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An Economic Analysis of the Logan Cow Pasture Water Company

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AN ECONOMIC ANALYSIS OF THE LOGAN COW PASTURE WATER COMPANY

by

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The Logan Cow Pasture Water Company

West and northwest of Logan City there are approximately 2,372 acres of land irrigated by water from the Logan Cow Pasture Water Company irrigation system. This company is a nonprofit corporation organized by a group of land owners for the purpose of arranging conveyance of water to their farms and ranches.

Use of both the lands and the water for irrigation dates back to the late 1800's. The corporation, however, was not organized until 1902. Sources of the water are natural springs, Logan River, and water from Logan City's sewer system. At the time of this writing there are 43 stockholders. Of these stockholders 40 are private land owners while three of them are public organizations: specifically, The Utah Fish and Game Department, Logan City Corporation, and the Latter-day Saint Church Dairy Farm (Table 11, Appendix). All of the shareholders have property irrigated by water from the Logan Cow Pasture Water Company.

OBJECTIVE OF THIS STUDY

Statement of the problem

The Logan Cow Pasture Water Company is faced with the possibility of losing all or part of its water supply. This could occur when Logan City builds a new sewage disposal system which is in the advanced planning stages at the present time.

Background information

Logan City employed an engineering firm to study its sewage disposal problems and make recommendation for treatment. Two major alternate plans, which are mentioned here only to point out to the reader how each might disrupt the normal flow of irrigation water to the area served by the Logan Cow Pasture Water Company, were recommended by the firm.

Alternate plan "A", which is the one recommended by the firm as more feasible, would use stabilization ponds located north and east of the junction of the Benson Road and Utah Highway 69 (1, p. 95). This plan would require 660 acres of land, which is all located within the boundaries of the Logan Cow Pasture Water Company. The effluent would empty into the Logan River directly from the chlorination facility in the extreme southwest corner of the ponds (1, p. 97).

Alternate plan "B" would locate a mechanical system about one half mile directly south of the present Fish and Game Reservoir (1, p. 98). Either one of these plans, if constructed, would disrupt the normal flow of irrigation water to

the area. Alternate plan "A", if put into use as proposed by the engineers, would not only entirely cut off the flow of water to the approximately 650 acres of land west of the ponds but would also take up much of the land in the area for the ponds. Alternate plan "B" would cause less disruption of the irrigation flow but would still decrease the amount of water available to the company. This decrease would be caused by the diversion of water from the sewage system, which is presently emptying into the company's canals, to a new location or structure, thus making the outfall unavailable for irrigation. The loss therefrom would amount to about 19 cubic feet per second (c.f.s.) of water (2).

Years ago the primary source of water was from natural springs located at the reservoir. Some of the farmers think that in the past thirty-five years the flow from these springs has decreased, possibly because of the highway's being constructed thru the reservoir and covering one or more of the springs (3). Originally the highway went around the reservoir and springs. With the decreased flow of the springs and the possible loss of the sewage and surface water there could be a definite shortage of water for the company. Then too, the water right from Logan River is a secondary right and if a dry year occurs in which the river flow drops below 380 cubic feet per second (c.f.s.) the company could not use water from this source (4). This would not only cause a real shortage of water in a normal year but present an acute situation in a dry season.

Information to be determined

Assuming that land with controlled irrigation water is usually more productive of agricultural products than is nonirrigated land in arid regions, then loss of irrigation

water to the Logan Cow Pasture Water Company would mean an economic loss to the farmers of the area. It is recognized here that sewage disposal is a problem to a larger number of people than is represented by the farmers of the area and that social-economic gains may far outweigh the economic losses caused by an interrupted irrigation supply; however, expansive demands of society should not cause one to overlook the individual rights of people.

If the present water supply is eliminated or reduced, then other alternate sources will have to be investigated. Other sources such as wells, piping and pumping, etc., would all vary in cost. It may even be possible that the land would be more productive as far as net return is concerned without irrigation.

The purview of this research is to recognize the presence of these avenues of study, but not to explore them in depth.

Loss of water will probably mean an economic loss to the farmers affected. The purpose of this study is to determine approximately how much this impending economic loss would amount to, or, in other words, what is the economic value of the water of the Logan Cow Pasture Water Company. Knowing the economic value of the company's water may be useful in determining alternate sources of water or perhaps arriving at an equitable basis for financial reimbursement for water that may be lost due to action of Logan City if liability were established. Uses other than academic ones may also be found if the value is established. This research is pointed to calculating the economic value of the water of the Logan Cow Pasture Water Company.

Supporting informational sources

Because of the many differences found in various farming localities, studies showing economic and cost analyses of irrigation systems and districts to use as a basis for generalization are difficult to find. Even if they are made, their validity with regard to a particular water company or irrigation district would be questionable. Each district or project has to be studied separately and judged on its own merits. There is ample literature on the costs of various irrigation systems and practices. Bowie (5), for example, has made analyses of costs of, and returns from various irrigation methods and practices. More directly related to this study are the practices followed by the United States Bureau of Reclamation. It makes an economic feasibility analysis of each project it considers. These studies can be found on file in the local Bureau of Reclamation offices.

The procedure used herein is very similar to that employed by the Bureau of Reclamation in their feasibility studies. This procedure is to interview the farmers involved and determine production now and estimated production after the project is completed (6). Cornell, Howland, Hayes and Merryfield, the Engineering firm hired by Logan City to study its sewage problems, made no attempt to analyze the value of the irrigation water although they might well have done so (1).

