A Cooperative Approach... Solving Domestic and Livestock Water Problems

Cooperative Extension South Dakota State University

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solving domestic and livestock water problems

(Rural Community Water Systems)
The rural residents of South Dakota are well aware of the rapidly increasing interest in water and its development as a resource. Recent State Legislatures have enacted legislation requiring each Board of County Commissioners to appoint a Planning Commission to aid them in planning orderly development of all resources including water. Federal and State authorities have arrived at a mutually acceptable set of quality standards for water used for domestic purposes.

South Dakota has large supplies of excellent water. Unfortunately this water is poorly distributed over the state. Large areas are entirely dependent on underground water supplies of poor quality and sometimes limited quantity. In many cases, quality is such that it cannot be economically treated. Few areas have raw water that will meet existing quality standards.

This publication discusses various factors involved in construction of a rural community water system. Such a system would be designed to meet the particular needs of farmers and other rural residents not being served by existing municipal systems.

**Economic Feasibility**

When considering the construction of a rural water distribution system, a major factor is location of the future patrons. If thinly scattered over a large area, the construction costs per user are high and water charges levied to operate and pay for the system will be high. As population density increases, the investment per user will decrease. This will permit a reduction in water rates.

One of the major decisions that must be made by the interested group is the top minimum charge they are willing to pay for water service. This monthly minimum can be expected to range between $8 and $15 per month for 3,000 gallons of water. As water use exceeds 3,000 gallons, the average would be available on a declining rate schedule. Typically, water used over 10,000 gallons per month would cost the consumer $0.50 per thousand gallons. In order to make an informed decision, future consumers must know the true cost of water being produced by their existing system. This calculation is simple if water is being bought in tank lots and delivered to the user’s cistern.

If the water source in question is a well, many factors enter the picture. There are several hidden costs that must be added to the obvious costs of operating a private water system. Extension Fact Sheet 468, “Cost of Rural Community Water and Sewer Systems as Compared to Private Systems,” is available to provide you with a method to analyze operating and maintenance costs of your present water system. All prospective customers of an interested group are urged to make use of this Fact Sheet. It should then be possible to reach a decision on the maximum acceptable monthly water rate.

The accompanying table is designed to show the relationship between water charges and investment per user. You will note the average consumer will use more water than the minimum of 3,000 gallons per month. This excess water causes the average cost per month to run about $5 over the minimum.

<table>
<thead>
<tr>
<th>Minimum cost per month that users are willing to pay</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average cost per month</td>
<td>13</td>
<td>15</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>Annual cost per user</td>
<td>156</td>
<td>180</td>
<td>204</td>
<td>240</td>
</tr>
<tr>
<td>Operating cost per user</td>
<td>20</td>
<td>22</td>
<td>24</td>
<td>26</td>
</tr>
<tr>
<td>Balance available for debt payment</td>
<td>136</td>
<td>158</td>
<td>180</td>
<td>214</td>
</tr>
<tr>
<td>Maximum allowable investment for user</td>
<td>$2,160</td>
<td>$2,500</td>
<td>$2,860</td>
<td>$3,390</td>
</tr>
</tbody>
</table>

*For 3,000 gallons
Based on 5,500 gallons which is the average amount used per hook-up in all rural water systems financed by Farmers Home Administration in the nation.
The table based on Farmers Home Administration experience can be used as a rough guide in determining the maximum amount a group could afford to spend in building a system. A group of one hundred users willing to pay a $10.00 minimum water charge could spend approximately $250,000 ($2,500x100 users) to build a system. The same group, agreeable to a $15.00 a month charge, could invest $339,000 in their system.

**Design and Cost of Rural Water Systems**

Interest in rural water systems is a relatively new development in South Dakota.

Other states, with serious water problems, have been very active in this field. Texas has at least 500 rural water systems. Some other states involved are Mississippi with 400 systems and Colorado with about 120. These states have been active in this field for many years and have accumulated operating experience and design procedures that provide valuable guidance. Dramatic changes in system design, the pipe manufacturing industry, and pipe laying techniques have made projects feasible that were impractical only a few years ago.

Generally, it has been assumed that a feasible rural system must serve about two customers per mile of pipeline installed. Recent design refinements indicate a user density of one user or less per mile of pipeline may be workable under favorable conditions. Pipeline capacities have generally been based on a flow of 3 gallons per minute per customer served. The operating history of hundreds of rural systems now indicate 3 gallons per minute design capacity is unnecessary to provide adequate service. Projects now on the drawing boards or under construction have been designed on flows of 1 or 2 gallons per minute. Basically the system should be designed to supply water on demand in a pressure range of 20 to 50 p.s.i. Service would be almost identical to service supplied by the average municipal system. Water quality would be of primary importance. The water should be treated to remove iron and manganese and softened to no more than 15-17 grains hardness. It must be kept in mind that many of the users have adequate water available. They are primarily interested in water quality.

Where utmost economy in construction is needed for a feasible system, a “constant flow” system can be utilized. This system utilizes small diameter pipe to deliver water to the users cistern or reservoir 24 hours a day. The user must repressure the water through the use of a standard farm pressure system. Each user pays
his water charges according to the size demand valve he needs. Demand valves react to water pressure and allow a constant one pint, one quart, etc., per minute to flow through to the reservoir.

**Organization**

A group of farmers or rural residents interested in a central water system have several alternative organizational routes to explore. These options may best be explained by use of two examples:

First, we could consider the case of three or four farmers clustered at or near a road junction. A simple nonprofit corporation organized under Chapter 24 of the South Dakota Code would be the logical organization. This corporation could obtain long-term financing to construct and operate a small system to serve the joint needs of the members. In some instances, cost-sharing by the Agricultural Stabilization Conservation Service may be available to aid in distributing the water for livestock use. Generally, financing would be available through the Farmers Home Administration for corporations of this type.

Another situation would be the case of a much larger group scattered over a broad area. This group could consider organizing as a Water District under State laws. The organization would have the taxing and regulatory powers common to a public body. This organization would have the authority to issue both obligation and revenue bonds much in the manner of a town or municipality. Financing construction would be handled through sale of bonds. An election would be required to create an organization of this type. A water district has a distinct advantage over a non-profit corporation since their assets are not subject to real and personal property tax. The same group, as an option, could organize as a non-profit corporation. As a corporation, their property would be subject to State taxes. In actual practice, corporations are more flexible and have worked very well as sponsoring organizations in other States.

There are other minor advantages and disadvantages to both approaches that should be considered during organizational sessions.

It has been found advisable for organizing groups to collect small initial membership fees to provide money needed to employ an attorney and a consulting engineer. The services of these professional people will be needed very early in the process to determine the type of organization best suited to the project and to determine whether the system can be built at a cost within the repayment ability of the members.

The pipe manufacturing industry has perfected new, less expensive pipe that reduces construction costs.
Rural Community Water Systems

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