SPRINKLER IRRIGATION DEVELOPMENT ON THE SNAKE RIVER PLAIN[a/]

by

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INTRODUCTION

Sprinkler systems are applying water to agricultural lands once thought to be too far removed in elevation from any source of water on the Snake River Plain of Idaho. Sprinkler development in the area began about 1950 and will continue as long as there is water in the Snake River for agricultural development. Most early systems required the water to be lifted from 100 to 200 feet. By 1960 the total pumping heads on systems were 400 to 500 feet, and by 1965 systems with pumping lifts of 750 feet were being installed.

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HISTORY

The Snake River Plain is an area bordering the Snake River in southern Idaho extending from the Wyoming line on the east to the Oregon State line on the west, a distance of 500 miles by road. It ranges in elevation from 2,000 feet at the Oregon border to 6,500 feet at the Wyoming border.

Lands in this area were first irrigated by the Mormon settlers in the early 1880's. The 1949 United States Census of Irrigation showed that 2,137,237 acres were irrigated in Idaho. Most of that area was irrigated using surface methods. Sprinkler irrigation accounted for 9,995 acres or 0.5 percent of the total area irrigated at that time. Most of these sprinkler irrigation systems were on orchard or small (less than 40 acres) diversified farming areas in southwestern Idaho. The beet sugar industry bought several sprinkler systems to speed the germination of the beet seed during periods of natural moisture shortage. Many of the sprinkler systems were designed for maximum acreage coverage with minimum equipment, and water application rates were very high. The high application rates encouraged runoff and discouraged sprinkler irrigation installations.

The 1959 U. S. Census of Irrigation showed 2,576,580 acres irrigated in Idaho with 215,595 acres or 8.4 percent of the irrigated area being sprinkled. Marion Clawson, working north of Rupert, and A. A. Merrill around Idaho Falls, started the land development trend by drilling wells and installing 160- and 320-acre sprinkler systems for each well. About 190,000 acres of sprinkler-irrigated farmland were developed during this decade by private capital.

Irrigation Engineering and Maintenance magazine estimates the 1964 irrigated area of Idaho to be 3,250,000 acres, of which 487,500 acres or 15 percent of the irrigated area is sprinkled. This increased sprinkler acreage has been developed by private investors, the U. S. Bureau of Reclamation, and the Bureau of Indian Affairs. The current trend is toward the development of blocks of land, 2,000 acres or more in size, by individuals or groups of individuals using community-type sprinkler irrigation systems.

DEVELOPMENTS TODAY

Much of the remaining land available for irrigation development is along the Snake River between Twin Falls, Idaho, and Ontario, Oregon. This land is currently in sagebrush and is used only for grazing. The land ownership is private, State of Idaho, or by the U. S. Government. The largest areas are held by the U. S. Government, and are administered by the U. S. Department of Interior through the Bureau of Reclamation and the Bureau of Land Management.

The Bureau of Reclamation has approximately 150,000 acres of this land withdrawn from the Public Domain that is scheduled to be developed under the Guffy Project. This is a combination power and water storage facility and long range planning is important to its future and development for irrigation.

Some of the land under the Bureau of Land Management is available for irrigation development through the Desert Land Act of 1877 at a basic land cost of $1.25 per acre.

The costs of developing sprinkler-irrigated lands on the Snake River Plain with water from the Snake River vary from $226 to $525 per acre, including the land acquisition costs. Land acquisition costs from $1.25 to $125 per acre. The river pumping station and penstocks cost from $50 to $100 per acre. Canals and main pipelines to the irrigated fields cost from $50 to $100 per acre. The booster pumps, field main pipelines and sprinkler laterals cost from $125 to $200 per acre.

Sprinkler irrigation development begins in the Snake River Plain area when some person obtains title to a piece of land and a water right from the State for water to irrigate the land. Water may be obtained from a well or wells on the property or from surface supplies such as the Snake River.

The land owner then contacts specialists in irrigation to determine the type of irrigation system and estimated cost of the development. This results in an economic feasibility report being made of the project which is used for two purposes - (1) to obtain financing and (2) to guide the owner in operation of the project. The feasibility study is usually made by a professional engineer working for one of the irrigation equipment supply companies. Sources of information used in compiling this report are U. S. Department of Interior Geological Survey quadrange standards, estimated irrigation water requirement publications for the area, pipe handbooks, and crop production reports for irrigated areas in the vicinity of the development.

The feasibility report contains eleven sections covering the introduction, legal description of land, system description, construction time, type of farming, operation of the Canal Company, cost estimate, crop value, cost analysis, conclusion and appendix.

If the feasibility report is favorable, the next step is to obtain financing of the development. Financing is obtained from banks, life insurance companies, private investors, and other sources of risk capital. At the present time it is easier to get financing for a development of 2,000 acres or larger than for smaller developments.

After the financing of a project has been arranged, the final detailed design of the sprinkler irrigation development is made by engineers before construction begins.

The majority of recent developments on the Snake River Plain have been designed for 2,000 to 6,000 acres. Pumping plants have been designed for electric motors or natural gas engines powering the pumping plant that supplies the water to the distribution system.

The water distribution systems consist of several designs. A closed pipe system with pumps and power plant located at the water source supplying water at sprinkler pressure to the fields being irrigated is most favored, but is higher in first cost. Other systems pump water in pipelines to canals which deliver the water to sumps where booster pumps supply the sprinkler pressure to the sprinkler system on the fields. Some systems have reservoirs to store water from the main canal and relift stations that pump this water to higher elevations for sprinkler systems.