HISTORY

Irrigation of the farm lands in Cache Valley was of prime concern to the farmers and ranchers who settled the area. Irrigation canals and ditches were dug soon after settlement to provide water for the lands, and in the 1870's several irrigation districts were approved by the county court (7, p. 93).

Some of the ranchers operating land west of Logan were using two main sources of water. One was from the Logan River (North Fork of the Logan River) and the other was from springs located in the natural depression that became known as the Logan Fish and Game Reservoir. A canal was constructed from the North Fork of the Logan River to conduct the water to the Fish and Game Reservoir. At this location the users had constructed a dam in order to form a reservoir and divert the water to their lands.

On June 18, 1902, this group of users incorporated and formed the Logan Cow Pasture Water Company.

In 1922 Logan City constructed part of its sewer system known as Sewer District Number 8 or the Island Sewer. At that time the city and the water company entered into a formal agreement granting the city the right to empty its sewer water into the water company's canal system in exchange for the company's right to use any water coming from the sewer system (8).

Irrigation with these waters has been very inexpensive for the users. This is because there were no costly dams or other appurtenances to build and maintain,

and since the sources of water are quite close at hand, canals and ditches are short and relatively simple to maintain. For some years the assessment, which many of the farmers would pay in labor, was as low as ten cents a share. Currently the assessment is one dollar per share.

ORGANIZATION OF THE CORPORATION

The Logan Cow Pasture Water Company was organized under the laws of the State of Utah to provide a legal vehicle for conducting business relevant to the irrigation interests of its stockholders. The capital stock was set at $4,176 dollars divided into 2,088 shares of stock each with a $2.00 par value (9, p. 2).

When the company was organized there were 31 stockholders (Table 10, Appendix). At the time of this writing there are 43 stockholders (Table 11, Appendix). The corporate organization calls for the following officers:

1. A board of directors consisting of five members
2. A president
3. A vice-president
4. A secretary-treasurer

Both the president and vice-president must be one of the five directors. To qualify for directorship, a person must own at least five shares of fully paid-up stock in the corporation. All of the above officers are to be elected by ballot of the majority of stockholders. Each stockholder is entitled to one vote regardless of the number of shares of stock he owns. The normal term of office for all of the officers of the corporation is two years. These officers have the right to levy whatever assessments are required for operation. They may borrow money for the corporation only up to one hundred dollars without the majority vote of the stockholders. Stockholders meetings originally were called for bi-annually on the second day of January. Since the 1930's meetings have been held annually.

LOCATION

Location of the land

The land irrigated by the Logan Cow Pasture Water Company is located west and northwest of Logan City. The southeast beginning point is west of the railroad tracks near Logan's 6th West and 2nd South Streets. The northeast beginning point is west of the railroad tracks between 2nd and 3rd North Streets. From these points, irrigation extends generally west on both sides of the Valley View Highway (Utah Highway 69) to Logan River and the flood water of the Cutler Dam (Figure 1). It may further be described as being located in Sections Five (5) and Six (6), Township Eleven (11), north of Range One (1), east of the Salt Lake Meridian, in Sections Twenty-nine (29), Thirty (30), Thirty-one (31), and Thirty-two (32), of Township Twelve (12), north of Range One (1), east of the Salt Lake Meridian, and in Sections Twenty-three (23), Twenty-four (24), Twenty-five (25), Twenty-six (26), and Thirty-six (36) of Township Twelve (12), north of Range One (1), west of the Salt Lake Meridian (10).

Location of the water company's canal and appurtenances

The above description encompasses all the land irrigated by the company. With the exception of one source, delivery of all waters begins within this area. The one exception is the water from the Logan River. This water is received from the North Fork of the Logan River at the dividing point located next to the Anderson Lumber Mill at 3rd South and 2nd West in Logan. From there the canal goes south

to the fair grounds. At a point near the center of the fair grounds, a ditch branches off the main canal and runs generally west of southwest to 6th South and 10th West. Here it turns north and continues to 2nd South where the Island sewer empties into it. Following north, it crosses the Valley View Highway. About a quarter of a mile north of the highway the north sewer outfall empties into it. Here it turns west and empties into the Fish and Game Reservoir. From the reservoir the ditch extends west for about one half mile, where it forks. One branch goes northwest for approximately a mile and a quarter to the Benson Road. The other branch continues west for a mile and a half, then empties into the Logan River (Figure 1).

The system may be further described as follows:

> A Main canal beginning in the North Branch of Logan River in the South East quarter of the North West quarter of Section four (4), on Township eleven (11) North of Range one (1) East of the Salt Lake meridian United States Surveys for Utah; and thence extending in a South westerly direction to the West line of the Park Addition to Logan City; thence South about twenty (20) rods to the South line of Block sixteen (16) Plat "A" Logan Farm Survey; thence West about Eighty-eight (88) rods to the South East corner of Block fifteen (15) Plat "A" Logan Farm Survey; thence North to a point in the North East quarter of Section thirty-two (32) in Township twelve (12) North of Range one (1) East of the Salt Lake meridian; thence in a Westerly direction to what is known as the Cow-Pasture Dam; thence in a Westerly direction to a point in the South West quarter of Section thirty (30), Township twelve (12) North of Range one (1) East of the Salt Lake meridian, where the canal forks one main branch extending in a North westerly direction about one mile to a point in the North West quarter of Section twenty-five (25), Township twelve (12) North of Range one (1) West of the Salt Lake meridian; and the other branch to extend in a westerly direction to the South West corner of Section twenty-six (26), Township twelve (12) North of Range one (1) West of the Salt Lake meridian, thence South to Logan River (9, pp. 10-11).

