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THE COST OF OWNING AND OPERATING  
SIX SEMI-PORTABLE SPRINKLER SYSTEMS  
IN THE COLUMBIA BASIN, WASHINGTON

by

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INTRODUCTION

Many developments in irrigation methods have taken place during the last twenty years. Previously gravity irrigation was the primary method. After World War II aluminum tubing and electricity became available to farmers at a more reasonable cost. As a result, farmers began to use sprinkler systems for regular and supplemental irrigation. By 1965 approximately 36 percent of the irrigated land in Washington was sprinkled. (1)\*\* Semi-portable systems are the most common type of sprinklers. However, some farmers are installing solid-set systems to reduce irrigation labor requirements and increase irrigation efficiency.

Sprinkler irrigation is adapted to a wide range of soil, topographic and climatic conditions. Sprinklers are well suited to sandy soils with high water intake rates, soils too shallow too level for gravity irrigation and land with steep or irregular topography. Water application can more readily be varied with sprinklers to match the water penetration rates and the water holding ability of the soil. Frequent applications of small amounts of water can be applied to reduce water charges, leaching of crop nutrients and lessen ground water buildup.

More than one-third of the sprinkler irrigated land in Washington is in the Columbia Basin. A study of Columbia Basin irrigation for 1959 and 1960 determined the average on-farm irrigation efficiency to be 64.3 percent for sprinkler systems compared with 43.4 percent for gravity irrigation methods. (2) The on-farm irrigation efficiency was determined by dividing the crops' consumptive use of water by the amount of water delivered to the farm.

Labor charges are becoming a larger portion of the total annual costs of operating sprinklers because of increasing wage rates. Farmers that hire irrigation labor may be able to reduce their operating costs by installing a system with lower labor requirements. The information obtained during this study indicates that approximately 41 minutes per acre are required to move a lateral by hand, compared with 16 minutes per acre for gas powered wheel-move laterals. Self-propelled systems required no labor for moving during the rotation. Thus, while hand-move systems require the lowest capital investment, their annual cost of operation is not the lowest for farmers that hire irrigation labor.

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\*\*Numbers in parenthesis refer to Bibliography.

OBJECTIVE

Farmers frequently select their sprinkler system solely on the basis of its purchase price. However, the decision should be based on the annual cost of owning and operating the system, its suitability for the field conditions and the proposed cropping pattern. Factors to consider when selecting a system are its adaptability to the farm layout, capability of uniform water distribution, ability to adequately irrigate the crops to be grown and the labor requirements of each system.

This study was made to consider some of the important physical features of six semi-portable sprinkler systems and to determine their capital investment and annual operating costs. Additional information is provided to help farmers select a sprinkler system for a particular farm.

The six systems studied are: (a) hand-move systems with 60-foot spacing between lateral settings; (b) side-roll systems with 60-foot spacing between lateral settings; (c) hand-move systems with 50-foot spacing between lateral settings; (d) side-roll systems with 50-foot between lateral settings; (e) circular hydraulic self-propelled systems; and (f) circular electric self-propelled systems.

Specific objectives of the study were:

1. Determine the capital investment for six semi-portable systems designed for rectangular 80-acre and square 160-acre farms in central Washington.
2. Determine the annual cost of owning and operating the various systems for four different water distribution rates in the Columbia Basin area.
3. Indicate some important physical features farmers should consider when selecting a semi-portable sprinkler system for a particular farm situation and cropping pattern.

SOURCE OF INFORMATION

The physical and financial information for the study was obtained during 1965 and 1966 from Columbia Basin and other central Washington farmers that own and operate sprinkler systems. Additional investment and operating information was obtained from local equipment dealers and power supply representatives.

IRRIGATION TRENDS IN THE COLUMBIA BASIN

Table 1 shows the acres and percentage of gravity and sprinkler irrigated land in the Columbia Basin for the years 1959-1965. During those years the amount of irrigated land increased 54 percent. The sprinkler irrigated land increased 122 percent while the gravity irrigated land increased only 31.5 percent.

TABLE 1  
ACRES AND PERCENTAGE OF GRAVITY AND SPRINKLER  
IRRIGATED LAND IN THE COLUMBIA BASIN, 1959-1965 (3)

<u>Year</u>	<u>Total Irrigated</u>	<u>Gravity Irrigated</u>		<u>Sprinkler Irrigated</u>	
		(Acres)	(%)	(Acres)	(%)
1959	266,590	200,358	75	66,232	25
1960	294,195	215,270	73	78,925	27
1961	314,239	226,762	72	87,477	28
1962	345,637	248,894	72	96,743	28
1963	370,322	257,703	70	112,619	30
1964	388,691	259,943	67	128,748	33
1965	410,645	263,622	64	147,023	36

The distribution of sprinkled land is not uniform throughout the Columbia Basin. As shown in Table 2, on a percentage basis, the South Irrigation District had almost twice as much sprinkled land in 1965 as the Quincy District and three times as much as the East District. The larger percentage of sprinkled land in the South District is primarily due to the sandy soils in that area. They can be more efficiently irrigated with sprinklers. Also, more of this area was developed in recent years when sprinkler systems were more attractive to farmers because of operational improvements.

TABLE 2  
PERCENTAGE OF SPRINKLER IRRIGATED LAND IN THE  
COLUMBIA BASIN, BY IRRIGATION DISTRICTS, 1959-1965 (3)

<u>Year</u>	<u>Project Average</u>	<u>East District</u>	<u>Quincy District</u>	<u>South District</u>
1959	25%	17%	23%	42%
1960	27%	18%	25%	43%
1961	28%	18%	25%	46%
1962	28%	18%	25%	46%
1963	30%	19%	27%	50%
1964	33%	19%	28%	56%
1965	36%	21%	30%	60%

#### SYSTEM DESCRIPTIONS AND COSTS

The systems studied are grouped according to their movement into (a) side-move systems and (b) circular self-propelled systems. Side-move systems are further separated as to whether they are moved by hand or mounted on wheels and whether the laterals are spaced fifty or sixty feet apart. The self-propelled systems are either hydraulically or electrically propelled.

## SIDE-MOVE SYSTEMS

HAND-MOVE

Hand-move systems require the lowest capital investment, as shown in Table 3. The lateral is composed of three or four-inch aluminum pipe in 40-foot sections for easily moving from one location to another. The system is readily adapted to irregular shaped fields and rough topography. The major disadvantages are the high labor requirement for moving laterals and the limitation to low crops. The spacing between laterals for hand-move systems is either fifty or sixty feet.

