

## IRRIGATION : NEW MEXICO

FARMS AND ACREAGE IRRIGATED, IRRIGATION WORKS, COST OF CONSTRUCTION, COST OF OPERATION AND MAINTENANCE,  
AND CROPS IRRIGATED

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## INTRODUCTION.

This bulletin presents the larger part of the statistics of irrigation for New Mexico obtained in connection with the Thirteenth Census. These data, with additional information, will be embodied in a special report of the Census of Irrigation and in the final reports of the Thirteenth Census. The statistics of the number of farms and acreage irrigated, cost of operation and maintenance, and irrigated crops are for the calendar year 1909; those of irrigation works, cost of enterprises, acreage enterprises were capable of irrigating in 1910, and acreage included in projects are of the date July 1, 1910.

These statistics have been collected under the law of February 25, 1910, which contained the following clause relating to irrigation:

Inquiries shall also be made as to the location and character of irrigation enterprises, quantity of land irrigated in the arid region of the United States and in each state and county in that section under state and Federal laws; the price at which these lands, including water rights, are obtainable; the character and value of crops produced on irrigated lands, the amount of water used per acre for said irrigation and whether it was obtainable from national, state, or private works; the location of the various projects and methods of construction, with facts as to their physical condition; the amount of capital invested in such irrigation works.

The information called for by this law which could be supplied by farm operators was obtained on supplemental schedules by the regular census enumerators as a part of the agricultural census. The remaining data, which were supplied by the owners or officials of irrigation enterprises, were obtained on special schedules by special agents. The data relating to number of farms irrigated and irrigated crops are taken from the supplemental schedules, while all data relating to acreage irrigated and to irrigation works and their construction and operation are taken from the special schedules.

In accordance with the law, the data collected have been classified primarily by the state and Federal laws by virtue of which the land was brought under irrigation. The results are presented in detail at the end of this bulletin and summarized in text tables.

Such of the terms used as are not self-explanatory are defined below.

**Farms irrigated.**—The number of "farms irrigated" is the number of farms on which irrigation is practiced and is equivalent to the term "number of irrigators" used in previous census reports.

**Types of enterprise.**—The types of enterprise under which the lands irrigated in 1909 are classified are as follows:

*United States Reclamation Service enterprises*, which operate under the Federal law of June 17, 1902, providing for the construction of irrigation works with the receipts from the sale of public lands.

*United States Indian Service enterprises*, which operate under various acts of Congress providing for the construction by that service of works for the irrigation of land in Indian reservations.

*Carey Act enterprises*, which operate under the Federal law of August 18, 1894, granting to each of the states in the arid region 1,000,000 acres of land on condition that the state provide for its irrigation, and under amendments to that law granting additional areas to Idaho and Wyoming.

*Irrigation districts*, which are public corporations that operate under state laws providing for their organization and management, and empowering them to issue bonds and levy and collect taxes with the object of obtaining funds for the purchase or construction, and for the operation and maintenance of irrigation works.

*Cooperative enterprises*, which are controlled by the water users under some organized form of cooperation. In New Mexico most of the cooperative enterprises are operated under laws regulating "community" ditches.

*Commercial enterprises*, which supply water for compensation to parties who own no interest in the works. Persons obtaining water from such enterprises are usually required to pay for the right to receive water, and to pay, in addition, annual charges based in some instances on the acreage irrigated and in others on the quantity of water received.

*Individual and partnership enterprises*, which belong to individual farmers or to neighboring farmers, who control them without formal organization. It is not always possible to distinguish between partnership and cooperative enterprises, but as the difference is slight this is unimportant.

**Source of water supply.**—Of the terms used in the classification according to source of water supply, none requires explanation except "reservoirs." The only reservoirs which are treated as independent sources of supply are those filled by collecting storm water or from watercourses that are ordinarily dry. When reservoirs are filled from streams or wells, the primary source is considered the source of supply.

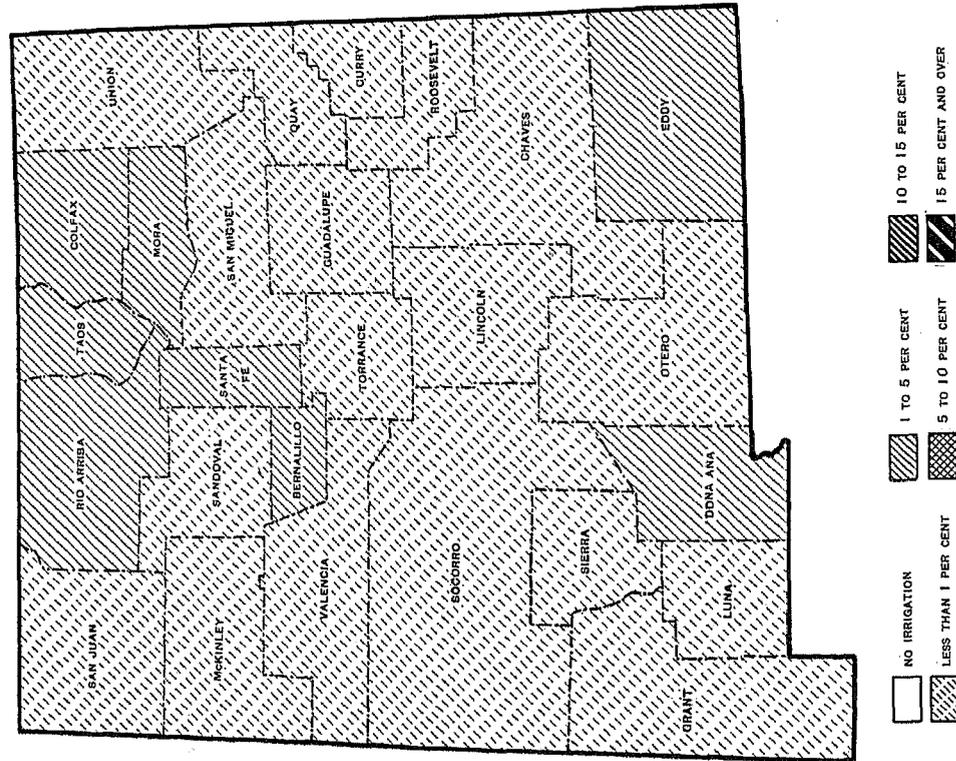
**Acre-foot.**—The "acre-foot," used to express the capacity of reservoirs, is the volume of water required to cover 1 acre to a depth of 1 foot, or 43,560 cubic feet.

**Cost.**—The cost of irrigation enterprises is that given by the owners. For the larger works the cost given is taken, in most cases, from the books of account and represents the actual cost. In the case of most of the private and partnership and many of the cooperative enterprises, however, the works were built by their owners without records of money or labor expended, and the cost given represents the owners' estimates. The cost reported for 1910 includes the cost of construction and of acquiring rights. The latter usually consists of filing fees only. In some instances it includes the purchase price of rights, but these cases are so rare that they are unimportant. The cost reported for 1899 is designated "cost of construction," but probably includes the cost of acquiring rights, as in 1910. The average cost per acre is based on the acreage enterprises were capable of irrigating in 1910 and the cost to July 1, 1910.

PER CENT OF TOTAL LAND AREA IRRIGATED, AND PER CENT OF NUMBER OF FARMS IRRIGATED, IN NEW MEXICO, BY COUNTIES: 1909.