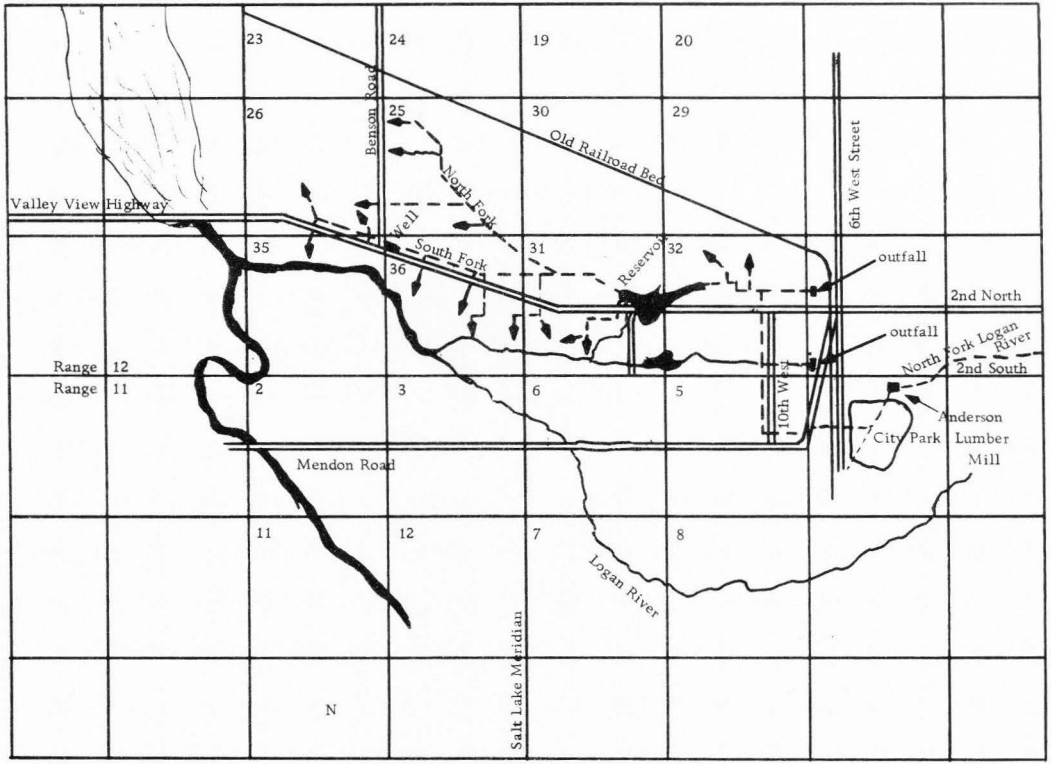

Figure 1. Logan cow pasture distribution system

DESCRIPTION OF THE WATER COMPANY'S SYSTEM AND OPERATION

The system which the corporation uses for conveying its water is neither elaborate nor complicated. It consists only of a main canal which forks about a mile from its terminal point and a reservoir which is made from a natural depression. The canal is used to conduct the water from Logan River to the reservoir. From the reservoir the canal continues to the end of the irrigated properties.

Lands situated east of the reservoir are served by the water coming from the sewage outfalls and, when needed, the Logan River. Lands west of the reservoir get water from the springs, wells, and that water which is not used east of the reservoir. At the forks west of the reservoir the flow has been measured and found to vary from 23 c.f.s. to half that amount or 11.2 c.f.s. when weeds and moss cover the entire width of the canal (11, pp. 12-13). The average flow is approximately 17 c.f.s. The South Fork is entitled to 42.5 percent of the flow and the North Fork is entitled to 57.5 percent. This is determined by the distribution of the water shares and land that is served by each canal.

On the South Fork the shares run 50 minutes, and on the North Fork they run 37 minutes. Each person takes his water according to a schedule which sets the turns at 18 day intervals. Flooding is the usual method of irrigation employed.

During the winter the reservoir is drained. Water coming from the sewage outfall, the Fish Hatchery wells, and the springs passes directly thru the reservoir and out the drain ditch to the south which leads to the Logan River. In late March

or early April the reservoir is filled so that delivery of water can be made throughout the irrigation season. One advantage the company enjoys is that the flow of water into the late fall is usually sufficient for needs.

Ditch cleaning, repairs, and construction are usually done in the early spring by the stockholders before water is turned into the ditches. Machinery has been used in recent years to replace much of the hand labor. Moss has been a particular problem in the warm water. Various methods have been used to combat this. Young boys were used to ride horses up and down the ditches to loosen it. Dragging a heavy chain thru the ditch was another method used. Chemicals added to the water have proven to be quiet effective in recent years.

DESCRIPTION OF THE LAND

There are approximately 2,595 acres of land within the area irrigated by the Logan Cow Pasture Water Company. About 2,372 acres of this land are irrigated and 223 acres are dry.[1] The 223 acres of dry land are nonirrigated in some places because the land is too high to get water on it. Other parts are not irrigated because the farmer does not have adequate water shares in the company to sufficiently serve all his land.

