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Drinking Water Quality for Beef Cattle: An Environment-Friendly and Production Management Enhancement Technique

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Abstract

A simple yet potentially effective mechanism to modify animal behavior and improve land use has been set up as an applied research demonstration project. The summer water source for livestock on much of the western rangelands is supplied via earthen ponds, dugouts, and reservoirs, referred to as dams/pits. Observed drinking behavior of cattle at these dams/pits may cause shoreline vegetation degradation as the water level drops throughout the season. The decline in shoreline vegetation reduces the filtering effectiveness for these water sources and the cover for wildlife. Willms *et al.* showed yearling steer performance increased 23% when supplied with an alternate water source rather than watering in a dugout.

Our project objective was to answer these questions: Will cattle prefer to drink water from tanks or from dams/pits? Will the shoreline vegetation be affected by a dam/pit having a tank nearby (i.e., 50 to 150 feet away) as compared to a dam/pit with no tank? Are there any differences between tank and dam/pit water quality?

To answer these questions, one solar and two siphon systems were established. Data and observations show nearly an 80% preference for tank water over dam/pit water when both sources are near.

Keywords: Drinking water preference; water quality; shoreline vegetation.

Introduction

Most ranchers want to maximize the return of their livestock enterprise while sustaining use of the resources. Maximizing returns while ignoring the sustainability of the resources will result in eventual economic and environmental disaster. Ranchers who have been economically sustainable over generations must have learned how to work within environmental constraints. In general, the forage resources used by livestock operations today are in a more environmentally sound condition than at any other time in this century.

Water distribution is better now than at any other time in this century. Ranchers continue to improve the distribution of water by providing additional water sources where it has not been available before. Reservoirs, dugouts, and pipelines have increased in numbers over the last half-century, thereby improving the distribution of livestock and wildlife. This has allowed ranchers to utilize forage resources that were unused in the past because of their distance from water.

However, limited data are available on the quality of water supplied to livestock. Most Montana water sources have not been quantified as to quality (Surber, 1997). We do not recommend water quality tests on private dams/pits, unless there is a suspected problem. Instead, cattle behavior and performance may indicate problems with the water quality.

For livestock to perform up to their genetic potential, they must have adequate feed and water. Quality of the feed and water affects performance. Livestock will select the better quality feed and water when given a choice. Providing the highest quality water possible to livestock may have added benefits similar to that of high quality forages. Many parameters can be used in defining water quality. For example, water temperatures between 40 and 65 degrees Fahrenheit are ideal. Steers having access to cool drinking water gained 0.3 to 0.4 pounds more per day than those drinking warm water (Boyles *et al.*, 1988).

Free access to water is a high priority for dairy cattle. Cows which drink ad libitum produce more milk and butterfat than cows which drink only twice a day (Boyles *et al.*, 1988). Dry cows require about 8 to 10 gallons of water daily. Daily water consumption by cows in their last 3 months of pregnancy may rise to 15 gallons per day. Those in milk need about five times as much water as the volume of milk they produce. Calves start drinking water at an early age and their performance can be highly dependent on the availability of water. Their consumption is dependent on access and quality of the water.

Can Water Source Affect Quality?

A large number of cattle in the northern Great Plains depend on earthen water basins, such as reservoirs, ponds, or dugouts for their drinking water. Cattle dependent on these sources for drinking water may influence water quality simply by their method of access. Cows which drink from dams/pits resuspend sediments as they enter and move through the water to get a drink. The second cow to drink, many times, will wade farther, if possible, to get a cleaner drink of water. Fecal organisms, such as fecal coliform and streptococcus, are bound to sediments at the bottom of water sources until disturbed (Sherer *et al.*, 1988). Livestock or wildlife walking into or through the water source are a typical disturbance. However, livestock drinking from a tank do not resuspend bottom sediments, and rarely deposit urine and manure in the tank, as do those drinking from a dam/pit.



A question to be answered is whether cattle will drink out of a tank if other water sources are available. Oregon research (Miner *et al.*, 1992) demonstrated under winter feeding conditions that cattle preferred to drink out of a tank rather than a stream. Cattle were split in two equal pasture groups and fed during a winter feeding period. Both groups had full access to the stream. One group was also provided an alternate water source out of a tank. Access to the stream was not fenced off. Time in the stream was reduced by 90% over cattle that only had the stream as a water source. In addition, personal observations on several demonstration sites (Gallatin County Extension Service, 1994) demonstrated cattle preferentially drink from a tank versus stream or dam/pit sources.