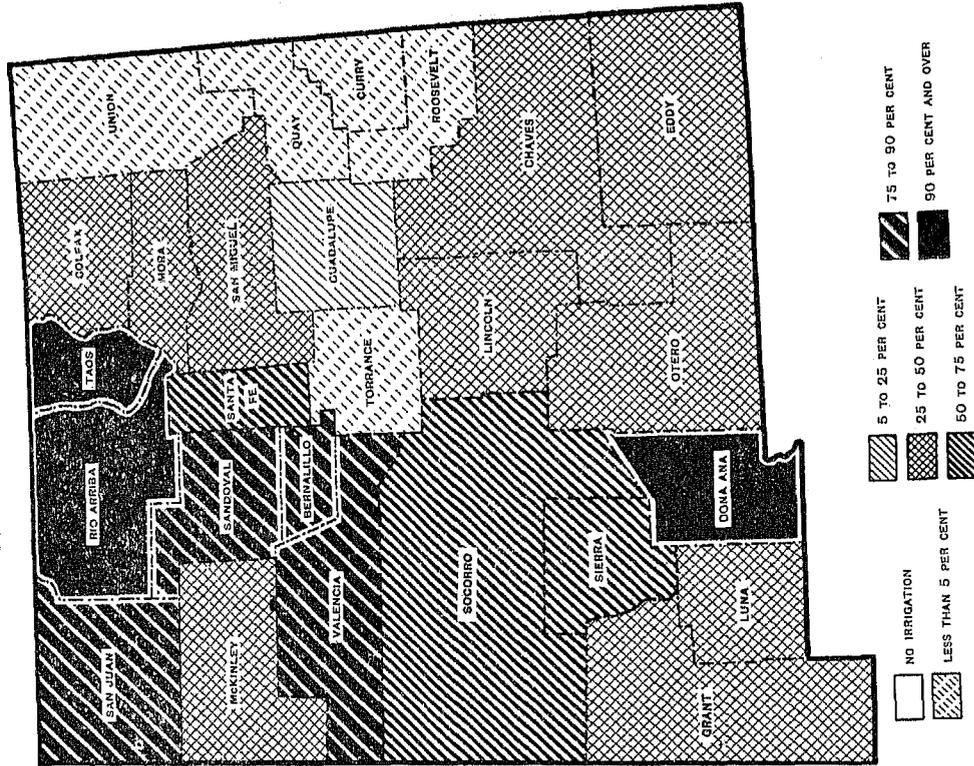
PER CENT OF TOTAL LAND AREA IRRIGATED.

[Per cent for the state, 0.6.]



PER CENT OF NUMBER OF FARMS IRRIGATED.

[Per cent for the state, 35.9.]



FARMS AND ACREAGE IRRIGATED.

New Mexico lies on the border of the Rocky Mountains and the Great Plains, the western part being occupied by broken ranges of mountains with intervening valleys, and the eastern part by the western extension of the plains. Throughout the eastern part of the state the rainfall is sufficient in many seasons for growing crops without irrigation, the normal annual precipitation ranging from 15 to 20 inches, and in other scattered sections also the rainfall is sufficient for dry farming.

Irrigation is practiced to some extent throughout the state, but the development has not been marked in the east central counties. The distribution of the irrigated lands of the state is indicated in a general way by the accompanying maps, which show the class in which each county falls with reference to the percentage which the irrigated land forms of the total land area and the percentage which irrigated farms represent of all farms.

The following table shows for the state as a whole the number of farms and the acreage irrigated in 1909, in comparison with the total number of farms, the total land area, the total land in farms, and the total acreage of improved land in farms in 1910, together with the areas not yet irrigated for which water has been or is being made available. Comparative statistics for the census of 1900 are included as far as possible.

The figures relating to irrigation given in the Twelfth Census report are exclusive of Indian reservations in the case of all the items which are shown in the present bulletin, except the total number of farms irrigated in the state. Thus it appears that the acreage irrigated in 1899, as shown in this and other tables, and the figures based upon it, are not strictly comparable with the corresponding figures for 1909. This should be borne in mind in considering comparisons between the two censuses.

	CENSUS OF—		INCREASE. <sup>1</sup>	
	1910	1900	Amount.	Per cent.
Number of all farms.....	<sup>2</sup> 35, 676	<sup>3</sup> 12, 311	23, 365	189. 8
Approximate land area of the state..... acres.....	78, 401, 920	78, 401, 920	.....	.....
Land in farms.....	<sup>2</sup> 11, 270, 021	<sup>3</sup> 5, 130, 878	6, 139, 143	119. 7
Improved land in farms..... acres.....	<sup>2</sup> 1, 467, 191	<sup>3</sup> 326, 873	1, 140, 318	348. 9
Number of farms irrigated.....	<sup>4</sup> 12, 795	<sup>5</sup> 9, 128	3, 667	40. 2
Acreage irrigated.....	<sup>4</sup> 461, 718	<sup>6</sup> 203, 893	257, 825	126. 5
Acreage enterprises were capable of irrigating.....	<sup>7</sup> 644, 970	<sup>8</sup> 646, 784	.....	.....
Acreage included in projects.....	<sup>7</sup> 1, 102, 297	( <sup>9</sup> )	.....	.....
Percentage irrigated of—				
Number of all farms.....	35. 9	74. 1	-38. 2	.....
Approximate land area of the state.....	0. 6	<sup>10</sup> 0. 3	0. 3	.....
Land in farms.....	4. 1	<sup>10</sup> 4. 0	0. 1	.....
Improved land in farms.....	31. 5	<sup>10</sup> 67. 2	-35. 7	.....
Excess of acreage enterprises were capable of irrigating in 1910 over acreage reported as irrigated in 1909.....	183, 252	<sup>11</sup> 442, 891	.....	.....
Excess of acreage included in projects over acreage irrigated in 1909.....	640, 579	.....	.....	.....

<sup>1</sup> A minus sign (—) denotes a decrease. <sup>2</sup> April 15. <sup>3</sup> June 1. <sup>4</sup> In 1909. <sup>5</sup> In 1899. <sup>6</sup> In 1899. Exclusive of Indian reservations. <sup>7</sup> July 1. <sup>8</sup> Reported under ditch in 1899. Exclusive of Indian reservations and acreage covered by well systems. <sup>9</sup> Not reported. <sup>10</sup> Based on figures which are exclusive of Indian reservations. <sup>11</sup> Represents difference between acreage irrigated and acreage under ditch shown above.

**Number of farms irrigated.**—The number of farms given as irrigated in 1909 is made up of the number reported on the supplemental schedules by the regular enumerators, together with an estimate of the number of farms covered by enterprises which were reported by special agents but not by the regular enumerators. This estimate was based upon the average acreage irrigated per farm as shown by the supplemental schedules.

According to the figures presented in the table, irrigation was practiced on slightly more than one-third (35.9 per cent) of the farms in the state in 1909. In 1899 the proportion of irrigated farms was much higher (74.1 per cent), while in 1889 it was 69.2 per cent. It is evident that between 1889 and 1899 the number of irrigated farms increased more rapidly than the number of unirrigated farms, while during

the last decade the rate of increase in the number of unirrigated farms was very much greater than that in the number of irrigated farms. From 1899 to 1909 the increase in the number of farms irrigated was 40.2 per cent for the state as a whole.

In 10 out of the 26 counties in the state, more than half the farms are irrigated, and in 3 the proportion is between 40 and 50 per cent, while in 6 others it is at least 30 per cent; in 1 it is 28.7 per cent; in 1, 17.3 per cent; and in the remaining 5 counties, less than 5 per cent. All except 2 of the counties having more than 50 per cent of their farms irrigated are in the western half of the state, while those in which the percentage of irrigated farms is low form a large group in the eastern part. The highest percentage shown for any county is 96.4 in Rio Arriba County, and the next highest 96.2 in Taos County.

**Acreege irrigated.**—The acreage irrigated is taken from the special schedules filled out by agents from information obtained from owners or officials of irrigation enterprises and, in some instances, from public records. The acreage thus obtained is considerably larger than the irrigated acreage reported on the supplemental schedules filled out by the farm enumerators. This difference is due in a measure to the fact that the special agents found enterprises which were not reported on any schedules returned by the enumerators, indicating that the acreage reported on the supplemental schedules is under the true figure. There is a natural tendency, however, for the officials of irrigation enterprises to report as irrigated the entire area of farms of which only a part was irrigated. Furthermore, some farms are so situated as to receive water from more than one enterprise, and may be reported as irrigated by each, which results in duplication. Owing to the two causes last enumerated, it seems probable that the acreage reported as irrigated is somewhat excessive, but the extent of this excess can not be determined. It is believed, however, to be less than 10 per cent for the state of New Mexico.

The total acreage reported as irrigated in 1909 was 461,718 acres, as against 203,893 acres in 1899 and 91,745 acres in 1889. The percentage of increase from 1889 to 1899 was 122.2, while that from 1899 to 1909 was 126.5. The absolute increase shown for the later decade was the larger, however, being 257,825 acres, as compared with only 112,148 acres during the earlier decade. Since the acreage irrigated in 1909, however, includes land lying in Indian reservations, while the figures for 1899 and 1889 do not, the reported increase between 1899 and 1909 is larger than the actual increase.

The percentage of increase between 1899 and 1909 in the acreage irrigated was considerably higher than that in the number of farms irrigated, the average acreage irrigated per farm in 1909 being 36.1, as compared with an average of 25.9 for the 7,884 farms outside of Indian reservations which were irrigated in 1899. For the same period a decrease from 416.8 to 315.9 acres in the average size of farms in the state was reported, which change, considered in connection with the increase in the acreage irrigated per farm, indicates that farmers are irrigating larger parts of their holdings than formerly.