According to soil tests made by the Soil Conservation Service, the lands in the area have been classified as shown in Table 1. These classifications are not the only ones found in the area of the irrigation company, but they are the major ones and serve generally to identify the soils located there.

As indicated by the soils description, this land is low bottom land that is generally a heavy clay soil. Some spots are low and lack adequate drainage. Other places have sufficient fall but are situated so as to serve as drain ways for excess irrigation water coming from fields located above them. In some spots there is much alkali. Many spots, however, are well-irrigated, well-drained, and the soil is fertile and highly productive for certain crops if handled properly.

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[1] These figures come from Column 1 of Table 8, plus the acreage owned in the area by the Utah Power and Light Company and the Utah State Fish and Game Department.

Table 1. Soils classifications

Series	Characteristics
Logan (LG)	This soil is poorly drained, moderately fine textured, silty clay loam. It is moderately alkaline with some hard pans. Depth to water table is 14 to 43 inches. Some over ponding occurs in places. It is mostly used as permanent pasture and wild hay. Often there is a 2 inch layer of peat on the surface of the uncultivated areas.
Cardon (CA)	This soil is imperfectly drained, fine textured, silty clay. It is mildly alkaline. This constitutes some of the better soils.
Air Port (AP)	This is a deep, imperfectly drained, salt and alkali-affected soil. It is a silt loam with the water table ranging from 24 to 36 inches deep. It is used mostly for unimproved pastures.
Salt Lake (SL)	This is deep, poor and very poorly drained soil. It is a silty clay loam, strongly calcareous which indicates hard pan tendencies. The surface is mildly alkaline. The subsurface is moderately alkaline and substratum strongly alkaline. The water table varies from ponded to 60 inches where drained. Thirty inches is normal. It is used mostly for meadow pasture and hay. A peaty layer of 4 inches sometimes occurs on the surface.
Trenton (TT)	This is deep, imperfectly drained, silty clay loam, moderately to strongly alkaline. This soil is found extensively in the county, especially in the north central part of the valley. Included in these areas are small places of poorly drained and strongly saline soils. Use is mainly for dry farming with only fair yields.
Collette (CP)	Deep, imperfectly drained, silty clay loam soils are characteristic of these places. Surfaces are mildly alkaline and the subsoil and substratum are moderately alkaline. Depth to water table is 20 to 36 inches. Some areas have a weak hard pan. A few small areas are affected with salt and alkali and some small areas are poorly drained. Use is mainly for irrigated crops and pasture.

Table 1. Continued

Series	Characteristics
Ironton (IR)	These are deep, moderately and imperfectly drained, silt loam soils, used mainly for irrigated crops and pastures. Surface soil is mildly alkaline while under surface is moderately alkaline. Depth to water table is from 30 to 60 inches. Much of this land has been artificially drained. Some areas have fine textured soils that are poorly drained. There are some spots also that have weak hard pans.

Source: National Cooperative Soil Survey. Soil Conservation Service, Logan Office.

Because of the composition and texture of the soil, it holds water for a long time. This accounts for the fact that the water turns come at eighteen-day intervals which seem to be adequate for most crops grown there. Best success has been achieved from wheat, barley, oats, alfalfa, and pasture crops.

Three crops of fine quality alfalfa can be grown on the better soils that have ample water. One farmer, who for years operated land both in the area and on the east bench, claims that the quality of the alfalfa grown on his land below was far superior to that produced on his bench land. He also had better success in surviving winter kill, frost, and other such problems on the land in the bottoms. He noted that his milk cows maintained higher production when fed the hay from the bottom land than that produced on the east bench (3). Also the better soils in the bottoms produce excellent crops of wheat and barley. There are, however, spots that are too high or too low to be irrigated properly. Production on these parts is not very satisfying. Some nonirrigated spots, although the soils may be good, do not seem to produce as well as nonirrigated land on the east bench. This could be due in part to lack of rain fall. It seems that the middle of the valley does not receive as much

spring and summer rain as the bench lands. Often after a good shower has fallen on the bench, one can find that hardly a trace of moisture has fallen in the Cow Pasture area. Average grain yields per acre on this land are somewhat lower than those of Cache County (12, p. 169). Hay yields compare favorably with county averages (Table 2).

Table 2. Comparison of average crop yields on irrigated land in Cache County with the land irrigated by the Logan Cow Pasture Water Company

Crop	Yield Per Acre 1959 Cache County (a)	1964 Cow Pasture (b)
Wheat (winter) Wheat (spring)	51.7 bu. 43.6 bu.	45.4 bu.[c]
Barley	58.2 bu.	49.2 bu.
Oats	60.3 bu.	42.3 bu.
Alfalfa	3.5 tons	3.9 tons
Grass hay	1.4 tons	1.4 tons

[a]United States Census of Agriculture, 1959.
[b]Table 5.
[c]Winter and spring wheat are averaged together.

Much of the land has a high mineral content which limits the type of crops that can be grown. Corn and beets have been tried with limited success. A little more than half the total acreage consists of permanent pasture. This is because the land is too wet and too high in mineral content to be cultivated profitably. This land makes good summer and fall pasture for beef cattle. It is considered by some

to be especially valuable for its fall pasture since it provides grazing late into the season, usually until snow covers it.

