source (see box) to supply 100 cow/calf pairs. The systems have foot valves on the intake lines; a foot valve keeps the pump primed so water is available as soon as the pump is started.



#### WATER PERMITS AND LICENSING

If you plan to use water from a river, stream or lake, you must contact the nearest offices of both Alberta Environment and Fisheries and Oceans Canada for information on permits and licensing.

The cost estimates for this comparison consider the capital costs for each system, and do not include maintenance or depreciation. The costs are compared based on the expected lifetime of each system. The calculations assume that each system has the same number and size of animals per year and that the system has no value at the end of its expected lifetime.

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## NOSE PUMPS

Nose pumps are the most common livestock-powered pumping systems. The animal pushes a lever to reach water. This action activates the plunger and pumps water into the bowl.

Installation of a nose pump system is relatively easy and takes about one hour per pump. One pump will serve about 20 head, depending on how far and how high the water must be pumped. The pumps have a simple design, and can be moved easily from one water source to another.

Cattle need to learn how to operate the nose pumps. Young calves may not have the strength to use them.

The pumps require little maintenance, but can be rebuilt or replaced. The system has a 20-year life expectancy.



## NOSE PUMPING SYSTEM

Cost estimate for 100 cow/calf pairs	Cost
Water from stream running close to pasture	free
Nose pumps (1 for every 20 head), 5 pumps x \$300/pump	\$1500.00
Platform (2 feet x 6 feet), 5 platforms x \$50/platform	\$250.00
Polyethylene pipe (1-inch), 150 feet x \$0.36/foot x 5 pump sites	\$270.00
Foot valves, 5 valves at \$10/valve	\$50.00
<b>Subtotal</b>	<b>\$2070.00</b>
Contingencies @ 15%	\$310.50
<b>Total</b>	<b>\$2380.50</b>

**Capital cost/(cow/calf pairs) over lifetime of pumping system\***

$$= (\$2380.50) \div (100 \text{ cow/calf pairs})$$

$$\div (20 \text{ years}) = \$1.19/(\text{cow/calf pair})/\text{year} \quad \$1.19$$

\* Assuming same number and size of animals over the lifetime of the pumping system. Not including interest, maintenance costs or depreciation.

## SOLAR PUMPING SYSTEM

Solar pumping systems can be used to pump water continuously into a reservoir during sunny weather, or to charge batteries so the pumps can operate when needed. (The solar panels are less efficient in cloudy conditions and do not operate at night.) The cost estimate below is based on the option of storing electricity in a battery.

These systems usually require less than one day to install. They can be operated in remote locations. They are reliable and require little maintenance. There are a couple of water storage options for producers to consider for low sunlight conditions. The first option is to set-up the solar system with extra batteries that can be charged during sunny conditions that will run the pump during low sunlight conditions. The second option is during sunny conditions to pump water into troughs. Both options require storage of either energy or water for low sunlight condition. General rule of thumb is to have three to four day supply of water or energy for low sunlight conditions.

For the cost estimate, the panel is assumed to have a 20-year expected lifespan; however, the actual lifespan can be much longer with proper care and maintenance. The pump has a 10-year expected lifespan. These systems can be relatively expensive compared to other watering systems, although the cost/animal/year will decrease if the panel has a longer lifespan.

## SOLAR PUMPING SYSTEM

Cost estimate for 100 cow/calf pairs	Cost
Water from stream running close to pasture	free
Solar system (panels and pump)	\$3000.00
Trough (3000-gallon), 2 troughs x \$300/trough	\$600.00
Battery	\$80.00
Polyethylene pipe (1-inch), 150 feet x \$0.36/foot	\$54.00
Foot valve, 1 valve at \$10/valve	\$10.00
<b>Subtotal</b>	<b>\$3744.00</b>
Contingencies @ 15%	\$561.60
<b>Total</b>	<b>\$4305.60</b>

**Capital cost/(cow/calf pairs) over lifetime of pumping system\***

$$= (\$4305.60 + \$500 \text{ replacement cost of pump after 10 years})$$

$$\div (100 \text{ cow/calf pairs}) \div (20 \text{ years}) = \$2.40/(\text{cow/calf pair})/\text{year} \quad \$2.40$$

\* Assuming same number and size of animals over the lifetime of the pumping system. Not including interest, maintenance costs or depreciation.