The percentage irrigated of the total land area of the state increased from 0.3 in 1899 to 0.6 in 1909, while the percentage which the irrigated land formed of all land in farms was practically the same in the two years, 4 in 1899 and 4.1 in 1909. As a result of the rapid development of dry farming in recent years, however, there was a decrease in the proportion of the improved land in farms irrigated, from 67.2 per cent in 1899 to 31.5 per cent in 1909.

In 1909 the county for which the largest area of irrigated land was reported was Chaves, with an irrigated

acreage of 56,064. In three other counties the land reported as irrigated exceeded 40,000 acres, while three counties contained irrigated areas of between 30,000 and 40,000 acres.

The counties in which irrigated land forms the highest percentage of the total land area are Taos and Bernalillo, the proportion in the former being 2.9 per cent and that in the latter 1.9 per cent.

**Acreege included in projects.**—The foregoing table shows that in 1910 existing enterprises were ready to supply water to 644,970 acres, or 183,252 acres more than were irrigated in 1909. It is probable that, after allowance is made for an increase in the area irrigated in 1910 over that in 1909, there remained at the close of 1910 under ditch but not irrigated considerably more than half as much land as was brought under irrigation in the 10 years from 1899 to 1909. The acreage included in projects exceeds the acreage irrigated in 1909 by 640,579, which is almost two and one-half times the acreage brought under irrigation in the last decade and considerably more than the total area irrigated in 1909. This acreage represents the area which will be available for the extension of irrigation in the next few years upon the completion of existing enterprises and without new undertakings. It indicates in a general way the area available for settlement, although much of this unirrigated land is in farms already settled.

**Acreege irrigated, classified by character of enterprise.**—The next table gives the distribution of the acreage irrigated in 1909 according to the character of the enterprise controlling the irrigation works. In this table and in the general table at the end of this bulletin lands under the Leasburg project of the United States Reclamation Service are credited to the enterprises which were supplying them with water before the Reclamation Service undertook the work, and for which that service merely diverts the water. In this state most of the cooperative enterprises operate under laws regulating "community" ditches.

CHARACTER OF ENTERPRISE.	ACREEGE IRRIGATED IN 1909.	
	Amount.	Per cent distribution.
All classes.....	461,718	100.0
U. S. Reclamation Service.....	13,398	2.9
U. S. Indian Service.....	24,007	5.2
Cooperative enterprises.....	251,911	54.6
Commercial enterprises.....	28,190	6.1
Individual and partnership enterprises.....	144,212	31.2

Cooperative enterprises and individual and partnership enterprises are all controlled by the water users. These supplied about 86 per cent of the acreage irrigated in 1909, while United States Reclamation Service enterprises, which are to be turned over to the water users, supplied 2.9 per cent. Thus only about 11 per cent of the irrigated land is supplied by enterprises which are not either controlled by the water users or to be turned over to them ultimately.

**Acreage irrigated, classified by source of water supply.**—The table in the next column shows the distribution of the acreage irrigated in 1909 according to the source of water supply.

From this table it will be noted that nearly seven-eighths of the acreage irrigated in 1909 was supplied from streams, while wells constitute the only other source of supply that has been utilized to any considerable extent.

SOURCE OF WATER SUPPLY.	ACREAGE IRRIGATED IN 1909.	
	Amount.	Per cent distribution.
All sources.....	461,718	100.0
Streams.....	398,592	86.3
Lakes.....	862	0.2
Wells.....	54,829	11.9
Springs.....	6,163	1.3
Reservoirs.....	1,272	0.3

**IRRIGATION WORKS.**

The accompanying table summarizes the data collected relating to works for supplying water for irrigation in 1910 and 1900, Indian reservations, as already noted, not being represented in the figures shown for 1900. As only a few of the items reported in 1910 were reported in 1900, there is little opportunity for comparisons between the two censuses. The figures shown for the earlier census relate only to those systems which received water by gravity diversion from streams in 1899, but the other systems represented in the Twelfth Census report, which obtained water from wells, supplied only 1,004 acres of the total area reported as irrigated in 1899.

Assuming that the enterprises in operation in 1909 were identical with those reported in 1910, the average acreage irrigated per enterprise was 165.7 and the acreage irrigated per mile of main ditch was 99. For the enterprises shown for 1899, which, as stated, are exclusive of systems that received water from wells, the average acreage irrigated per enterprise in 1899 was 208.1 and the average per mile of main ditch was 85.2.

The utilization of underground water for irrigation has formed one of the most important phases of irrigation development in New Mexico in recent years, although confined principally to Chaves and Eddy

Counties. The table shows 673 flowing wells, all but 2 of which are in the counties named, and 466 pumped wells, of which these counties report 155. Luna County reports 94 pumped wells, but these are mostly windmill plants, and supplied only a small total acreage in 1909. The total acreage supplied by flowing wells in 1909 was 48,877 acres, and that supplied by pumped wells, 5,952 acres.

The total number of pumping plants was 413, these plants supplying water for the irrigation of 7,485 acres in 1909.

IRRIGATION WORKS.	CENSUS OF—		INCREASE.	
	1910	1900 <sup>1</sup>	Amount.	Per cent.
Independent enterprises..... number.....	2,788	975	1,811	185.7
Ditches, total length..... miles.....	5,854	( <sup>2</sup> )		
Main ditches..... number.....	2,101	975	1,126	115.5
Length..... miles.....	4,864	2,382	2,282	95.8
Capacity..... cu. ft. per second.....	29,646	( <sup>2</sup> )		
Lateral ditches..... number.....	1,280	( <sup>2</sup> )		
Length..... miles.....	1,190	( <sup>2</sup> )		
Reservoirs..... number.....	522	( <sup>2</sup> )		
Capacity..... acre-feet.....	454,162	( <sup>2</sup> )		
Flowing wells..... number.....	673	( <sup>2</sup> )		
Capacity..... gals. per minute.....	669,268	( <sup>2</sup> )		
Pumped wells..... number.....	466	( <sup>2</sup> )		
Capacity..... gals. per minute.....	100,690	( <sup>2</sup> )		
Pumping plants..... number.....	413	( <sup>2</sup> )		
Engine capacity..... horsepower.....	14,226	( <sup>2</sup> )		
Pump capacity..... gals. per minute.....	216,355	( <sup>2</sup> )		

<sup>1</sup> Figures relate only to systems obtaining water from streams. <sup>2</sup> Not reported.

**COST OF CONSTRUCTION, OPERATION, AND MAINTENANCE.**

The following table shows the total cost of irrigation enterprises up to July 1, 1910, including construction of works and acquisition of rights but not operation and maintenance, with the average cost per acre, based on the acreage the enterprises were capable of irrigating in 1910; the estimated final cost of enterprises completed and those now under construction, with the average cost per acre, based on the acreage included in projects; and the total cost and average cost per acre of operation and maintenance of systems operated in 1909. Data relating to the cost of construction and maintenance of systems operated in 1899 are included for comparison. The figure for average cost per acre of operation and maintenance in 1899 does not cover the cost for systems receiving water from wells, but these are comparatively unimportant, having supplied only 1,004 acres in that year. As previously stated, Indian reservations are not covered by the figures shown for 1900.

The cost of operation and maintenance is not reported for individual and partnership enterprises, for the reason that farmers whose land is irrigated by such

systems generally clean their own ditches at odd times without keeping any record of the time spent. In the case of larger enterprises this cost represents a cash outlay by the farmers, while in the case of many of the smaller cooperative enterprises the cost is worked out by the farmers.

	CENSUS OF—		INCREASE.	
	1910	1900	Amount.	Per cent.
Cost of irrigation enterprises.....	<sup>1</sup> \$9,154,897	<sup>2</sup> \$4,165,312	\$4,989,585	119.8
Average per acre.....	<sup>3</sup> \$14.19	<sup>4</sup> \$20.43	( <sup>5</sup> )	
Estimated final cost of existing enterprises.....	\$11,640,091	( <sup>6</sup> )		
Average per acre included in projects.....	\$10.56	( <sup>6</sup> )		
Operation and maintenance:				
Acreage for which cost is reported.....	278,489	( <sup>6</sup> )		
Total cost reported.....	<sup>7</sup> \$377,072	( <sup>6</sup> )		
Average cost per acre.....	\$1.36	<sup>8</sup> \$0.82	\$0.54	65.8

<sup>1</sup> Reported July 1.  
<sup>2</sup> Cost of construction of systems operated in 1899.  
<sup>3</sup> Based on acreage enterprises were capable of irrigating in 1910.  
<sup>4</sup> Based on acreage irrigated in 1899.  
<sup>5</sup> Figures not comparable. (See explanation in text.)  
<sup>6</sup> Not reported.  
<sup>7</sup> For 1909.  
<sup>8</sup> Figure relates only to systems obtaining water from streams.