Sixty-foot lateral spacing is the most common type of hand-move system. A larger area (120 percent) is irrigated than with 50-foot spacing, but less water per acre (87.5 percent) is applied during each irrigation. It takes 7.5 days to complete an 80-acre irrigation with three laterals being moved twice daily. The same time is required for a 160-acre system with six laterals. The water distribution pattern is not as uniform as with closer spaced laterals. Systems with laterals spaced sixty feet apart require larger pumps because a larger volume of water is distributed. Also these systems use more power.

The capital investment was determined to be \$115.98 per acre for an 80-acre system and \$87.70 per acre for a 160-acre system. The total annual costs are \$48.52 per acre for 80 acres and \$44.68 per acre for 160-acre systems distributing 42-acre inches of water per year. The annual labor costs are \$16.40 per acre for both sizes of operation.

TABLE 3  
CAPITAL INVESTMENT, ANNUAL OPERATING COSTS AND TOTAL  
COST PER ACRE OF SIX SPRINKLER SYSTEMS ON 80-ACRE  
AND 160-ACRE FARMS IN THE COLUMBIA BASIN<sup>a/</sup>  
(1966)

<u>Cost Per Acre</u>	40x60	40x60	40x50	40x50	Hydraulic	Electric
	<u>Hand</u>	<u>Wheel</u>	<u>Hand</u>	<u>Wheel</u>	<u>Self-Propelled</u>	<u>Self-Propelled</u>
	\$	\$	\$	\$	\$	\$
	<u>80 ACRES</u>					
Capital Investment	115.98	192.10	112.34	184.56	184.95	
Operating Costs <sup>a/</sup>						
Irrigation labor	16.40	6.56	16.27	6.51	2.75	
Electricity	7.15	7.15	5.48	5.48	6.72	
Water	8.00	8.00	8.00	8.00	8.00	
Other operating	5.29	6.73	5.04	6.42	6.60	
Investment overhead	11.68	21.18	11.38	20.40	14.44	
Loss of crop land					7.50	
<u>TOTAL ANNUAL COSTS<sup>a/</sup></u>	<u>48.52</u>	<u>49.62</u>	<u>46.17</u>	<u>46.81</u>	<u>46.01</u>	

160 ACRES

Capital Investment	87.70	165.20	86.02	160.01	146.48	197.28
Operating costs <sup>a/</sup>						
Irrigation labor	16.40	6.56	16.27	6.51	.00	.00
Electricity	6.79	6.79	5.48	5.48	6.84	6.73
Water	8.00	8.00	8.00	8.00	8.00	8.00
Other operating	4.40	5.88	4.23	5.67	5.28	6.32
Investment overhead	9.09	18.75	8.97	18.15	12.25	15.40
Loss of crop land					7.50	7.50
<u>TOTAL ANNUAL COSTS<sup>a/</sup></u>	<u>44.68</u>	<u>45.98</u>	<u>42.95</u>	<u>43.81</u>	<u>39.87</u>	<u>43.95</u>

<sup>a/</sup> Costs based on distributing 42-acre inches of water annually. Details in tables 6 through 17.

Fifty-foot lateral spacing is becoming more popular. The closer spacing of laterals provides better water distribution efficiency at the same or less capital investment and annual operating cost. A smaller area is irrigated with each lateral setting but more water is applied per acre. Also, the water distribution is more uniform. It takes 8.5 days to complete one rotation on 80 acres when three laterals are moved twice daily or when 160 acres are irrigated with six laterals. The irrigation time and labor requirements per rotation are greater because the closer lateral spacing requires more moves to cover an area. However, less rotations are required to distribute 42 inches of water per season.

The capital investment is \$112.34 per acre for an 80-acre system and \$86.02 per acre for a 160-acre system. The total annual costs are \$46.17 per acre for 80 acres and \$42.95 per acre for 160-acre systems. The annual labor costs are \$16.27 per acre for 80-acre and 160-acre systems.

WHEEL-MOVE (SIDE ROLL)

In 1962 it was estimated that 80 percent of the sprinkler systems installed on Columbia Basin farms during the previous five years were of the wheel-move type. (2) They have since become even more popular. The lateral pipe serves as axle for the wheels, which are 40 feet apart. A gasoline powered engine, usually located in the center of the lateral, propels the lateral from one location to another. Laterals spaced 60 feet apart have either five-foot wheels for low crops or seven-foot wheels for taller crops. Six-foot wheels are normally used on laterals spaced 50 feet apart.

Sixty-foot lateral spacing is the most common type wheel-move system. The area irrigated, the amount of water applied, the length of rotations and the power requirements are the same as indicated for a hand-move system with sixty-foot lateral spacing. The irrigation labor requirements are less, however, because less time is needed to move the laterals.

The capital investment was determined to be \$192.10 per acre for an 80-acre system and \$165.20 per acre for 160 acres. The total annual costs are \$49.62 per acre for 80 acres and \$45.98 per acre for 160-acre system distributing 42 inches of water per season. The annual labor costs of \$6.56 per acre are only 40 percent of the labor costs for a comparable system that is hand-moved.

Fifty-foot lateral spacing. The design and operational features of this system are similar to those of the hand-move system with fifty foot spacing. However, the irrigation labor costs are only 40 percent of hand-move costs when 42-acre inches of water are distributed per season.

The capital investment is \$184.56 per acre for an 80-acre system and \$160.01 for 160 acres. The total annual costs are \$46.81 and \$43.81 per acre, respectively, for 80-acre and 160-acre systems. The annual labor costs are \$6.51 per acre for both sizes of operation.

#### CIRCULAR SELF-PROPELLED SYSTEMS

Circular self-propelled systems are designed to irrigate circular areas. One lateral rotates around a central pivot. It is 655 feet long for 40-acre systems and 1285 feet for 160-acre systems. The lateral is mounted on a carriage with either wheels or tracks at 90-foot intervals. The amount of water applied each rotation can be varied from less than one inch per acre to as much as four inches per acre by changing the speed of lateral rotation.

No irrigation labor is needed to move the lateral during rotation since the systems are self-propelled. However, at least two hours labor per rotation should be allocated for greasing and periodic adjustments. The time required to move the lateral from one pivot location to another varies according to the type of system.

Slightly over 95 percent of the potential crop land is normally irrigated with sprinkler systems. The regular circular systems, however, will irrigate only 70 acres of a rectangular 80-acre farm or 140 acres of a square 160-acres, since the corner areas are not irrigated. Additional land can be irrigated only by installing special boom-type nozzles or other sprinkler systems. For this study a charge of \$100 per acre was made for the loss of irrigated crop land below the 95 percent normally served by a sprinkler system.