A common practice in the past has been to pasture lightly or until the mountain range was ready, then cut the growth for hay about the first of August. After hay harvest water is applied and the regrowth used for fall pasture. Because of the ever-narrowing profit margin in hay and the recognition that the value of the grass hay is comparatively low, some of the farmers are changing their usage to grazing only. Better quality hay is then purchased or raised on other land. Whether this change will be complete and permanent remains to be seen.

WATER SOURCES

There are four sources of water claimed by the Logan Cow Pasture Water Company. They are as follows:

1. 22.5 c.f.s. of water from springs situated in Sections 31, Township 12 North, Range 1 East, S.L.M. This water is collected in a natural depression known as the Logan Fish and Game Reservoir which is a lower tributary to the Logan River. This water is allocated to irrigate approximately 1800 acres of land located in Sections 25, 26, 27, 35, 34, 28, and 23, Township 12 North, Range 1 East, S.L.M. (4).

2. 9.00 c.f.s. of water from Logan River. This is a secondary right dating to 1888. Water from this source is to be conveyed to the Logan Fish and Game Reservoir and used for supplemental irrigation of the lands described above (4).

3. A. 19.00 c.f.s. of underground water from Logan City's sewage system. This water is to irrigate approximately 1,920 acres of land. It would be used not only to supplement the sources listed above but also water land located between 6th West and the Fish and Game Reservoir (2).

B. 10.00 c.f.s. (approximately) of surface water from Logan City's sewage system. This surface component was filed on 1961. The petition was protested and the conclusions are still pending.

4. Water from wells used by the State Fish and Game Hatchery. These are located at the Hatchery and empty into the reservoir. The Logan Cow Pasture Water Company has not filed on nor established any legal entitlement to the usage of the drainage from these wells at this time.

OBSERVATIONS FROM TABLES

Tables 4 and 6 indicate that the biggest use of the land is for pasture. Beef cattle and dairying was at one time the dominant farming practice of the area. Recently dairying has been giving way to beef operations and pasturing of dry dairy cattle. This is probably because of the preponderance of permanent pasture which tends to be of low quality.

The value of the grass hay produced is much below that of the pasture, thus substantiating the statement made earlier that some farmers are beginning to pasture their meadows more rather than harvest the hay from them.

Note should be made that the figure representing total acres does not include grass hay, fall pasture of stubble nor straw, as this would be duplication. These acres are, in most cases, already counted with the permanent pastures, alfalfa, and grain crops.

Next to permanent pasture, wheat is the biggest crop in terms of dollar value. Feed grain, alfalfa and other crops represent the remainder of the value produced and added together they amount to $27,537, which is nearly as much as the permanent pasture.

A comparison of Tables 4 and 6 with Tables 5 and 7 shows that the loss of water to the land would mean a large loss of income to the farmers. Grass hay and straw would be raised only at a loss. Return from oats and barley would be so small that they would probably not be used in the farm program. It seems that permanent pasture, wheat and alfalfa would be the best crops under a dry situation.

Table 3 shows the estimated difference in value of the crops that could be produced with irrigation and without irrigation. The table also shows the estimated percentage of reduction that would occur in the crop production without irrigation. It should be noted that the total percentage figure is not an average of the percentage figures for each crop, but shows what percentage the total reduction is of the total value of all crops produced in 1964.

Table 3. Estimated reduction of crop value that would occur with loss of irrigation water[1]

Crop	Amount of reduction	Percentage reduction
Permanent pasture	$ 25,945	84.2%
Wheat	14,135	75.6
Alfalfa	6,937	74.1
Grass hay	6,185	110.8
Barley	5,160	93.5
Improved pasture	3,721	78.3
Oats	1,247	96.0
Fall pasture of stubble	1,219	93.3
Straw	150	250.0
Total	$ 63,799	83.9%

[1]Data based on figures from Tables 4,5,6, and 7.

Table 4. Value of cultivated crops produced in 1964 on irrigated land

Crop	Number of acres	Average yield per acre[a]	Total production	Price of Crop	Gross value	Average cost per acre[b]	Total expenses	Net value of crop
Wheat	323	45.44 bu	14,677 bu	1.67 bu.	$24,511	$18.00	$ 5,814	$18,697
Barley	141	49.17 bu	6,933 bu	1.10 bu	7,626	14.96	2,109	5,517
Oats	51	42.35 bu	2,159 bu	.82 bu	1,771	9.26	472	1,299
Alfalfa	151	3.9 ton	588 ton	23.00 ton	13,545	27.70	4,183	9,362
Grass hay	428.9	1.37 ton	587 ton	16.50 ton	9,695	10.39	4,456	5,239
Straw	40 (less straw)	.5 ton	20 ton	15.00 ton	300	6.00	240	60
Total	1,094.9	-	-	-	$57,448.07	-	$17,275	$40,173

[a] Total yield divided by total number of acres
[b] Total of all costs divided by number of acres

Source: Questionnaires sent to farmers

Table 5. Estimated value of cultivated crops that could be produced if there were no irrigation water