The cost of irrigation systems shows an increase of 119.8 per cent from 1899 to 1910, but the average cost per acre apparently decreased considerably. This decrease is misleading, however. The average cost per acre shown for the census of 1900 is based on the acreage irrigated in 1899 instead of the acreage under ditch, which forms the basis of the figure given for 1910. If computed on the basis of the acreage irrigated in 1909, the average cost in 1910 would be \$19.83, representing a decrease of 2.9 per cent from the figure for the average cost at the census of 1900. At that census an area under ditch was reported equal to more than three times the area actually irrigated in 1899, the difference being due to the construction of new enterprises which had not then reached a stage of development enabling them to irrigate more than small parts of the area they were designed to reclaim, and to a shortage of water under old canals that prevented them from irrigating the acreage which they ordinarily served. The cost of construction per acre of land under ditch in 1899, exclusive of the comparatively unimportant well systems, is given as \$6.40, which corresponds to the cost per acre as computed for 1910 upon the basis of the acreage enterprises were capable of irrigating in 1910 and shown in the table. If compared with the average cost per acre under ditch in 1899, the average cost given in the table for 1910 would represent an increase of \$7.79, or 121.7 per cent.

In 1910 a condition somewhat similar to that at the previous census existed. Several large enterprises were under construction upon which considerable expenditures had been made, while but little land had been actually irrigated. The average based on the estimated final cost and the acreage included in projects, \$10.56 per acre, probably more truly represents the average cost per acre of irrigation in New Mexico than either of the average costs based on Thirteenth Census figures that are discussed above.

The county showing the lowest average cost per acre enterprises were capable of irrigating in 1910, \$3.20, is Sierra, while the highest average cost per acre, \$127.52, is reported for the group designated "All other counties" comprising Curry, Quay, Roosevelt, and Torrance, in which irrigation is an incidental, rather than an essential, factor in agriculture. In Eddy and Chaves Counties, which had the largest acreages that existing works were capable of supplying with water in 1910, the average costs reported were \$21.72 and \$27.30 per acre, respectively.

The acreage for which cost of operation and maintenance in 1909 was reported constitutes 60.3 per cent of the total acreage reported as irrigated in 1909 and 87.7 per cent of the acreage reported as irrigated by other than individual and partnership enterprises. The cost reported can be said, therefore, to represent fairly the average annual expense for all but individual and partnership enterprises.

## CROPS.

As previously stated, the data relating to irrigated crops are taken from supplemental schedules filled out by the regular census enumerators. Since the special agents found enterprises which the enumerators had not reported, it is evident that the information relating to irrigated crops is incomplete to some extent. It shows, however, the

relative importance of the different irrigated crops, and is sufficiently complete to afford reliable averages of yields.

The following table shows the acreage, yield, and value of the principal crops reported as grown under irrigation in 1909, in comparison with totals for the same crops reported for the entire state:

CROP.	ACREAGE.			YIELD.			VALUE.	
	Total for state.	Irrigated.		Unit.	Total for state.	On irrigated land.	Total for state.	For irrigated land.
		Amount.	Per cent of total.					
<b>Cereals:</b>								
Corn.....	85,999	34,430	40.0	Bushels.....	1,164,970	714,710	\$984,052	\$636,151
Oats.....	33,707	18,221	54.1	Bushels.....	720,560	440,500	459,308	309,911
Wheat.....	32,341	25,757	79.6	Bushels.....	409,799	456,531	505,728	447,704
Barley.....	2,131	1,469	68.9	Bushels.....	43,490	35,391	35,626	27,960
Rye.....	257	72	28.0	Bushels.....	2,913	1,274	2,650	895
<b>Other grains and seeds:</b>								
Alfalfa seed.....	2,159	1,140	52.8	Bushels.....	4,958	2,653	41,523	22,423
Dry edible beans.....	20,766	2,741	13.2	Bushels.....	85,795	28,288	232,023	74,551
Dry peas.....	2,485	1,541	62.0	Bushels.....	30,829	21,839	35,077	23,606
<b>Hay and forage:</b>								
Timothy alone.....	2,370	894	37.7	Tons.....	3,233	1,505	37,003	17,073
Timothy and clover mixed.....	1,881	115	6.1	Tons.....	2,650	189	28,035	2,214
Clover alone.....	197	25	12.7	Tons.....	410	47	3,501	488
Alfalfa.....	102,660	98,963	96.4	Tons.....	265,622	261,989	2,846,388	2,795,987
Other tame or cultivated grasses <sup>1</sup> .....	20,117	2,276	7.8	Tons.....	20,355	2,652	235,281	27,433
Wild, salt, or prairie grasses.....	28,028	13,024	46.5	Tons.....	22,050	14,512	239,396	149,075
Grains cut green.....	13,139	3,353	25.5	Tons.....	17,363	4,419	194,689	46,636
Coarse forage.....	191,024	7,270	3.8	Tons.....	99,320	10,145	885,001	101,137
<b>Sundry crops:</b>								
Potatoes.....	6,230	1,119	18.0	Bushels.....	295,255	83,234	234,636	65,625
Orchard fruits and grapes.....	(*)	6,556					* 535,778	447,189
Small fruits.....	* 66	42	63.6				* 9,335	6,591

<sup>1</sup>Includes millet or Hungarian grass.

\* Agricultural returns show number of trees, not acreage.

\* Preliminary tabulation, subject to correction.

While small quantities of other crops are grown both on irrigated and unirrigated land, the leading crops of the state, as well as the leading crops grown under irrigation, are represented in the table. In the reports of the agricultural census the acreages of seed crops are not usually given, but since the growing of alfalfa seed is coming to be an important industry in the irrigated sections of the country, the total acreage and the acreage under irrigation are presented here.

**Acreage.**—Of the entire acreage of the crops for which totals are presented in the table, slightly less than 39 per cent is irrigated. The proportion irrigated varies widely for the different crops.

In the eastern part of New Mexico the cereals are very generally grown without irrigation, but the irrigated acreage for the whole state as given in the table forms 51.8 per cent of the total acreage shown for these crops. The highest percentage of acreage irrigated shown for any cereal, 79.6, is reported for wheat, and the next highest, 68.9, for barley. The proportions for oats and corn are, respectively, 54.1 and 40 per cent.

The hay and forage crops, except alfalfa, are not so generally irrigated as the cereals, the irrigated acreage of such crops forming 34.2 per cent of their total acreage. Of these, alfalfa is the only crop of which more than half of the total acreage is irrigated, the proportion being 96.4 per cent. For "wild, salt, or prairie grasses" and for "timothy alone" the corresponding percentages are 46.5 and 37.7, respectively.

Of the entire acreage in potatoes in 1909, only 18 per cent was irrigated, and of that in small fruits, 63.6 per cent. The percentage of orchard land irrigated can not be determined, because the total acreage of orchards in the state is not reported, but it will be observed that more than 83 per cent of the value of all orchard fruits produced in the state is that of products grown on irrigated lands.

Of the crops shown in the table, alfalfa has the largest irrigated acreage, representing 45.2 per cent of the total irrigated acreage of the crops given. Corn is next, with 15.7 per cent of this total, and is followed by wheat, with 11.8 per cent, and oats, with 8.3 per cent. No other single crop covered as much as 6 per cent of the total acreage of the irrigated crops presented in the table.

While most of the crops irrigated are well distributed geographically, there is a tendency toward the concentration of certain crops in particular localities. This is shown by the following statement, which gives the counties having the largest acreages of the principal irrigated crops, with the proportion which each contains of the total irrigated acreage of that crop in the state.