#### HYDRAULIC PROPELLED

The lateral is mounted on wheels which are propelled by a driving force developed through hydraulic cylinders. This system is best adapted to land with slope changes of less than five percent. It is suitable for tall crops because the lateral is seven and one-half feet above the ground. The system can readily be moved from one location to another. Crops with the same or similar water requirements should be grown in one area because the amount of water applied in one area cannot easily be adjusted for crops with different water needs.

The cost information for irrigating an 80-acre rectangular shaped farm with a hydraulic self-propelled system was based on moving one 40-acre system to two locations.

The capital investment for 80 acres is \$184.95 per acre and \$146.48 per acre for 160 acres. The total annual costs are \$46.01 per acre and \$39.87 per acre, respectively, for 80-acre and 160-acre farms when 42-acre inches of water are distributed during the season. The seasonal labor costs due to moving a 40-acre system from one pivot location to another on 80 acres is \$2.75 per acre. An additional two or three hours per rotation are required for greasing and adjustments, depending on the size of the system.

#### ELECTRIC PROPELLED

The lateral is mounted on track-type wheels and propelled by electric motors. Crops with different water requirements can more readily be grown in one area. The system was designed for land with slope changes as much as 10 percent. It is limited to short crops because of the braces under the lateral.

Irrigation of an 80-acre rectangular area with the electric self-propelled system was not considered practical for intensive agriculture in central Washington because of the difficulty of moving the system from one pivot location to another.

The capital investment for a 160-acre system is \$197.28 per acre. The annual operating cost is \$43.95 per acre for distributing 42-acre inches per season. While there are no labor costs for moving the system, approximately three hours per rotation are needed for greasing and adjusting the system.

#### BASIS FOR COMPARISON

Basic considerations in sprinkler design for a particular farm include farm size and shape, water holding capacity of the soil, the rate of water penetration into the soil, irrigation requirement of the crop, and the cropping pattern.

The following criteria were used in this study to determine the design and operational characteristics of the six systems:

1. The maximum daily water requirement during the irrigation season was 0.35-acre inches.
2. The systems were designed to distribute 42-acre inches per season.
3. The systems were designed for rectangular 80-acre and square 160-acre farms.
4. Water is available at one end of the farm from a gravity flow irrigation lateral.
5. There is no significant change in elevation across the farm.

6. The systems have no more than 20 percent pressure loss along the lateral lines.
7. Expected useful life of various components of the systems was based on local experience.

Soil. Texture, structure and depth of the soil affect its water penetration rate and water holding capacity. The many soil conditions in the Columbia Basin requires each sprinkler system be designed for the particular soil condition on the farm.

Irrigation Requirement. An irrigation study of 698 farms by Swarner and Hagood determined the average irrigation requirement for all crops grown in the Columbia Basin to be 27-acre inches in 1960. (2) They also determined the on-farm efficiency of sprinkler systems to be 64.3 percent. Farms with an on-farm irrigation efficiency of 64 percent need 42-acre inches of water delivered at the headgate to supply crops with 27 inches of usable water.

Another study, by Jensen and Middleton, reports a near-constant relationship in Washington between the rate of consumptive use of water by a crop and the evaporation from evaporimeters. (4) This relationship can be used to estimate the irrigation requirement of various crops when the amount of evaporation is known. Table 4 summarizes the evaporation data from seventeen Columbia Basin evaporation stations for the years 1960-1965. The average annual evaporation for 198 days was 45.65 inches. This is a longer irrigation period than needed for most crops.

TABLE 4  
MONTHLY RATE OF EVAPORATION  
COLUMBIA BASIN, WASHINGTON (5)  
1960-1965

Month	1960	1961	1962	1963	1964	1965	Average
April			6.24	3.84	6.76	5.35	5.54
May			5.64	6.71	7.57	7.19	6.78
June		8.66	9.08	9.59	8.65	9.03	9.00
July		8.62	9.93	8.88	9.30	9.21	9.19
August	6.36	7.58	7.00	8.58	7.38	7.87	7.46
September		6.22	6.27	5.60	6.03	6.13	6.01
October 1-15		1.75	1.31	1.49	1.74	2.07	1.67
Average		45.47	45.49	44.69	47.42	46.85	45.65

For this study, the annual operating costs are based on distributing 42-acre inches of water annually through each system.

Power Rates. Four utility companies supply electric power to Columbia Basin farms. There is considerable difference in the various power rate schedules but the total seasonal costs for irrigation power are within a reasonably narrow range. Below is the sprinkler power rate of one of the utilities. It is considered to be a median seasonal power rate for sprinklers during the irrigation season (April 20 - October 20). (6)



First 500 KWH per horsepower per season	1.7¢ per KWH
Next 750 per horsepower per season	.7¢ per KWH
Additional KWH per horsepower per season	.2¢ per KWH

#### COMPARISON OF COSTS AT VARIOUS WATER DISTRIBUTION RATES

While irrigation studies indicate that 42-acre inches of water is adequate in the Columbia Basin, many farmers apply larger amounts of water. Therefore, the annual cost of distributing 48 inches, 54 inches and 60 inches of water were also determined, as shown in Table 5. The cost differences are primarily due to increased labor and power requirements. However the water charge was also increased, to \$8.50 per acre, at the 60-acre inch rate.

The self-propelled systems have the lowest operating costs and total annual costs throughout the range of water distribution studied. Their lower cost is due to the lower labor requirements. The hand-move systems have the highest total annual costs when a charge is made for irrigation labor if more than 42-acre inches of water is distributed by the various systems.

#### DETAILS OF CAPITAL INVESTMENT AND ANNUAL COST OF THE VARIOUS SYSTEMS

Tables 6 through 17 provide details of the capital investment, annual operating costs, annual overhead and total annual cost for each of the systems studied. Again, these systems are designed to deliver 42-acre inches on rectangular 80-acre and square 160-acre farms in the Columbia Basin. The costs for a sprinkler system on farms of different shapes or sizes should be separately determined when comparing the various systems. Also, the type of cropping program must be considered when selecting a sprinkler system.