Crop	Number of acres	Average yield per acre[a]	Total production	Price of crop	Gross value	Average cost per acre[b]	Total expenses	Net value of crops
Wheat	323	18.50 bu	5,975 bu	1.67 bu	$ 9,979	$16.77	$ 5,417	$4,562
Barley	141	15 bu	2,115 bu	1.10 bu	2,327	13.97	1,970	357
Oats	51	.9 bu	46 bu	.82 bu	376	6.37	325	52
Alfalfa	151	1.15 ton	174 ton	23.00 ton	3,994	10.39	1,567	2,425
Grass hay	428.9	.31 ton	133 ton	16.50 ton	2,194	7.32	3,140	-946
Straw	40	.25 ton	10 ton	15.00 ton	150	6.00	240	-90
Total	1,094.9 (less straw)	-	-	-	$19,020	-	$12,660	$6,360

[a] Total yield divided by total number of acres
[b] Total of all costs divided by number of acres

Source: Questionnaire sent to farmers

Table 6. Costs, income, and value of irrigated pasture

Type of Pasture	Number of acres	Number of animals per acre[a]	Number of months	Number of animal months	Average rental value per animal month	Rental value per acre	Gross value of pasture	Average cost per acre	Total cost	Net value of pasture
Permanent or native pasture	1,142.53	1.27	6.06	7.70	$4.00	$30.80	$35,190	$4.76	$5,438	$29,752
Improved pasture	129	1.34	6.41	8.59	5.00	42.95	5,541	6.10	787	4,754
Fall pasture of crop stubble	289	.91	1.24	1.13	4.00	4.52	1,306	none	none	1,306
Totals	1,560.53	-	-	-	-	-	$42,037	-	$6,225	$35,812

[a]Assuming a cow over two years old

Source: Questionnaire sent to farmers

Table 7. Estimated costs, income, and value of pasture without irrigation

Type of pasture	Number of acres	Number of animals per acre[a]	Number of months	Number of animal months	Average rental value per animal month	Rental value per acre	Gross value of Pasture	Average cost per acre	Total cost	Net value of pasture
Permanent or native pasture	1,142.53	.79	2.26	1.78	$4.00	$ 7.12	$8,135	$3.00	$3,428	$4,707
Improved pasture	129	.96	2.31	2.22	5.00	11.1	1,432	3.09	399	1,033
Fall pasture of crop stubble	289	.1	.1	.1	3.00	.3	87	none	none	87
Totals	1,560.53	-	-	-	-	-	$9,654	-	$3,827	$5,827

[a]Assuming a cow over two years old

Scource: Questionnaire sent to farmers

Table 8. Owner estimates of the market value of their property with irrigation and without irrigation

Type of land	Number of acres	Irrigated		Dry		Difference between columns 3 and 5
		Estimated value per acre	Total value	Estimated value per acre	Total value	
Irrigated crop land	\$1,039	\$430	\$446,770	\$165	\$171,227	\$275,543
Dry crop land	146	317	46,232	158	23,116	23,116
Permanent irrigated pasture	925.53	312	288,340	120	110,925	177,415
Dry pasture land	77	150	11,550	131	10,106	1,444
Totals	\$2,191.53[a]	-	\$792,892	-	\$315,374	\$477,518

[a] This does not include the land owned by the State Fish and Game Department and the Utah Power and Light Company.

Source: Questionnaire sent to farmers

PROCEDURE USED FOR ARRIVING AT THE VALUE OF THE WATER

Much of the information used in this research was gathered from the owners or operators of the land irrigated by the Logan Cow Pasture Water Company's system. A questionnaire was sent to each owner or operator (see appendix). Information from these questionnaires was used to compile the various tables found in this study. Data from the tables were used to determine the value of the water to the land it irrigates.

In requesting production figures from farmers, only 1964 yields were asked for since it seemed to represent a fairly average production year. Crop prices used in extending the calculations were averages of prices received by farmers in Utah for these crops in 1964. These prices were furnished by the Department of Economics of the Utah State University. 1964 prices represent a fairly good average since they have remained quite stable for the past three or four years. A summary of the facts gathered from the questionnaires and used to calculate the value of the water is made below.

1. The value of the crops produced in 1964. This figure is arrived at by adding the value of all crops produced on the farms in the area. (Table 4).

2. The value of the pasture produced in 1964. This figure is arrived at by adding the value of all the pasture produced on the lands in the area (Table 6).

3. The estimated value of the crops that could be produced in a normal or average year if the land were without irrigation (Table 5).

4. The estimated value of the pasture that could be produced in a normal or average year if there were no irrigation (Table 7).

5. The present estimated market value of the combined owners' property with irrigation. This figure is arrived at by having each owner estimate the market value per acre of his own farm. From these estimates an average price per acre is calculated and multiplied by the total number of acres (Table 8).

6. The estimated market value of the combined owner's property if there were no irrigation water for it. This estimate is derived by using the same method employed in step 5 above (Table 8).

7. The owners estimated costs or expenses incurred in producing his crops and pasture in 1964 (Tables 4 and 6). These costs or expenses were to include all operating costs such as seed, labor, depreciation, repairs, property taxes, etc. A form was sent to the operator along with the questionnaire to assist him in calculating his expenses (appendix).

8. The owners estimate of the costs that would be incurred in producing crops if there were no irrigation water (Tables 5 and 7). The same method used in step 7 is employed here.