**Corn.**—Grant County, 13.8 per cent; Sandoval, 12.9 per cent; San Juan, 8.8 per cent.

**Oats.**—Colfax County, 27.4 per cent; Taos, 13 per cent; Mora, 12.1 per cent.

**Wheat.**—Valencia County, 15.6 per cent; Sandoval, 14.6 per cent; Rio Arriba, 12.2 per cent.

**Barley.**—Grant County, 33.8 per cent; Colfax, 18.5 per cent; Rio Arriba, 9.7 per cent.

**Alfalfa seed.**—Chaves County, 41.7 per cent; Eddy, 36.5 per cent; San Juan, 11.5 per cent.

**Dry edible beans.**—Taos County, 15.9 per cent; Rio Arriba, 12.6 per cent; Dona Ana, 12.3 per cent.

**Dry peas.**—Taos County, 66.5 per cent; Rio Arriba, 27.9 per cent; Mora, 2.9 per cent.

**Timothy alone.**—Colfax County, 34.9 per cent; Rio Arriba, 29.2 per cent; Taos, 13.2 per cent.

**Alfalfa.**—Chaves County, 21.9 per cent; Dona Ana, 16.2 per cent; Eddy, 13.3 per cent.

**"Other tame or cultivated grasses."**—Mora County, 48.7 per cent; Taos, 14 per cent; Colfax, 10.6 per cent.

**"Wild, salt, or prairie grasses."**—Colfax County, 25.6 per cent; Rio Arriba, 13.4 per cent; San Miguel, 10.3 per cent.

**Grains cut green.**—Rio Arriba County, 26.4 per cent; Colfax, 18 per cent; Taos, 16 per cent.

**Coarse forage.**—Eddy County, 58.3 per cent; Chaves, 19.8 per cent; Luna, 4.5 per cent.

**Potatoes.**—San Juan County, 29.7 per cent; Rio Arriba, 29.4 per cent; Taos, 9.1 per cent.

Of the irrigated acreage of orchards not bearing in 1909, amounting to 7,253 acres, 55.5 per cent was in Chaves County, 12.1 per cent in San Juan County, and 11.7 per cent in Eddy County.

**Yield.**—In the following table the average yields per acre of crops extensively grown, both with and without irrigation, are shown. The yields on unirrigated land are obtained by subtracting the totals for irrigated crops from the totals for the state.

CROP.	AVERAGE YIELD PER ACRE.		
	On unirrigated land.	On irrigated land.	
		Amount.	Per cent of excess over yield on unirrigated land.
Corn.....bushels..	8.7	20.8	139.1
Oats.....bushels..	18.1	24.2	33.7
Wheat.....bushels..	6.6	17.7	168.2
Barley.....bushels..	12.2	24.1	97.5
Alfalfa seed.....bushels..	2.3	2.3	.....
Dry edible beans.....bushels..	3.3	9.6	190.9
Dry peas.....bushels..	9.5	14.2	49.5
Timothy alone.....tons..	1.17	1.68	43.6
Alfalfa.....tons..	0.99	2.65	167.7
Other tame or cultivated grasses.....tons..	0.66	1.17	77.3
Wild, salt, or prairie grasses.....tons..	0.50	1.11	122.0
Grains cut green.....tons..	1.32	1.32	.....
Coarse forage.....tons..	0.49	1.40	185.7
Potatoes.....bushels..	41.5	74.4	79.3

For all the crops given in the table, except alfalfa seed and grains cut green, there were greater average yields in 1909 on irrigated than on unirrigated land. The relative excess is greatest in the case of dry edible beans, and next greatest in the case of coarse forage. Among the cereals the excess of the

average yield under irrigation over that without irrigation ranges from 33.7 to 168.2 per cent. In the average yield of alfalfa seed and of grains cut green no difference appears between the irrigated and unirrigated acreage. Of the five hay and forage crops with a greater average yield on irrigated land than on unirrigated land, coarse forage shows the highest percentage of excess, 185.7.

In considering these comparisons it should be borne in mind that they are not comparisons of yields on

irrigated and on unirrigated land in the same localities, but of yields under irrigation in localities where crops can not be grown to advantage without it with yields in localities where irrigation is not necessary. They do not indicate, therefore, the relative advantages of farming with and without irrigation in a given community, but rather give one factor for determining the relative advantages of farming where irrigation is necessary and where it is not necessary for the successful growing of crops.

#### COUNTY TABLE.

The next table gives in detail, by counties, the data summarized above, except those relating to crops. For purposes of comparison the total number of farms in the state, the approximate land area of the state, the total land in farms, and the improved land in farms have been included in the table. In the last column of the table, under the heading "All other counties," are grouped Curry, Quay, Roosevelt, and Torrance Counties, in which irrigation was so unimportant that it was not considered advisable to give a separate detailed showing for each county.

Certain enterprises extend into more than one county, and in the case of some of these enterprises the reports do not segregate the data by counties. In such cases a distribution has been made according to the best estimates possible from all the information in the possession of the bureau. It is believed that these estimates are approximately correct.

Attention is again directed to the fact that the totals for 1899 shown in this bulletin, with the exception of the figure for number of farms irrigated in the state as a whole, do not cover Indian reservations. Although comparisons between the two censuses are to some extent affected by this omission in the figures for the earlier census, it is not feasible either to attempt to estimate the extent of Indian Service irrigation in 1899 or to eliminate from the 1909 and 1910 totals figures representing irrigation on reservations. The omission

in the earlier figures should be borne in mind in considering the percentages of increase shown in most of the items for the state and for the counties containing Indian reservations.

*Change of boundaries.*—In comparing the data secured in 1910 with those for the preceding census the following changes in county boundaries should be considered:

Luna County was organized from parts of Dona Ana and Grant Counties in 1901; McKinley County was organized from parts of Bernalillo, Rio Arriba, San Juan, and Valencia Counties in 1901; a part of Santa Fe County was annexed to Rio Arriba County in 1902; Quay County was organized from parts of old Guadalupe and Union Counties in 1903; Roosevelt County was organized from parts of Chaves and old Guadalupe Counties in 1903; Sandoval County was organized from part of Bernalillo County in 1903; that part of the old county of Guadalupe remaining after part was taken to form Quay and Roosevelt Counties in 1903, together with parts of Bernalillo and Valencia, was taken to form Leonard Wood County in 1903, its name being changed from Leonard Wood to Guadalupe in 1905; Torrance County was organized from parts of Bernalillo, Lincoln, San Miguel, Santa Fe, Socorro, and Valencia Counties in 1905; and Curry County was organized from parts of Quay and Roosevelt Counties in 1909.

# IRRIGATION—NEW MEXICO.

## ACREAGE IRRIGATED, EXTENT AND COST OF IRRIGATION ENTERPRISES, AND COST OF OPERATION AND MAINTENANCE, BY COUNTIES: 1909 AND 1910.

[Comparative data for 1899 in italics.]