TABLE 5  
ANNUAL OPERATING COST AND TOTAL ANNUAL COST PER ACRE TO  
DELIVER VARIOUS AMOUNTS OF WATER WITH SIX SPRINKLER  
SYSTEMS ON 80-ACRE AND 160-ACRE FARMS IN THE COLUMBIA BASIN

<u>Amount of Water</u>	40x60	40x60	40x50	40x50	Hydraulic	Electric
	<u>Hand</u>	<u>Wheel</u>	<u>Hand</u>	<u>Wheel</u>	<u>Self-Propelled</u>	<u>Self-Propelled</u>
	\$	\$	\$	\$	\$	\$
<u>80 ACRES</u>						
Operating Costs at:						
42"	36.84	28.44	34.79	26.41	24.07	
48"	39.56	29.62	37.52	27.56	25.11	
54"	42.29	30.81	40.10	28.70	26.14	
60" <u>a/</u>	45.54	32.52	43.29	30.36	27.69	
Other Annual Costs <sup>b/</sup>	11.68	21.18	11.38	20.40	21.94	
Total Annual Costs at:						
42"	48.52	49.62	46.17	46.81	46.01	
48"	51.24	50.80	48.91	47.96	47.05	
54"	53.97	51.99	51.48	49.10	48.08	
60" <u>a/</u>	57.22	53.70	54.67	50.76	49.63	
<u>160 ACRES</u>						
Operating Costs at:						
42"	35.88	27.23	33.97	25.65	20.00	21.06
48"	38.66	28.43	36.62	26.79	20.56	21.37
54"	41.42	29.66	39.28	27.93	21.11	21.69
60" <u>a/</u>	44.73	31.34	42.47	29.59	22.19	22.52
Other Annual Costs <sup>b/</sup>	9.09	18.75	8.97	18.15	19.75	22.90
Total Annual Costs at:						
42"	44.97	45.98	42.94	43.80	39.75	43.95
48"	47.76	47.18	45.59	44.94	40.31	44.27
54"	50.52	48.41	48.25	46.08	40.86	44.59
60" <u>a/</u>	53.82	50.10	51.44	47.74	41.94	45.42

a/ Irrigation water charge increased to \$8.50 per acre.

b/ Charges due to investment overhead and loss of crop land.

TABLE 6

ANNUAL COST OF OWNING AND OPERATING  
A HAND MOVE SYSTEM, 40 x 60 SPACING  
COLUMBIA BASIN, WASHINGTON  
(1966)

	80 Acres		160 Acres		Your Estimate
	Total	Per A	Total	Per A	
<u>OPERATING COSTS</u> <sup>1/</sup>					
Maintenance (3% of investment)	278.00	3.48	421.00	2.63	
Electricity (61,000 or 122,000 KWH)	572.00	7.15	1,087.00	6.79	
Irrigation water	640.00	8.00	1,280.00	8.00	
Labor (1½ hr/lat./move) <sup>2/</sup>	1,312.00	16.40	2,624.00	16.40	
Tractor & Trailer (1½ hr/lat./rotation) <sup>3/</sup>	45.00	.56	90.00	.56	
Interest on operating capital (6 mo. @ 7%)	100.00	1.25	193.00	1.21	
<b>ANNUAL OPERATING COSTS</b>	<b>2,947.00</b> <sup>1/</sup>	<b>36.84</b>	<b>5,695.00</b> <sup>1/</sup>	<b>35.59</b>	
<u>INVESTMENT OVERHEAD</u> <sup>4/</sup>					
Depreciation	663.14	8.29	1,043.66	6.52	
Interest on average investment (6%)	271.44	3.39	411.30	2.57	
<b>ANNUAL OVERHEAD COSTS</b>	<b>934.58</b>	<b>11.68</b>	<b>1,454.96</b>	<b>9.09</b>	
<b>TOTAL ANNUAL COSTS</b>	<b>3,881.58</b>	<b>48.52</b>	<b>7,149.00</b>	<b>44.68</b>	

NOTES:

Area irrigated	1320' x 2640'	2640' x 2640'
Length of rotation (days)	7.5	7.5
Sets per day	2	2
Water delivered per set (gross)	3.15"	3.15"
Water delivered per season (gross)	42"	42"

<sup>1/</sup> Rounded to nearest dollar<sup>2/</sup> Labor charged at \$1.75 per hour<sup>3/</sup> Tractor and trailer charged at 90¢ per hour for fuel and repairs<sup>4/</sup> See Table 7 for details on charges due to investment overhead.

TABLE 7  
CAPITAL INVESTMENT FOR A HAND MOVE SYSTEM, 40 x 60 SPACING  
COLUMBIA BASIN, WASHINGTON (1966)

	80 Acres				160 Acres				Your Estimate
	Total	Per A	Annual <sup>1/</sup> Deprec.	6% Int. on Ave. Inv.	Total	Per A.	Annual <sup>1/</sup> Deprec.	6% Int. on Ave. Inv.	
<u>MAINLINE</u> (Buried Steel Pipe)									
880'-8"; 1,760'-6"	\$ 3,080.00	\$ 38.50	\$154.00	\$92.40					
880'-10"; 880'-8"; 880'-6"					\$ 3,730.00	\$23.31	\$ 186.50	\$111.90	
Hydrant Valves, 44	646.00	8.08	64.60	19.38	646.00	4.04	64.60	19.38	
Valve Openers (3 or 6)	105.00	1.31	10.50	3.15	210.00	1.31	21.00	6.30	
Labor and Welding	335.00	4.19	33.50	10.05	510.00	3.19	51.00	15.30	
<u>LATERAL LINES</u> (Complete)									
(3 or 6) 320'-4"; 960'-3" laterals	2,475.00	30.94	247.50	74.25	4,950.00	30.94	495.00	148.50	
<u>PUMP AND MOTOR</u>									
4" x 3" Centrifugal w/40 HP motor	1,150.00	14.38	69.00*	37.95					
6" x 5" Centrifugal w/75 HP motor					1,800.00	11.25	108.00*	59.40	
Suction Assembly	79.00	.99	7.90	2.37	90.00	.56	9.00	2.70	
Discharge Assembly	74.00	.92	7.40	2.22	85.00	.53	8.50	2.55	
Pump Base and Housing	150.00	1.88	10.00	4.50	200.00	1.25	13.33	6.00	
<u>ELECTRICAL</u>									
Pump Panel - materials	291.00	3.64	17.47*	9.60	540.00	3.37	32.40*	17.82	
Pump Panel - wiring	154.00	1.92	10.27	4.62	200.00	1.25	13.33	6.00	
Pressure Switch	15.00	.19	1.00	.45	15.00	.09	1.00	.45	
<u>MISCELLANEOUS</u>									
Reservoir	150.00	1.88	10.00	4.50	300.00	1.88	20.00	9.00	
Pipe Trailer	200.00	2.50	20.00	6.00	200.00	1.25	20.00	6.00	
<b>SUBTOTAL</b>	<b>8,904.00</b>	<b>111.31</b>	<b>663.14</b>	<b>271.44</b>	<b>13,476.00</b>	<b>84.22</b>	<b>1,043.66</b>	<b>411.30</b>	
SALES TAX (4.2%)	374.00	4.67			556.00	3.48			
<b>TOTAL INVESTMENT</b>	<b>9,278.00</b>	<b>115.98</b>			<b>14,032.00</b>	<b>87.70</b>			

\* 10% salvage allowed

<sup>1/</sup> Straight line depreciation used; mainline pipe depreciated in 20 years; reservoir, pump, electrical equipment and base in 15 years; other items in 10 years.