## WIND PUMPING SYSTEM

Windmills use wind energy to pump water mechanically or convert the energy into electricity for use when needed. A wind pumping system needs more battery space to store energy than a solar pumping system. The cost estimate below is based on mechanical pumping, which is less expensive than storing the energy in a battery.

A wind pumping system needs to store enough water to meet the herd's watering needs for three to four days in case of long periods with little or no wind. The windmill must be in an open area free of windbreaks so it can receive the maximum amount of wind available.

Installation of the wind pumping system requires two or three people for two days. These systems have a 10-year life expectancy and will work in remote locations. Because windmills have many moving parts, maintenance requirements may vary.

## WIND PUMPING SYSTEM

Cost estimate for 100 cow/calf pairs	Cost
Water from stream running close to pasture	free
12-foot tower	\$700.00
Pressure pump	\$350.00
Trough (3000-gallon), 2 troughs x \$300/trough	\$600.00
Polyethylene pipe (1-inch), 150 feet x \$0.36/foot	\$54.00
Foot valve, 1 valve at \$10/valve	\$10.00
<b>Subtotal</b>	<b>\$1714.00</b>
Contingencies @ 15%	\$257.10
<b>Total</b>	<b>\$1971.10</b>

**Capital cost/(cow/calf pairs) over lifetime of pumping system\***

$$= (\$1971.10) \div (100 \text{ cow/calf pairs})$$

$$\div (10 \text{ years}) = \$ 1.97/(\text{cow/calf pair})/\text{year}$$

$$\$1.97^*$$

\* Assuming same number and size of animals over the lifetime of the pumping system.  
Not including interest, maintenance costs or depreciation.

## PASTURE WATERING SYSTEMS SUMMARY

SYSTEM	NOSE PUMPING	SOLAR PUMPING	WIND PUMPING
<b>Limiting factors</b>	<ul style="list-style-type: none"> <li>Cattle must learn to use</li> <li>Some types are difficult for young calves to use</li> <li>Limited number of animals watered one at a time</li> </ul>	<ul style="list-style-type: none"> <li>Batteries are needed to store energy; or extra troughs to store water, otherwise no sunlight, no pumping</li> </ul>	<ul style="list-style-type: none"> <li>Batteries are needed to store energy; or extra troughs to store water, otherwise no sunlight, no pumping</li> </ul>
<b>Installation labour</b>	<ul style="list-style-type: none"> <li>About 1 hour per pump</li> <li>Estimated cost = 1 person x 8 hours x \$10/hour = \$80</li> </ul>	<ul style="list-style-type: none"> <li>One day or less</li> <li>Estimated cost = 1 person x 8 hours x \$10/hour = \$80</li> </ul>	<ul style="list-style-type: none"> <li>Two or three people for two days</li> <li>Estimated cost = 3 people x 16 hours x \$10/hour = \$480</li> </ul>
<b>Lifespan, maintenance</b>	<ul style="list-style-type: none"> <li>20 years, with rubber diaphragm to be replaced every 2 to 5 years</li> <li>Low maintenance</li> </ul>	<ul style="list-style-type: none"> <li>Panel 20 years, pump 10 years</li> <li>Low maintenance</li> </ul>	<ul style="list-style-type: none"> <li>10 years, with yearly maintenance</li> <li>Maintenance requirements variable</li> </ul>
<b>Water storage</b>	<ul style="list-style-type: none"> <li>Constant supply</li> </ul>	<ul style="list-style-type: none"> <li>Need to have 3 to 4 days' supply on hand</li> </ul>	<ul style="list-style-type: none"> <li>Need to have 3 to 4 days' supply on hand</li> </ul>
<b>Capital cost per cow/calf pair per year</b>	<ul style="list-style-type: none"> <li>\$1.19</li> </ul>	<ul style="list-style-type: none"> <li>\$2.40</li> </ul>	<ul style="list-style-type: none"> <li>\$1.97</li> </ul>





## INFORMATION SOURCES

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