	THE STATE.	Bernalillo. <sup>1</sup>	Chaves. <sup>1</sup>	Colfax.	Dona Ana. <sup>1</sup>	Eddy.	Grant. <sup>1</sup>	Guadalupe.	
1	Number of all farms in 1910.....	35,676	925	2,487	693	851	1,411	627	1,760
2	Number of farms irrigated in 1909.....	12,795	700	733	270	778	605	256	305
3	Per cent of all farms.....	35.9	75.7	29.5	39.0	91.4	42.9	40.8	17.3
4	Number of farms irrigated in 1899.....	<i>9,125</i>	<i>624</i>	<i>185</i>	<i>191</i>	<i>504</i>	<i>84</i>	<i>273</i>	<i>99</i>
5	Per cent of increase, 1899-1909.....	40.2			41.4		620.2		
<b>LAND AND FARM AREA</b>									
6	Approximate land area..... acres.....	78,401,920	776,960	6,021,120	2,430,720	2,445,440	4,430,720	4,753,920	2,551,680
7	Land in farms..... acres.....	11,270,021	112,774	1,049,606	1,375,846	84,635	352,758	170,449	507,650
8	Improved land in farms..... acres.....	1,467,191	22,836	138,703	56,368	33,195	92,094	21,160	46,186
9	Acres irrigated in 1909.....	461,718	14,832	56,064	30,756	32,282	47,141	14,834	4,395
10	Per cent of total land area.....	0.6	1.9	0.9	1.3	1.3	1.1	0.3	0.2
11	Per cent of land in farms.....	4.1	13.2	5.3	2.2	38.1	13.4	8.4	0.9
12	Per cent of improved land in farms.....	31.5	65.0	40.4	54.6	97.1	51.2	70.1	9.6
13	Acres irrigated in 1899.....	<i>203,893</i>	<i>11,003</i>	<i>15,790</i>	<i>15,008</i>	<i>17,248</i>	<i>6,187</i>	<i>10,976</i>	<i>1,855</i>
14	Per cent of increase, 1899-1909.....	126.5			105.0		661.9		
15	Acres enterprises were capable of irrigating in 1910.....	644,970	20,375	64,385	52,391	48,744	74,004	16,668	13,952
16	Acres included in projects.....	1,102,297	25,510	106,948	156,503	77,530	94,680	18,821	20,212
<b>ACREAGE IRRIGATED AND INCLUDED IN PROJECTS</b>									
CLASSIFIED BY CHARACTER OF ENTERPRISE.									
17	U. S. Reclamation Service, irrigated in 1909.....	13,368		1,300			12,098		
18	Enterprises were capable of irrigating in 1910.....	21,467		1,200			20,267		
19	Included in projects.....	30,267		10,000			20,267		
20	U. S. Indian Service, irrigated in 1909.....	24,007	3,620						
21	Enterprises were capable of irrigating in 1910.....	24,743	3,620						
22	Included in projects.....	37,455	3,680						
23	Carey Act enterprises, irrigated in 1909.....								
24	Enterprises were capable of irrigating in 1910.....								
25	Included in projects.....	16,000			16,000				
26	Irrigation districts, irrigated in 1909.....								
27	Enterprises were capable of irrigating in 1910.....								
28	Included in projects.....	16,400							
29	Cooperative enterprises, irrigated in 1909.....	251,011	10,907	8,450	4,143	31,300	6,230	4,075	2,658
30	Enterprises were capable of irrigating in 1910.....	355,327	16,203	8,200	7,733	47,446	14,640	5,236	3,050
31	Included in projects.....	482,054	21,188	9,600	9,893	74,410	14,640	6,145	5,195
32	Commercial enterprises, irrigated in 1909.....	28,190		12,500	11,510		760		1,200
33	Enterprises were capable of irrigating in 1910.....	58,160		13,100	26,660		1,400		10,000
34	Included in projects.....	224,950		31,640	86,000		13,820		20,000
35	Individual and partnership enterprises, irrigated in 1909.....	144,212	305	33,814	15,103	926	28,053	10,759	537
36	Enterprises were capable of irrigating in 1910.....	185,283	492	41,895	17,995	1,208	37,697	11,433	896
37	Included in projects.....	295,171	642	55,708	44,010	3,120	46,053	12,076	1,017
<b>ACREAGE IRRIGATED</b>									
CLASSIFIED BY SOURCE OF WATER SUPPLY.									
38	Supplied from streams.....	398,592	14,696	27,647	29,998	31,790	20,307	14,557	4,065
39	By gravity.....	397,059	14,696	27,362	29,950	31,500	20,103	14,554	4,063
40	By pumping.....	1,533		285	48	290	204	3	2
41	Supplied from lakes.....	802		30			10		120
42	By gravity.....	802		30			10		120
43	By pumping.....								
44	Supplied from wells.....	54,829	136	27,242		442	25,661	114	10
45	Flowing.....	48,877		23,937			24,939		
46	By pumping.....	5,952	136	3,305		442	722	114	10
47	Supplied from springs.....	6,163		1,145	738		1,063	103	200
48	Supplied from reservoirs.....	1,272			20		100		
49	Total acreage supplied by pumping.....	7,485	136	3,590	48	732	926	117	12
<b>IRRIGATION ENTERPRISES</b>									
50	Independent enterprises..... number.....	2,786	34	471	115	37	270	102	18
51	Number in 1899.....	<i>975</i>	<i>75</i>	<i>27</i>	<i>27</i>	<i>14</i>	<i>8</i>	<i>67</i>	<i>15</i>
52	Per cent of increase, 1899-1910.....	185.7			325.9		3,275.0		
53	Main ditches..... number.....	2,101	22	49	166	29	51	75	14
54	Number in 1899.....	<i>975</i>	<i>75</i>	<i>27</i>	<i>27</i>	<i>14</i>	<i>8</i>	<i>67</i>	<i>15</i>
55	Per cent of increase, 1899-1910.....	115.5			514.8		537.5		
56	Length..... miles.....	4,664	120	174	398	139	136	154	60
57	Length in 1899.....	<i>2,532</i>	<i>83</i>	<i>98</i>	<i>130</i>	<i>123</i>	<i>85</i>	<i>168</i>	<i>56</i>
58	Per cent of increase, 1899-1910.....	95.8			208.2		60.0		
59	Capacity..... cubic feet per second.....	29,046	710	801	5,448	2,020	1,203	241	676
60	Laterals..... number.....	1,280	108	08	82	10	54	11	11
61	Length..... miles.....	1,190	112	80	286	31	39	7	17
62	Reservoirs..... number.....	522	19	54	51	4	65	23	7
63	Capacity..... acre-feet.....	454,162	5	40,560	191,320	2	52,008	9	162
64	Flowing wells..... number.....	673		404			267		
65	Capacity..... gallons per minute.....	669,268		428,640			240,549		
66	Pumped wells..... number.....	406	12	130		19	25	30	5
67	Capacity..... gallons per minute.....	190,690	3,980	50,315		7,938	8,450	10,652	89
68	Pumping plants..... number.....	413	12	131	4	22	27	31	6
69	Engine capacity..... horsepower.....	14,228	105	10,445	50	304	219	110	71
70	Pump capacity..... gallons per minute.....	216,355	3,980	58,648	1,890	13,638	9,144	11,002	4,289
<b>COST</b>									
71	Cost of enterprises up to July 1, 1910..... dollars.....	9,154,897	130,450	1,757,561	1,633,408	165,505	1,607,244	72,242	191,287
72	Cost in 1899..... dollars.....	<i>4,165,312</i>	<i>336,200</i>	<i>250,334</i>	<i>297,393</i>	<i>67,600</i>	<i>2,265,600</i>	<i>154,073</i>	<i>22,251</i>
73	Per cent of increase, 1899-1910.....	119.8			466.1		29.1		
74	Average cost per acre enterprises were capable of irrigating in 1910..... dollars.....	14.19	6.40	27.30	32.13	3.40	21.72	4.33	13.71
75	Average cost per acre irrigated in 1899..... dollars.....	<i>20.43</i>	<i>30.77</i>	<i>18.51</i>	<i>19.85</i>	<i>3.96</i>	<i>368.87</i>	<i>14.11</i>	<i>12.00</i>
76	Estimated final cost of existing enterprises..... dollars.....	11,640,091	130,450	1,953,424	2,512,336	165,505	1,686,990	72,242	226,787
77	Average per acre included in projects..... dollars.....	10.56	5.11	18.27	16.05	2.13	17.81	3.84	8.66
<b>OPERATION AND MAINTENANCE</b>									
78	Acres for which cost is reported.....	278,439	10,907	18,450	8,220	31,306	18,328	4,075	3,858
79	Total cost reported..... dollars.....	377,972	22,042	11,443	11,952	43,815	47,028	4,254	19,294
80	Average per acre for which cost is reported..... dollars.....	1.36	2.02	0.62	1.45	1.38	2.57	1.04	5.00
81	Average cost per acre in 1899..... dollars.....	<i>0.82</i>							
82	Per cent of increase, 1899-1909.....	64.6							

<sup>1</sup> Change in boundary. (See explanation at close of text.)  
<sup>2</sup> Includes 1,244 farms on Indian reservations, which were not reported by counties.  
<sup>3</sup> Figures relate only to systems obtaining water from streams.  
<sup>4</sup> State total includes \$41,241 for Indian reservations, which was not reported by counties.

<sup>5</sup> Total cost shown for state includes \$24,993, representing the cost of systems supplied by wells. County figures relate only to systems obtaining water from streams.  
<sup>6</sup> Decrease.  
<sup>7</sup> Not reported by counties. Figure for state relates only to systems obtaining water from streams.

## IRRIGATION—NEW MEXICO.

## ACREAGE IRRIGATED, EXTENT AND COST OF IRRIGATION ENTERPRISES,

[Comparative data for 1899 in italics.]