TABLE 8  
ANNUAL COST OF OWNING AND OPERATING  
A WHEEL MOVE SYSTEM, 40 x 60 SPACING  
COLUMBIA BASIN, WASHINGTON  
(1966)

	80 Acres		160 Acres		Your Estimate
	Total	Per A	Total	Per A	
<u>OPERATING COSTS</u> <sup>1/</sup>					
Maintenance (3% of investment)	\$ 461.00	\$ 5.76	\$ 793.00	\$ 4.96	
Electricity (61,000 or 122,000 KWH)	572.00	7.15	1,087.00	6.79	
Irrigation water	640.00	8.00	1,280.00	8.00	
Labor (30 min./ lat./move) <sup>2/</sup>	525.00	6.56	1,050.00	6.56	
Interest on operating capital (6 mo. @ 7%)	77.00	.96	147.00	.92	
<b>ANNUAL OPERATING COSTS</b>	<b>2,275.00<sup>1/</sup></b>	<b>28.44</b>	<b>4,357.00<sup>1/</sup></b>	<b>27.23</b>	
<u>INVESTMENT OVERHEAD</u> <sup>3/</sup>					
Depreciation	1,247.64	15.60	2,232.66	13.95	
Interest on average investment (6%)	446.79	5.58	768.00	4.80	
<b>ANNUAL OVERHEAD COSTS</b>	<b>1,694.43</b>	<b>21.18</b>	<b>3,000.66</b>	<b>18.75</b>	
<b>TOTAL ANNUAL COSTS</b>	<b>3,969.43</b>	<b>49.62</b>	<b>7,357.66</b>	<b>45.98</b>	

NOTES:

Area irrigated	1320' x 2640'	2640' x 2640'
Length of rotation (days)	7.5	7.5
Sets per day	2	2
Water delivered per set (gross)	3.15"	3.15"
Water delivered per season (gross)	42"	42"

<sup>1/</sup> Rounded to nearest dollar<sup>2/</sup> Labor charged at \$1.75 per hour<sup>3/</sup> See Table 9 for details on charges due to investment overhead.

TABLE 9  
CAPITAL INVESTMENT FOR A WHEEL MOVE SYSTEM, 40 x 60 SPACING  
COLUMBIA BASIN, WASHINGTON (1966)

	80 Acres				160 Acres				Your Estimate
	Total	Per A	Annual <sup>1/</sup> Deprec.	6% Int. on Ave.Inv.	Total	Per A.	Annual <sup>1/</sup> Deprec.	6% Int. on Ave.Inv.	
<u>MAINLINE (Buried Steel Pipe)</u>									
880'-8"; 1,760'-6"	\$3,080.00	\$ 38.50	\$ 154.00	\$ 92.40					
880'-10"; 880'-8"; 880'-6"					\$3,730.00	\$ 23.31	\$ 186.50	\$111.90	
Hydrant Valves, 44	646.00	8.08	64.60	19.38	646.00	4.04	64.60	19.38	
Valve Openers (3 or 6)	105.00	1.31	10.50	3.15	210.00	1.31	21.00	6.30	
Labor and Welding	335.00	4.19	33.50	10.05	510.00	3.19	51.00	15.30	
<u>LATERAL LINES (76" wheels)</u>									
(3 or 6) 1,300' x 4" laterals (includes mover units, sprinklers, drains, cleats, etc.)	8,520.00	106.50	852.00	255.60	17,040.00	106.50	1,704.00	511.20	
<u>PUMP AND MOTOR</u>									
4" x 3" Centrifugal w/40 HP motor	1,150.00	14.38	69.00*	37.95					
6" x 5" Centrifugal w/75 HP motor					1,800.00	11.25	108.00*	59.40	
Suction Assembly	79.00	.99	7.90	2.37	90.00	.56	9.00	2.70	
Discharge Assembly	74.00	.92	7.40	2.22	85.00	.53	8.50	2.55	
Pump Base and Housing	150.00	1.88	10.00	4.50	200.00	1.25	13.33	6.00	
<u>ELECTRICAL</u>									
Pump Panel - materials	291.00	3.64	17.47*	9.60	540.00	3.37	32.40*	17.82	
Pump Panel - wiring	154.00	1.92	10.27	4.62	200.00	1.25	13.33	6.00	
Pressure Switch	15.00	.19	1.00	.45	15.00	.09	1.00	.45	
<u>MISCELLANEOUS</u>									
Reservoir	150.00	1.88	10.00	4.50	300.00	1.88	20.00	9.00	
<u>SUBTOTAL</u>	14,749.00	184.36	1,247.64	446.79	25,366.00	158.54	2,232.66	768.00	
STATE SALES TAX (4.2%)	619.00	7.74			1,065.00	6.66			
<u>TOTAL INVESTMENT</u>	15,368.00	192.10			26,431.00	165.20			

\* 10% salvage allowed

<sup>1/</sup> Straight line depreciation used; mainline pipe depreciated in 20 years; reservoir, pump, electrical equipment and base in 15 years; other items in 10 years.