The value of the water was determined by finding the difference between the net value of the crops and pasture produced in 1964 and the estimated net value of the crops and pasture that could be produced on the same land without irrigation water. From this figure interest on the estimated value of the combined owners' property without irrigation was deducted. A five percent interest rate was used since this seemed to be close to a long term average of rates charged for farm real estate loans. The remaining figure was capitalized at five percent to arrive at the final value of the irrigation water.

ANALYSIS OF DATA

To arrive at the value of the irrigation water, the information from the questionnaire sent to the farmers is compiled into tables and totaled so that averages and aggregate totals are readily available. From these figures the following analysis is made:

Net value of crops and pasture produced in 1964 (Table 9)	. . . . . $75,986
less	
Net value of crops and pasture that could have been produced without irrigation (Table 9)	. . . . . $12,187
equals	
Value of irrigated crops and pasture that would be lost without irrigation (Table 3)	. . . . . $63,799

less

Interest on estimated value of land without irrigation water (5 percent of Column 5, Table 8) $15,769

equals

Net value of the irrigation water $48,030

Value of the irrigation water capitalized at 5 percent $960,580

Table 9. Comparison of 1964 production with estimated production without irrigation

Crop	Value of 1964 crop	Estimated value of crop that could be produced without irrigation
Permanent pasture	$29,752	$ 4,707
Wheat	18,697	4,562
Alfalfa	9,362	2,425
Barley	5,517	357
Grass hay	5,239	--946
Improved pasture	4,754	1,033
Oats	1,299	51
Fall pasture of stubble	1,306	87
Straw	60	--90
Total	$75,986	$12,186

Source: Data compiled from questionnaires sent to farmers.

SUMMARY AND CONCLUSIONS

1. There are 43 stockholders using approximately 2,595 acres of land located in the area irrigated by the Logan Cow Pasture Water Company. This includes land owned by the Utah Power and Light Company, which is used by one of the ranchers, and the State Fish and Game Department.

2. Irrigation of these lands began early in the settlement of the valley and the system used by the company has proved to give inexpensive and reliable irrigation.

3. Beef cattle is the predominant farm operation since it makes more effective use of the large amounts of pasture.

4. Loss of water would cause an approximate annual crop reduction amounting to $63,799. This would be an 83.9 percent crop reduction each year over what is being produced presently with irrigation.

5. Capitalized at 5 percent, the value of the water is equal to $960,580.

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(4) Civil case number 1772. February 22, 1922. Utah Power & Light Co., plaintiff V.S. Richmond Irrigation Company et. al., Defendants. Final decree by District Judge James N. Kimball in the District Court of the First Judicial District of the State of Utah, Cache County.

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(7) Ricks, Joel R, Ed. 1956. The History of a Valley. Cache Valley Centennial Commission. Logan, Utah.

(8) Agreement Number 107291 between Logan City Corp. and the Logan Cow Pasture Water Company. 1924. Recorded in Book 10 of Miscellaneous on pages 515 and 516. Cache County Recorders Office, Logan.

(9) Articles of Incorporation of The Logan Cow Pasture Water Company. 1902. Filed at the office of the clerk, Cache County, Utah.

(10) Plat map. 1965. Located in the Cache County Recorders Office.

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(12) U. S. Dept. of Commerce. 1959. Bureau of the Census. United States Census of Agriculture, Utah Counties.

APPENDIX

Table 10. Original stockholders of the Logan Cow Pasture Water Company

Name	Number of shares	Amount of capital stock subscribed
Joseph E. Cowley	75	$ 150
Louis S. Cardon	30	60
George L. Farrell	50	100
William Cunningham	160	320
Thomas X. Smith	12	24
Peter L. Nielsen	40	80
John D. Wilcox	50	100
R. H. Williams, Jr.	80	160
R. H. Williams	80	160
L. R. Martineau	80	160
J. Z. Stewart, Jr.	180	260
Thomas H. Smith	54	108
Henry A. Yonk Co.	74	148
Nephi Andrews	6	12
J. C. Petersen	20	40
F. A. Benson	80	160
Harry Worley	225	450
James Larsen	20	40
William Andrew	10	20
Lars C. Larsen	30	60
Jonathan Holland	50	100
Lauritz M. Lauritzen	30	60
Melvin J. Ballard	30	60
George Worley	20	40
W. D. Cranney	60	120
Robert Crookston	12	24
A. M. Clayton	25	50
Rebecca Evans	20	40
Thomas Worley	5	10
J. Z. Stewart Agent	30	60
J. E. Cowley Agent	500	1,000
Total	2138	$4,176

Author's Note: The total number of shares multiplied by the par value ($2.00) does not equal the total amount of capital stock subscribed ($4,176). These are figures found in the Articles of Incorporation of the company. The author is unable to find an explanation for the discrepancy.