	Lincoln. <sup>1</sup>	Tuna.	McKinley.	Mora.	Otero.	Rio Arriba. <sup>2</sup>	San Juan. <sup>1</sup>	San Miguel. <sup>1</sup>
1 Number of all farms in 1910.....	641	340	574	1,988	795	1,542	924	1,408
2 Number of farms irrigated in 1909.....	239	116	172	620	241	1,487	706	594
3 Per cent of all farms.....	37.3	34.1	30.0	31.2	34.2	96.4	76.4	40.5
4 Number of farms irrigated in 1899.....	195	( <sup>1</sup> )	( <sup>1</sup> )	783	119	815	469	907
5 Per cent of increase, 1899-1909.....				20.8	102.5			
<b>LAND AND FARM AREA</b>								
6 Approximate land area.....acres.	3,058,560	1,904,640	3,523,840	1,645,440	4,280,900	3,757,440	3,504,640	3,070,720
7 Land in farms.....acres.	157,715	96,402	50,085	601,515	147,734	223,870	100,289	1,044,726
8 Improved land in farms.....acres.	15,942	11,958	5,215	66,703	16,064	25,550	26,356	51,141
9 Acreage irrigated in 1909.....	7,355	5,347	2,564	19,083	6,378	45,673	29,520	14,318
10 Per cent of total land area.....	0.2	0.3	0.1	1.2	0.1	1.2	0.8	0.5
11 Per cent of land in farms.....	4.7	5.5	4.5	3.2	4.3	20.4	29.4	1.4
12 Per cent of improved land in farms.....	46.1	44.7	49.2	28.6	38.3	178.8	112.0	28.0
13 Acreage irrigated in 1899.....	4,038	( <sup>1</sup> )	( <sup>1</sup> )	26,630	2,150	16,812	14,734	15,857
14 Per cent of increase, 1899-1909.....				199.4				
15 Acreage enterprises were capable of irrigating in 1910.....	7,907	9,763	4,200	28,137	3,359	51,635	52,656	16,602
16 Acreage included in projects.....	9,678	15,291	10,200	32,668	12,173	67,384	77,169	52,417
<b>ACREAGE IRRIGATED AND INCLUDED IN PROJECTS</b>								
CLASSIFIED BY CHARACTER OF ENTERPRISE.								
17 U. S. Reclamation Service, irrigated in 1909.....								
18 Enterprises were capable of irrigating in 1910.....								
19 Included in projects.....								
20 U. S. Indian Service, irrigated in 1909.....			1,054		350	1,836	2,275	
21 Enterprises were capable of irrigating in 1910.....			1,200		350	2,206	2,505	
22 Included in projects.....			7,200		350	2,358	6,005	
23 Carey Act enterprises, irrigated in 1909.....								
24 Enterprises were capable of irrigating in 1910.....								
25 Included in projects.....								
26 Irrigation districts, irrigated in 1909.....								
27 Enterprises were capable of irrigating in 1910.....								10,400
28 Included in projects.....								11,277
29 Cooperative enterprises, irrigated in 1909.....	2,520	2,000	1,500	11,891	1,894	33,987	24,271	10,947
30 Enterprises were capable of irrigating in 1910.....	2,770	4,000	3,000	20,342	1,894	36,394	45,479	10,947
31 Included in projects.....	2,895	4,430	3,000	22,212	2,094	47,696	53,856	16,892
32 Commercial enterprises, irrigated in 1909.....					900			2,000
33 Enterprises were capable of irrigating in 1910.....					2,700			15,000
34 Included in projects.....					3,700		7,500	3,041
35 Individual and partnership enterprises, irrigated in 1909.....	4,835	3,347		7,192	3,234	9,850	2,974	3,041
36 Enterprises were capable of irrigating in 1910.....	5,237	5,733		7,795	3,415	13,035	4,672	3,855
37 Included in projects.....	6,783	10,311		10,456	6,029	17,330	6,808	4,125
<b>ACREAGE IRRIGATED</b>								
CLASSIFIED BY SOURCE OF WATER SUPPLY.								
38 Supplied from streams.....	6,887	4,441	2,564	19,061	6,029	44,445	29,445	14,203
39 By gravity.....	6,887	4,441	2,564	19,061	6,029	43,835	29,438	14,203
40 By pumping.....						610	7	
41 Supplied from lakes.....						702		
42 By gravity.....						702		
43 By pumping.....								
44 Supplied from wells.....	35	906		3	32			76
45 Flowing.....								
46 By pumping.....	35	906		3	32			76
47 Supplied from springs.....	433			19	317	490		34
48 Supplied from reservoirs.....						36	75	5
49 Total acreage supplied by pumping.....	35	906		3	32	610	7	76
<b>IRRIGATION ENTERPRISES</b>								
50 Independent enterprises.....number.....	121	101	3	116	99	333	91	152
51 Cost in 1899.....dollars.....	41	( <sup>1</sup> )	( <sup>1</sup> )	58	43	170	55	53
52 Per cent of increase, 1899-1910.....				100.0	130.2			
53 Main ditches.....number.....	117	38	4	117	89	342	88	153
54 Cost in 1899.....dollars.....	41	( <sup>1</sup> )	( <sup>1</sup> )	58	43	170	55	53
55 Per cent of increase, 1899-1910.....				101.7	107.0			
56 Length.....miles.....	161	43	22	254	145	574	383	264
57 Length in 1899.....miles.....	32	( <sup>1</sup> )	( <sup>1</sup> )	131	40	198	211	156
58 Per cent of increase, 1899-1910.....				40.3	262.5			
59 Capacity.....cubic feet per second.....	440	2,141	135	1,344	454	2,195	2,543	2,378
60 Laterals.....number.....	11	16	11	39	56	83	22	43
61 Length.....miles.....	3	9	10	25	25	64	45	64
62 Reservoirs.....number.....	21	34	19	12	30	12	6	32
63 Capacity.....acre-feet.....	21	158	20,547	3,166	88	1,444	4,820	72,435
64 Flowing wells.....number.....		1						
65 Capacity.....gallons per minute.....		75						
66 Pumped wells.....number.....	14	94		3	18			2
67 Capacity.....gallons per minute.....	240	32,078		28	3,805			513
68 Pumping plants.....number.....	14	94		3	15	2		2
69 Engine capacity.....horsepower.....	27	1,034		3	102	4	10	25
70 Pump capacity.....gallons per minute.....	240	32,078		28	3,805	3,069	655	518
<b>COST</b>								
71 Cost of enterprises up to July 1, 1910.....dollars.....	39,645	110,264	364,250	133,604	182,211	244,156	789,927	300,708
72 Cost in 1899.....dollars.....	14,948	( <sup>1</sup> )	( <sup>1</sup> )	35,605	13,617	49,400	265,000	51,390
73 Per cent of increase, 1899-1910.....				56.1	1,288.1			
74 Average cost per acre enterprises were capable of irrigating in 1910.....dollars.....	5.01	11.29	88.73	4.75	21.50	4.73	15.00	17.79
75 Average cost per acre irrigated in 1899.....dollars.....	3.73	( <sup>1</sup> )	( <sup>1</sup> )	3.33	6.45	3.13	17.99	3.23
76 Estimated final cost of existing enterprises.....dollars.....	39,645	110,264	364,250	133,604	182,211	244,156	800,147	1,189,708
77 Average per acre included in projects.....dollars.....	4.10	7.21	50.51	4.09	14.97	3.62	10.37	22.70
<b>OPERATION AND MAINTENANCE</b>								
78 Acreage for which cost is reported.....	2,520	2,000	1,500	11,891	2,594	33,909	23,240	11,177
79 Total cost reported.....dollars.....	3,297	1,820	350	4,691	3,780	29,578	23,971	11,662
80 Average per acre for which cost is reported.....dollars.....	1.30	0.91	0.23	0.39	1.40	0.87	1.03	1.04
81 Average cost per acre in 1899.....dollars.....								
82 Per cent of increase, 1899-1909.....								

<sup>1</sup> Change in boundary. (See explanation at close of text.)

<sup>2</sup> Decrease.

<sup>3</sup> Less than one-tenth of 1 per cent.

<sup>4</sup> Irrigated acreage includes wild grass and pastures, while improved land does not.

<sup>5</sup> Figures relate only to systems obtaining water from streams.

# IRRIGATION—NEW MEXICO.

AND COST OF OPERATION AND MAINTENANCE, BY COUNTIES: 1909 AND 1910—Continued.

[Comparative data for 1899 in italics.]