TABLE 10  
ANNUAL COST OF OWNING AND OPERATING  
A HAND MOVE SYSTEM, 40 x 50 SPACING  
COLUMBIA BASIN, WASHINGTON  
(1966)

	80 Acres		160 Acres		Your Estimate
	Total	Per A	Total	Per A	
<u>OPERATING COSTS</u> <sup>1/</sup>					
Maintenance (3% of investment)	\$ 270.00	\$ 3.38	\$ 414.00	\$ 2.59	
Electricity (50,000 or 100,000 KWH)	438.00	5.48	876.00	5.48	
Irrigation Water	640.00	8.00	1,280.00	8.00	
Labor (1½ hr/lateral/move) <sup>2/</sup>	1,302.00	16.27	2,604.00	16.27	
Tractor & Trailer (1½ hr/lat/rotation) <sup>3/</sup>	39.00	.49	78.00	.49	
Interest on operating cap. (6 mo. @ 7%)	94.00	1.17	184.00	1.15	
<b>ANNUAL OPERATING COSTS</b>	<b>2,783.00<sup>1/</sup></b>	<b>34.79</b>	<b>5,436.00<sup>1/</sup></b>	<b>33.98</b>	
<u>INVESTMENT OVERHEAD</u> <sup>4/</sup>					
Depreciation	652.41	8.16	1,037.79	6.48	
Interest on average investment (6%)	258.30	3.23	398.19	2.49	
<b>ANNUAL OVERHEAD COSTS</b>	<b>910.71</b>	<b>11.38</b>	<b>1,435.98</b>	<b>8.97</b>	
<b>TOTAL ANNUAL COSTS</b>	<b>3,693.71</b>	<b>46.17</b>	<b>6,871.98</b>	<b>42.95</b>	

NOTES:

Area irrigated	1320' x 2640'	2640' x 2640'
Length of rotation (days)	8.5	8.5
Sets per day	2	2
Water delivered per set (gross)	3.60"	3.60"
Water delivered per season (gross)	42"	42"

<sup>1/</sup> Rounded to nearest dollar<sup>2/</sup> Labor charged at \$1.75 per hour<sup>3/</sup> Tractor and trailer charged at 90¢ per hour for fuel and repairs<sup>4/</sup> See Table 11 for details on charges due to investment overhead

TABLE 11  
 CAPITAL INVESTMENT FOR A HAND MOVE SYSTEM, 40 x 50 SPACING  
 COLUMBIA BASIN, WASHINGTON (1966)

	80 Acres				160 Acres				Your Estimate
	Total	Per A	Annual <sup>1/</sup> Deprec.	6% Int. on Ave. Inv.	Total	Per A	Annual <sup>1/</sup> Deprec.	6% Int. on Ave. Inv.	
<u>MAINLINE (Buried Steel Pipe)</u>									
880'-8"; 880'-6"; 880'-5"	\$2,956.00	\$36.95	\$147.80	\$ 88.68					
440'-10"; 1,320'-8"; 880'-6"					\$ 3,674.00	\$22.96	\$ 183.70	\$110.22	
Hydrant Valves, 54	790.00	9.87	79.00	23.70	790.00	4.94	79.00	23.70	
Valve Openers (3 or 6)	105.00	1.31	10.50	3.15	210.00	1.31	21.00	6.30	
Labor and Welding	335.00	4.19	33.50	10.05	510.00	3.19	51.00	15.30	
<u>LATERAL LINES (Complete)</u>									
(3 or 6) 320'-4"; 960'-3" laterals	2,475.00	30.94	247.50	74.25	4,950.00	30.94	495.00	148.50	
<u>PUMP AND MOTOR</u>									
4" x 3" Centrifugal w/30 HP motor	846.00	10.57	50.07*	25.08					
6" x 5" Centrifugal w/60 HP motor					1,509.00	9.43	90.53*	45.27	
Suction Assembly	79.00	.99	7.90	2.37	90.00	.56	9.00	2.70	
Discharge Assembly	74.00	.92	7.40	2.22	85.00	.53	8.50	2.55	
Pump Base and Housing	150.00	1.88	10.00	4.50	200.00	1.25	13.33	6.00	
<u>ELECTRICAL</u>									
Pump Panel - materials	291.00	3.64	17.47*	8.73	540.00	3.37	32.40*	16.20	
Pump Panel - wiring	154.00	1.92	10.27	4.62	200.00	1.25	13.33	6.00	
Pressure Switch	15.00	.19	1.00	.45	15.00	.09	1.00	.45	
<u>MISCELLANEOUS</u>									
Reservoir	150.00	1.88	10.00	4.50	300.00	1.88	20.00	9.00	
Pipe Trailer	200.00	2.50	20.00	6.00	200.00	1.25	20.00	6.00	
<u>SUBTOTAL</u>	8,620.00	107.75	652.41	258.30	13,273.00	82.95	1,037.79	398.19	
SALES TAX (4.2%)	367.00	4.59			492.00	3.07			
<u>TOTAL INVESTMENT</u>	8,987.00	112.34			13,765.00	86.02			

\* 10% salvage allowed

1/ Straight line depreciation used; mainline pipe depreciated in 20 years; reservoir, pump, electrical quipment and base in 15 years; other items in 10 years.



TABLE 12  
ANNUAL COST OF OWNING AND OPERATING  
A WHEEL MOVE SYSTEM, 40 x 50 SPACING  
COLUMBIA, BASIN, WASHINGTON  
(1966)

	80 Acres		160 Acres		Your Estimate
	Total	Per A	Total	Per A	
<u>OPERATING COSTS<sup>1/</sup></u>					
Maintenance (3% of investment)	\$ 443.00	\$ 5.54	\$ 768.00	\$ 4.80	
Electricity (50,000 or 100,000 KWH)	438.00	5.48	876.00	5.48	
Irrigation Water	640.00	8.00	1,280.00	8.00	
Labor (30 min/lateral/move) <sup>2/</sup>	521.00	6.51	1,042.00	6.51	
Interest on operating cap. (6 mo. @ 7%)	71.00	.89	139.00	.87	
<b>ANNUAL OPERATING COSTS</b>	<b>2,113.00<sup>1/</sup></b>	<b>26.41</b>	<b>4,105.00<sup>1/</sup></b>	<b>25.66</b>	
<u>INVESTMENT OVERHEAD<sup>3/</sup></u>					
Depreciation	1,207.31	15.09	2,167.59	13.55	
Interest on average investment (6%)	424.77	5.31	737.13	4.61	
<b>ANNUAL OVERHEAD COSTS</b>	<b>1,632.08</b>	<b>20.40</b>	<b>2,904.72</b>	<b>18.15</b>	
<b>TOTAL ANNUAL COSTS</b>	<b>3,745.08</b>	<b>46.81</b>	<b>7,009.72</b>	<b>43.81</b>	

NOTES:

Area irrigated	1320' x 2640'	2640' x 2640'
Length of rotation (days)	8.5	8.5
Sets per day	2	2
Water delivered per set (gross)	3.60"	3.60"
Water delivered per season (gross)	42"	42"

<sup>1/</sup> Rounded to nearest dollar<sup>2/</sup> Labor charged at \$1.75 per hour<sup>3/</sup> See Table 13 for details on charges due to investment overhead