Table 11. Stockholders of record in the Logan Cow Pasture Water Company, November, 1964

	Stockholder	Number of shares
1.	Utah Fish and Game Department	32
2.	T. Lynn Stewart	60
3.	Alton Dahle	20
4.	Blaine L. Sorenson	10
5.	R. T. Nish	6
6.	Alden Pitcher	30
7.	Edwin Gossner	13
8.	Joseph Meyrick	7
9.	Oliver Worley	82
10.	H. A. Worley	52
11.	Niederhauser Brothers	233
12.	George Worley Estate	22
13.	Annie S. Hawkes	26
14.	Paul Fitzgerald	15
15.	Hesy A. Beckstead	35
16.	Mrs. Alma Larsen	30
17.	Paul L. Olsen	1
18.	L. D. S. Dairy Farm	15
19.	Herschel Bullen	4
20.	Orland Peck	10
21.	Logan City Corp.	10
22.	Hans Anderson	12
23.	H. M. Cardon	25
24.	M. E. Schvaneveldt	185
25.	J. C. Peterson	18
26.	Merlin Eliason	132
27.	Ella Cowley	20
28.	Robert Thalman	25
29.	J. Howard Skabelund	25
30.	Clifford Atkinson	12
31.	Merlin Cowley	27
32.	J. E. Brockman	10
33.	Burdell Dahle	15
34.	Conrad Peterson	57
35.	Oliver H. Peterson	39
36.	David H. Peterson	39
37.	Gilbert H. Peterson	39
38.	Melrose Carson	88
39.	Howard H. Peterson	39
40.	Pride of the Rockies	9
41.	Dunford Weston	85
42.	T. Earl Hunsaker	5
43.	Cowley Brothers	20

RESEARCH STUDY

To Stockholders
Logan Cow Pasture Water Company
Cache County, Utah

Dear Stockholder:

As all stockholders of the Logan Cow Pasture Water Company are aware, when Logan City builds a new sewage disposal system there is a possibility of losing some or all of the irrigation water from the present source. This could effect a substantial loss to most all subscribers.

There is no doubt that the irrigation water from the city's disposal system has considerable value. Just how much is this value? In view of the possible loss of this water a study is being made to determine, as nearly as possible, what the value of the irrigation water is. The findings of this study may prove to be quite valuable to the Logan Cow Pasture Water Company when the time approaches for more firm plans and determinations by the city.

We are sending the enclosed questionnaire to each of you stockholders of the Water Company and ask that you help us in making this study. Individual records and answers will be kept absolutely confidential. Only completed averages and totals will be published thus making individual identification impossible. The importance of accuracy in a survey of this type is obvious.

We appreciate your help in this research and urge that each question be answered as accurately as possible. Where records may not have been kept please use the most accurate estimate possible. If possible please return the questionnaire by February 15th.

Thank you

President

Vice-President

Secretary

Director

Director

QUESTIONNAIRE

All of the questions in this questionnaire pertain only to that land which is located in the area irrigated by the Logan Cow Pasture Water Company.

1. How many acres of land do you own that are located in the area watered by the Logan Cow Pasture Water Company? _____

2. How many acres of land located in this area do you rent or lease to someone else? _____

3. Do you depend upon this irrigation water to water livestock? _____
If so, how many head of livestock? _____ What kind of livestock? _____

4. Do you use the irrigation water for any other purpose than for irrigation or livestock watering? _____ If so, tell what other uses you make of the water.

On this part of the form indicate your best estimate of your actual 1964 yields per acre and the total expense or cost per acre of producing the crop.

On this part of the form indicate what you estimate this same land would produce if there were no water provided from the irrigation company.

	With Irrigation			Without Irrigation		
Crop	Number of acres[a]	Average yield per acre	Average cost/acre[b]	Number of acres	Average yield per acre	Average cost per acre[b]
Wheat						
Barley						
Oats						
Alfalfa						
Grass Hay						
Other (list)						
Other (list)						
Other (list)						

[a] List the total number of acres you own and operate.
[b] List only those expenses required to produce the crop.

On this form give your best estimate of the present market value of various acres of your land located in the area irrigated by the Logan Cow Pasture Water Company.

		With Irrigation	Without Irrigation
Type of Land	Number of acres	Estimated present market value per acre with irrigation	Estimated value per acre without irrigation water
Irrigated Crop Land			
Dry Crop Land			
Permanent Irrigated Pasture			
Dry Pasture Land			

On this side of the form below indicate your estimate of the average carrying capacity of your pasture land. When filling in item #3 assume a cow over two years old.

On this side of the form estimate the carrying capacity if there were no irrigation water on the land.

	With Irrigation				Without Irrigation		
1	2	3	4	5	6	7	8
Type of Pasture	Number of acres[a]	Number of animals per acre	Number of months	Average cost per acre[b]	Number of months	Number of animals per acre	Average cost per acre[b]
Permanent of native pasture							
Improved pasture							
Fall pasture of crop stubble							

[a]List the total number of acres you own and operate.

[b]Include only direct costs required to produce the crop.

This sheet is not part of the questionnaire. It is only a worksheet provided for your convenience. You may use it if you wish to aid you in calculating your expenses incurred in operating your land. It need not be returned as it will not be used in the research.

Include only those direct expenses you had in producing the crops grown on your land located in the area of the Logan Cow Pasture Water Company.

	Include the following items			Do not include any of the expenses listed below
1.	Hired labor			1. Rent paid
2.	Your labor @$2.00 per hour			2. Breeding fees
3.	Taxes			3. Veterinary fees
4.	Fertilizer			4. Feed purchased
5.	Seed			5. Interest
6.	Machinery hired			6. Expenses of operating other lands of yours
7.	Depreciation on your machinery			7. Expenses on house, barns, milk-house, feed lots, etc.
8.	Gasoline			
9.	Desiel Fuel			
10.	Oils & Greases			
11.	Bailing twine			
12.	Water Assessment			
13.	Spray materials			
14.	Fencing			
15.	Other (list)			
16.				
17.				
18.				
19.				
20.				