Cattle performance may be enhanced by providing a higher quality of drinking water. Research in Alberta, Canada (Willms *et al.*, 1995) showed a 23% increase in weight gains over 71 days for yearling steers drinking well water versus those drinking from a dam/pit. Studies in 1993 showed a 20% difference in animal weights, when exposed to different water sources for a 30-day

period. Some of the sources were water pumped out of dugouts to tanks, compared to cattle drinking directly out of a dugout. A 1994 study confirmed the impact on cows, with a lesser impact on calves (Kenzie, 1995).

Application

Cattle choose not to wade in mud or risk slipping on ice to get a drink of water. Supplying water to cattle by adding a tank and some pipe and maybe even a pump (solar, wind, or other power source) just because the cows like it is not enough when cattle prices are having trouble keeping up with operational expenses. Is there an economic benefit to pursuing an additional expense? Does this have any application to summer grazing?

Demonstration Project

A demonstration project was planned to observe several aspects of a water source away from a dam/pit with the following objectives: (1) Determine if cattle show a preference for tank water versus direct drinking from a dam/pit. (2) Determine if availability of a tank would have any effect on shoreline vegetation versus a dam/pit without a tank nearby. (3) Determine if there are water quality differences between the tank, the dam/pit from which the tank was filled, or a dam/pit with no tank. The project also had several secondary objectives: (1) Make observations of gross performance of livestock. (2) Make observations using tanks as a distribution management tool. (3) Make observations on the behavior of cattle in relation to learning what and where the tank is.

During the summer of 1996, cattle at three sites were given a choice of drinking from dams/pits or tanks located 50 to 150 feet from the dams/pits. Water in the tank was supplied via gravity flow or a solar pumping system from the same dam/pit. No fencing was used to limit access to any of the dam/pit water sources. The cattle had a choice of drinking from the dam/pit or the tank. Two hundred thirty-two cattle drinking observations were recorded during daylight hours on 24 different days from July through mid-September. These observations were made in a three-pasture rotation where the solar pumping system was available at one dam/pit in each rotation.



Cows at solar pump..

Preliminary findings indicate cattle prefer tanks to muddy banks. Seventy-six percent of the cattle (cows and calves) which approached the watering source with a tank available watered at the tank. Cattle did exhibit a learning curve as the cattle in the last of the grazing season looked for the tank as a source of water. Calves demonstrated the most interest in the tank and were the most consistent users of the tank water. More residue was left on the shorelines of the dam/pit with nearby tank. Definite water quality differences did exist. Total suspended solids (TSS) were much lower (2mg/L) in the tank as compared to the dam/pit (50mg/L) sources. Other water quality parameters measured—electrical conductivity, pH, total dissolved solids, nitrate-nitrogen, calcium, potassium, magnesium, and sodium—displayed little difference.

Conclusion

If a significant weight gain or cow/calf efficiency can be shown, it would be profitable for producers to install tanks for an out of dam/pit drinking water source. For example, at a 5% increase in calf weights, 100 calves would pay for one gravity system (\$1,300-\$1,400) in one year at \$0.60 calf prices. At \$0.80 calf prices, the same calves could pay for a solar watering system.

500 lb. calf x .05 = 25 lbs.
25 lbs. x \$0.60/lb = \$15.00
\$15.00 x 100 calves = \$1500.00



Herd health may also benefit from providing access to water other than in the dams/pits thereby minimizing disease transmission. Monetary calculations of benefits are more difficult, but may be part of the increase because improved health does enhance cow performance. Cattle drinking out of a tank do consume lower levels of TSS. This, in part, may be the reason cattle appear to prefer the tank to the dam/pit.

There is a need to collect more information on performance of cattle and calves to determine the eco-



Solar system.

nomie benefit. The increase in plant residue around the dam/pit would serve as a better filtering system of the runoff water entering the dam/pit. In addition, increased aquatic plants in and around shorelines would use more of the nutrients, thereby improving water quality.

These demonstrations indicate that a rancher who is reconstructing dams or building new water sources should consider installing a siphon tube or pump system to a tank away from the edge of the dam/pit as an alternate livestock water source. It is the opinion of the authors that ranchers could avoid fencing water sources to enhance water quality if a tank water source was available. Water quality, wildlife habitat, and livestock performance could be enhanced if limited economic resources are used to provide tank water systems without the expense of additional fence.

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