TABLE 13  
CAPITAL INVESTMENT FOR A WHEEL MOVE SYSTEM, 40 x 50 SPACING  
COLUMBIA BASIN, WASHINGTON (1966)

	80 Acres				160 Acres				Your Estimate
	Total	Per A	Annual <sup>1/</sup> Deprec.	6% Int. on Ave. Inv.	Total	Per A.	Annual <sup>1/</sup> Deprec.	6% Int. on Ave. Inv.	
<u>MAINLINE</u> (Buried Steel Pipe)									
880'-8"; 880'-6"; 880'-5" 440'-10"; 1,320'-8"; 880'-6"	\$2,956.00	\$ 36.95	\$ 147.80	\$88.68	\$3,674.00	\$22.96	\$ 183.70	\$110.22	
Hydrant Valves, 54	790.00	9.88	79.00	23.70	790.00	4.94	79.00	23.70	
Valve Openers (3 or 6)	105.00	1.31	10.50	3.15	210.00	1.31	21.00	6.30	
Labor and Welding	335.00	4.19	33.50	10.05	510.00	3.19	51.00	15.30	
<u>LATERAL LINES</u> (64" wheels) (3 or 6) 1,300' x 4" laterals (Includes mover units, sprinklers, drains cleats, etc.)	8,224.00	102.80	822.40	246.72	16,448.00	102.80	1,644.80	493.44	
<u>PUMP AND MOTOR</u>									
4" x 3" Centrifugal w/30 HP motor	846.00	10.57	50.07*	25.08					
6" x 5" Centrifugal w/60 HP motor					1,509.00	9.43	90.53*	45.27	
Suction Assembly	79.00	.99	7.90	2.37	90.00	.56	9.00	2.70	
Discharge Assembly	74.00	.92	7.40	2.22	85.00	.53	8.50	2.55	
Pump Base and Housing	150.00	1.88	10.00	4.50	200.00	1.25	13.33	6.00	
<u>ELECTRICAL</u>									
Pump Panel - materials	291.00	3.64	17.47*	8.73	540.00	3.37	32.40*	16.20	
Pump Panel - wiring	154.00	1.92	10.27	4.62	200.00	1.25	13.33	6.00	
Pressure Switch	15.00	.19	1.00	.45	15.00	.09	1.00	.45	
<u>MISCELLANEOUS</u>									
Reservoir	150.00	1.88	10.00	4.50	300.00	1.88	20.00	9.00	
SUBTOTAL	14,169.00	177.12	1,207.31	424.77	24,571.00	153.56	2,167.59	737.13	
STATE SALES TAX (4.2%)	595.00	7.44			1,032.00	6.45			
<b>TOTAL INVESTMENT</b>	<b>14,764.00</b>	<b>184.56</b>			<b>25,603.00</b>	<b>160.01</b>			

\* 10% salvage allowed

<sup>1/</sup> Straight line depreciation used; mainline pipe depreciated in 20 years; reservoir, pump, electrical equipment and base in 15 years; other items in 10 years.

TABLE 14  
ANNUAL COST OF OWNING AND OPERATING  
A CIRCULAR HYDRAULIC SELF-PROPELLED SYSTEM  
COLUMBIA BASIN, WASHINGTON  
(1966)

	80 Acres		160 Acres		Your Estimate
	Total	Per A	Total	Per A	
<u>OPERATING COSTS</u> <sup>1/</sup>					
Maintenance					
grease, adjust (2 hr/rot.) <sup>2/</sup>	\$ 74.00	\$ .93			
grease, adjust (3 hr/rot.)			\$ 110.00	\$ .69	
other (2½% of investment)	370.00	4.62	626.00	3.91	
Electricity (72,000 or 125,000 KWH)	538.00	6.72	1,094.00	6.84	
Irrigation water	640.00	8.00	1,280.00	8.00	
Moving costs					
labor (6-hr/rotation)	220.00	2.75			
tractor (1-hr/rotation) <sup>3/</sup>	19.00	.24			
Interest on operating cap, (6 mo. @ 7%)	65.00	.81	109.00	.68	
<b>ANNUAL OPERATING COSTS</b>	<b>1,926.00<sup>1/</sup></b>	<b>24.07</b>	<b>3,219.00<sup>1/</sup></b>	<b>20.12</b>	
<u>INVESTMENT OVERHEAD</u> <sup>4/</sup>					
Depreciation	694.38	8.68	1,179.38	7.37	
Interest on average investment (6%)	460.74	5.76	781.35	4.88	
<b>ANNUAL OVERHEAD COSTS</b>	<b>1,155.12</b>	<b>14.44</b>	<b>1,960.73</b>	<b>12.25</b>	
<u>OTHER</u>					
Loss of crop land <sup>5/</sup>					
6 acres @ \$100/A	600.00	7.50			
12 acres @ \$100/A			1,200.00	7.50	
<b>TOTAL ANNUAL COSTS</b>	<b>3,681.12</b>	<b>46.01</b>	<b>6,379.73</b>	<b>39.87</b>	

**NOTES:**

Acres irrigated	70.0	140.0
Area irrigated	660' radius circle	1,320 radius circle
Length of rotation (days)	5.5	4.75
Water delivered per rotation (gross)	2"	2"
Water delivered per season (gross)	42"	42"

<sup>1/</sup> Rounded to nearest dollar<sup>2/</sup> Labor charged at \$1.75 per hour<sup>3/</sup> Tractor charged 90¢ per hour for fuel and repairs<sup>4/</sup> See Table 15 for details on charges due to investment overhead<sup>5/</sup> Charge made for loss of crop land in excess of 5 percent

TABLE 15  
 CAPITAL INVESTMENT FOR A CIRCULAR HYDRAULIC SELF-PROPELLED SYSTEM  
 COLUMBIA BASIN, WASHINGTON (1966)