Type of sprinkler lateral used in current sprinkler developments are hand-move, side roll, solid set, and movable solid set laterals.

With the detailed design of the pumping plant, pipelines, canals, storage ponds, relift stations, and field water distribution system completed, the installation of the irrigation system becomes the next problem.

INSTALLATION PROBLEMS

When the sprinkler irrigation development reaches the installation stage, time becomes a factor. Usually each part of the irrigation system must be completed by a certain date. A work schedule is prepared for the delivery of equipment and the installation work needed at each phase of the job. Because of weather factors and personnel problems, several phases of the installation usually overlap. The engineer in charge has to determine how to reschedule his work when something unexpected interferes with the planned timing so that the original completion date can be met. The usual breakdown of jobs is pumping plant, land clearing, main pipelines and canals, booster pumping stations, penstock, field mains with sprinkler laterals, and final system testing.

Several 3,000- to 5,000-acre developments have been completed and put into operation in four months or less. This rapid installation, together with complete water control and full crop production the first year, have been the factors influencing the choice of sprinklers for irrigating the new lands.

The clearing of the land of native sagebrush and preparing it for crop planting is started about the same time as the installation of the river pumping station if frozen ground and spring rains do not interfere.

Core drilling is done at selected sites to find the best location of underground formations for the pump sump and pumping plant location. An average pump sump along the Snake River will necessitate an excavation of 50' x 50' x 20' deep from the normal ground level. The excess overburden is removed by bulldozer and carryall down to a depth where

dragline and pumping combinations complete the excavation of the sump and pumping plant foundation site. The location of the pump site and penstock combination can be of prime importance to the overall cost of any irrigation development.

After the installation of the pumping plant is well under way, the penstocks are installed. These have varied from 20 inches to 42 inches in diameter and must stand operating pressures up to 300 pounds per square inch. These pipelines are usually placed on steep slopes with elevation differences between ends of pipe of up to 650 feet.

The main pipelines or concrete-lined canals that distribute water to the individual field sprinkler system follow conventional construction practice. Frozen ground and bad weather sometimes interfere with the installation schedule on this part of a development.

The booster pumps, field main lines, and sprinkler lateral lines are usually the last parts of the irrigation system installed. Usually, the farm manager is anxious to get water on some parts of the land that he has planted in crop by this time and he keeps the pressure up on the construction crews working on these items.

The tension begins to rise among the engineers, installation personnel, owners and others connected with the project as each part of the development installation is completed and readied for testing. This excitement is greatest when the first test of the completed development is started. Adjustments of equipment and necessary changes are made at this time. It usually takes the first year's operation to reveal the minor problems in a sprinkler development.

Normally, the problems are in direct ratio to the number of farm operators in the development. Each farmer has developed his own farm operation schedule based on the type and amount of farm machinery he uses in his farm operations. He then makes his irrigation schedule correspond with his farm schedule which in many cases is different than visualized by the development designer.

OPERATION

The sprinkler system is designed for large-scale farming operations. Plowing, planting, and harvesting in the longest continuous runs possible is of prime importance. This necessitates burying main pipelines at least 30 inches deep so the farm operations do not damage the underground irrigation equipment.

Owners and operators on new developments on the Snake River Plain seem to have the best success when they delegate authority to their respective foremen. New developments in seeds, fertilizers, machinery, soil and water conservation and a water pumping cost of $1 per acre-foot per hundred feet of lift keep management control a prime factor.

Facilities for farm labor is also one of the current problems that face the new irrigation developments. Permanent personnel, as well as itinerant labor, need housing. Trailer pads and commercial-type quarters are built for their use.

The labor problem influences the current methods of irrigation. Hand-move sprinkler laterals are less expensive and are used where labor is no problem. Boys of high school age make good pipe movers and during vacation are used extensively. However, before school is out and after

school starts other pipe movers must be employed. Several types of mechanized equipment and solid sets are being used to reduce the labor necessary for irrigating. In general, the trend is toward higher first system equipment cost to reduce the labor problem.

RESULTS

Crop yields on these new developments generally have been above average. High yields of potatoes are attributed to the virgin soil. Other crops normally produce better in soils that have been under cultivation for a period of time. The increase in crop yields should be attributed to better management of plant, soil, and water. The sprinkler irrigation industry feels that better water control under sprinkler irrigation has been a major factor in this yield increase.

An example of the investment in the larger developments along the Snake River is the following costs for one 3,975-acre development:

Irrigation system (Complete)	$ 775,000	
Buildings	332,000	
Roads, land clearing, etc.	110,000	
Total development cost		$1,217,000
Farm equipment	$ 428,000	
Crop planting, harvesting and irrigating	1,000,000	
Total operation costs		1,428,000
Total development and operation capital		$2,645,000

This investment provided employment for 16-1/2 full-time people and the peak number employed during harvesting operations was 110.

SUMMARY

The current sprinkler irrigation developments on the Snake River Plain area of Idaho began in 1950. System size has grown from 40 acres to 6,000 acres and the total pumping head from 100 feet to 750 feet.

The costs of developing new sprinkler-irrigated lands vary from $226 to $525 per acre.

The procedure for developing a block of new lands is to obtain title to the land, have a feasibility report made, obtain financing, have a correct sprinkler system designed and installed, clear the land, and plant and harvest the crop.

Success of the development depends on the proper sprinkler system design and proper management of the farming and irrigation operations. Potato yields on the newly developed land have been better than those obtained on older producing areas.

Investment costs for a 3,975-acre sprinkler development were $193 per acre for the irrigation system, but before a crop was produced an investment of $674 per acre was involved.

The development of land in the Snake River Plain is truly big business.