	80 Acres				160 Acres				Your Estimate
	Total	Per A.	Annual <sup>1/</sup> Deprec.	6% Int. on Ave.Inv.	Total	Per A.	Annual <sup>1/</sup> Deprec.	6% Int. on Ave.Inv.	
<u>MAINLINE</u> (Buried Steel Pipe installed)									
1,320'-10"					\$ 2,508.00	\$ 15.67	\$ 125.40	\$ 75.24	
640'-8"; 680'-6"	\$1,775.00	\$ 22.19	\$ 88.75	\$ 53.25					
<u>SPRINKLER UNIT</u> (Complete)									
655' lateral	10,400.00	130.00	468.00*	343.20					
1,285' lateral					17,725.00	110.78	797.65*	584.91	
<u>PUMP AND MOTOR</u>									
Centrifugal pump w/40 HP motor	930.00	11.62	55.80*	30.69					
Centrifugal pump w/75 HP motor					1,860.00	11.62	111.60*	61.38	
Suction Assembly	70.00	.87	7.00	2.10	140.00	.88	14.00	4.20	
Pivot and discharge assembly	75.00	.94	7.50	2.25	450.00	2.81	45.00	13.50	
Pump base and housing	150.00	1.88	10.00	4.50	200.00	1.25	13.33	6.00	
<u>ELECTRICAL</u>									
Pump panel - materials	250.00	3.12	15.00*	8.25	590.00	3.69	35.40*	19.47	
Pump panel - wiring	150.00	1.88	10.00	4.50	225.00	1.41	15.00	6.75	
Pressure switch	30.00	.38	2.00	.90	30.00	.19	2.00	.90	
<u>MISCELLANEOUS</u>									
Reservoir	200.00	2.50	13.33	6.00	300.00	1.88	20.00	9.00	
Towing equipment	170.00	2.12	17.00	5.10					
<b>SUBTOTAL</b>	14,200.00	177.50	694.38	460.74	24,028.00	150.18	1,179.38	781.35	
<b>SALES TAX (4.2%)</b>	596.00	7.45			1,009.00	6.31			
<b>TOTAL INVESTMENT</b>	14,796.00	184.95			25,037.00	156.48			

\* 10% salvage allowed

<sup>1/</sup> Straight line depreciation used; mainline pipe and lateral depreciated in 20 years; reservoir, pump, electrical equipment and base in 15 years; other items in 10 years.

TABLE 16  
ANNUAL COST OF OWNING AND OPERATING  
A CIRCULAR ELECTRIC SELF-PROPELLED SYSTEM  
COLUMBIA BASIN, WASHINGTON  
(1966)

	160 Acres		Your Estimate
	Total	Per Acre	
<u>OPERATING COSTS</u> <sup>1/</sup>			
Maintenance			
grease, adjust (30/hr/rot.) <sup>2/</sup>	\$ 110.00	\$ .69	
other (2½% investment)	789.00	4.93	
Electricity (116,000 KWH)	1,076.00	6.73	
Irrigation water	1,280.00	8.00	
Moving costs - labor			
Interest on operating cap. (6 months @ 7.0%)	114.00	.71	
<b>ANNUAL OPERATING COSTS</b>	<b>3,369.00<sup>1/</sup></b>	<b>21.06</b>	
<u>INVESTMENT OVERHEAD</u> <sup>3/</sup>			
Depreciation	1,478.72	9.24	
Interest on average investment (6%)	984.99	6.16	
<b>ANNUAL OVERHEAD COSTS</b>	<b>2,463.71</b>	<b>15.40</b>	
<u>OTHER</u>			
Loss of crop land <sup>4/</sup> 12 acres @ \$100/A	1,200.00	7.50	
<b>TOTAL ANNUAL COSTS</b>	<b>7,032.71</b>	<b>43.95</b>	

**NOTES:**

Acres irrigated 140  
Area irrigated 1,320' radius circle  
Length of rotation (days) 5.0  
Water delivered per rotation (gross) 2"  
Water delivered per season (gross) 42"

<sup>1/</sup> Rounded to nearest dollar

<sup>2/</sup> Labor charged at \$1.75 per hour

<sup>3/</sup> See Table 17 for details on charges due to investment overhead

<sup>4/</sup> Charge made for loss of crop land in excess of 5 percent

TABLE 17  
CAPITAL INVESTMENT FOR A CIRCULAR ELECTRIC SELF-PROPELLED SYSTEM  
COLUMBIA BASIN, WASHINGTON

	160 Acres				Your Estimate
	Total	Per Acre	Annual <sup>1/</sup> Deprec.	Int. on Ave. Inv 6%	
	\$	\$	\$	\$	
<u>MAINLINE</u> (Buried steel pipe) 1,320' - 10"	2,508.00	15.68	125.40	75.24	
<u>SPRINKLER UNIT (Complete)</u> 1,285' lateral	23,290.00	145.56	1,048.05*	768.57	
<u>PUMP AND MOTOR</u>					
Centrifugal pump w/60 HP Motor	1,520.00	9.50	91.20*	50.16	
Suction assembly	140.00	.88	14.00	4.20	
Pivot and discharge assembly	450.00	2.81	45.00	13.50	
Pump base and housing	200.00	1.25	13.33	6.00	
<u>ELECTRICAL</u>					
Pump panel - materials	590.00	3.69	35.40*	19.47	
Pump panel - wiring	250.00	1.56	16.67	7.50	
Pressure switch	30.00	.19	2.00	.90	
Underground cable - 1,350'	1,015.00	6.34	67.67	30.45	
<u>MISCELLANEOUS</u>					
Reservoir	300.00	1.88	20.00	9.00	
Moving equipment					
<b>SUBTOTAL</b>	<b>30,293.00</b>	<b>189.33</b>	<b>1,478.72</b>	<b>984.99</b>	
<b>SALES TAX (4.2%)</b>	<b>1,272.00</b>	<b>7.95</b>			
<b>TOTAL INVESTMENT</b>	<b>31,565.00</b>	<b>197.28</b>			

\* 10% salvage allowed

<sup>1/</sup> Straight line depreciation used; mainline pipe and lateral depreciated in 20 years; reservoir, pump, base and electrical equipment in 15 years; other items in 10 years.

BIBLIOGRAPHY

1. "U.S. Irrigated Acreage," Irrigation Engineering and Maintenance, August 1966, Page 11.
2. Swarner, L.R. and Hagood, M.A. "Irrigation Trends in the Pacific Northwest," Agricultural Engineering, Vol. 44, June 1963, pp 304-307.
3. U.S. Bureau of Reclamation, "Acreage Irrigated by Sprinkler or by Gravity Methods, South, East and Quincy Irrigation Districts', and Columbia Basin Project Total," Ephrata, Washington. (Mimeographed annual reports.)
4. Jensen, M.D. and Middleton, J.E., Scheduling Irrigation from Pan Evaporation, Washington Agricultural Experiment Station Circular 386, September 1965.
5. Hagood, M.A., "Daily Evaporation Records, Columbia Basin Project, 1960-1965." Prosser, Washington. 1966. (Multilithed)
6. Big Bend Electrical Cooperative, "Schedule I, Irrigation Service," Ritzville, Washington. (Mimeographed)