	Sandoval.	Santa Fe. <sup>1</sup>	Sierra.	Socorro. <sup>1</sup>	Taos.	Union. <sup>1</sup>	Valencia. <sup>1</sup>	All other counties.
1 Number of all farms in 1910.....	1,237	1,297	363	1,122	986	1,023	1,292	10,520
2 Number of farms irrigated in 1909.....	1,038	844	209	710	949	94	1,093	36
3 Per cent of all farms.....	83.0	65.1	57.6	63.3	96.2	4.0	84.6	0.3
4 <i>Number of farms irrigated in 1899.....</i>	( <sup>1</sup> )	<i>694</i>	<i>84</i>	<i>707</i>	<i>564</i>	<i>95</i>	<i>412</i>	
5 Per cent of increase, 1899-1909.....			148.8		68.3			
<b>LAND AND FARM AREA</b>								
6 Approximate land area..... acres	2,477,440	1,262,720	1,995,520	9,644,800	1,441,280	3,456,800	3,621,760	6,364,800
7 Land in farms..... acres	349,299	236,279	507,636	626,670	95,540	814,011	208,385	2,343,647
8 Improved land in farms..... acres	39,700	32,741	4,220	23,309	21,038	72,630	20,088	623,384
9 Acreage irrigated in 1909.....	18,259	16,180	3,637	14,289	41,486	6,315	30,302	788
10 Per cent of total land area.....	0.7	1.3	0.2	0.1	2.9	0.2	0.8	
11 Per cent of land in farms.....	5.2	6.8	0.7	2.3	43.4	0.8	14.6	( <sup>2</sup> )
12 Per cent of improved land in farms.....	46.0	49.4	86.2	61.3	197.2	8.7	150.8	0.1
13 <i>Acreage irrigated in 1899.....</i>	( <sup>1</sup> )	<i>8,249</i>	<i>2,648</i>	<i>10,567</i>	<i>11,853</i>	<i>6,479</i>	<i>6,641</i>	
14 Per cent of increase, 1899-1909.....			37.3		250.0			
15 Acreage enterprises were capable of irrigating in 1910.....	21,791	16,707	5,959	22,532	44,395	8,706	51,045	2,794
16 Acreage included in projects.....	37,136	51,758	10,426	41,760	60,426	30,107	74,814	12,686
<b>ACREAGE IRRIGATED AND INCLUDED IN PROJECTS</b>								
CLASSIFIED BY CHARACTER OF ENTERPRISE.								
17 U. S. Reclamation Service, irrigated in 1909.....								
18 Enterprises were capable of irrigating in 1910.....								
19 Included in projects.....								
20 U. S. Indian Service, irrigated in 1909.....	8,500	2,110			2,636		1,616	
21 Enterprises were capable of irrigating in 1910.....	8,500	2,110			2,636		1,616	
22 Included in projects.....	8,500	2,110			2,636		1,616	
23 Carey Act enterprises, irrigated in 1909.....								
24 Enterprises were capable of irrigating in 1910.....								
25 Included in projects.....								
26 Irrigation districts, irrigated in 1909.....								
27 Enterprises were capable of irrigating in 1910.....								
28 Included in projects.....								
29 Cooperative enterprises, irrigated in 1909.....	8,072	13,083	2,640	11,263	33,046	1,600	25,088	
30 Enterprises were capable of irrigating in 1910.....	10,607	13,342	4,690	18,732	35,456	1,600	41,521	2,000
31 Included in projects.....	17,583	16,707	8,695	36,991	40,596	2,080	35,206	10,000
32 Commercial enterprises, irrigated in 1909.....		90			1,000		280	
33 Enterprises were capable of irrigating in 1910.....		90			1,000	1,200		
34 Included in projects.....	5,000	31,090			10,000	1,200		
35 Individual and partnership enterprises, irrigated in 1909.....	1,687	897	997	3,025	4,804	4,485	3,588	758
36 Enterprises were capable of irrigating in 1910.....	2,084	1,105	1,269	3,800	5,323	5,968	8,811	794
37 Included in projects.....	6,053	1,851	1,731	4,769	7,194	20,827	17,992	2,686
<b>ACREAGE IRRIGATED</b>								
CLASSIFIED BY SOURCE OF WATER SUPPLY.								
38 Supplied from streams.....	18,259	15,810	2,958	14,092	41,103	6,248	29,935	52
39 By gravity.....	18,259	15,740	2,958	14,073	41,103	6,248	29,935	52
40 By pumping.....		70		14				
41 Supplied from lakes.....								
42 By gravity.....								
43 By pumping.....								
44 Supplied from wells.....		23	8	8		27	2	104
45 Flowing.....						1		
46 By pumping.....		23	8	8		26	2	104
47 Supplied from springs.....		182	671	189	143	10	365	1
48 Supplied from reservoirs.....		165			240	30		601
49 Total acreage supplied by pumping.....		93	8	22		26	2	104
<b>IRRIGATION ENTERPRISES</b>								
50 Independent enterprises..... number.....	92	122	63	99	205	43	62	32
51 <i>Number in 1899<sup>6</sup>.....</i>	( <sup>1</sup> )	<i>93</i>	<i>31</i>	<i>53</i>	<i>69</i>	<i>32</i>	<i>44</i>	
52 Per cent of increase, 1899-1910.....			103.2		197.1			
53 Main ditches..... number.....	100	141	57	89	238	48	64	10
54 <i>Number in 1899<sup>6</sup>.....</i>	( <sup>1</sup> )	<i>89</i>	<i>31</i>	<i>53</i>	<i>69</i>	<i>32</i>	<i>44</i>	
55 Per cent of increase, 1899-1910.....			83.9		244.9			
56 Length..... miles.....	299	229	84	242	343	95	334	11
57 <i>Length in 1899<sup>6</sup>.....</i>	( <sup>1</sup> )	<i>107</i>	<i>69</i>	<i>160</i>	<i>108</i>	<i>76</i>	<i>126</i>	
58 Per cent of increase, 1899-1910.....			21.7		217.6			
59 Capacity..... cubic feet per second.....	842	853	149	991	1,513	452	2,105	12
60 Laterals..... number.....	59	42	6	69	100	114	265	
61 Length..... miles.....	29	28	6	63	105	31	111	
62 Reservoirs..... number.....	22	41	9	12	11	25	8	14
63 Capacity..... acre-feet.....	241	75,451	104	24	327	1,324	14	32
64 Flowing wells..... number.....						1		
65 Capacity..... gallons per minute.....						4		
66 Pumped wells..... number.....		8	4	3		2	2	95
67 Capacity..... gallons per minute.....		1,026	140	208		609	50	70,564
68 Pumping plants..... number.....		10	4	4		2	1	27
69 Engine capacity..... horsepower.....		107	10	10		8	2	1,543
70 Pump capacity..... gallons per minute.....		1,710	140	258		609	50	70,564
<b>COST</b>								
71 Cost of enterprises up to July 1, 1910..... dollars.....	138,371	123,834	19,089	187,682	190,040	70,925	254,063	356,284
72 <i>Cost in 1899<sup>6</sup>.....</i>	( <sup>1</sup> )	<i>46,453</i>	<i>21,850</i>	<i>43,492</i>	<i>81,000</i>	<i>29,036</i>	<i>100,120</i>	
73 Per cent of increase, 1899-1910.....			12.6		809.2			
74 Average cost per acre enterprises were capable of irrigating in 1910..... dollars.....	6.35	7.41	3.20	8.33	4.30	8.09	4.89	127.52
75 <i>Average cost per acre irrigated in 1899<sup>6</sup>.....</i>	( <sup>1</sup> )	<i>5.63</i>	<i>8.25</i>	<i>4.69</i>	<i>1.77</i>	<i>4.48</i>	<i>14.42</i>	
76 Estimated final cost of existing enterprises..... dollars.....	138,371	347,056	19,089	301,582	190,940	70,981	254,063	356,284
77 Average per acre included in projects..... dollars.....	3.73	6.71	1.83	7.22	3.16	2.36	3.40	28.08
<b>OPERATION AND MAINTENANCE</b>								
78 Acreage for which cost is reported.....	8,072	13,083	2,640	11,263	33,046	1,830	24,530	
79 Total cost reported..... dollars.....	20,949	8,988	6,529	31,277	14,108	550	57,124	
80 Average per acre for which cost is reported..... dollars.....	26.0	0.69	2.47	2.78	0.43	0.30	2.33	
81 <i>Average cost per acre in 1899<sup>7</sup>.....</i>								
82 Per cent of increase 1899-1909.....								

<sup>6</sup> County figures are exclusive of statistics for Indian reservations.

<sup>7</sup> Not reported by counties.

## IRRIGATION : OREGON

FARMS AND ACREAGE IRRIGATED, IRRIGATION WORKS, COST OF CONSTRUCTION, COST OF OPERATION AND MAINTENANCE,  
AND CROPS IRRIGATED

Prepared under the supervision of LE GRAND POWERS, Chief Statistician for Agriculture, by R. P. TEELE, Special Agent in Charge of Irrigation

## INTRODUCTION.

This bulletin presents the larger part of the statistics of irrigation for Oregon obtained in connection with the Thirteenth Census. These data, with additional information, will be embodied in a special report of the Census of Irrigation and in the final reports of the Thirteenth Census. The statistics of the number of farms and acreage irrigated, cost of operation and maintenance, and irrigated crops are for the calendar year 1909; those of irrigation works, cost of enterprises, acreage enterprises were capable of irrigating in 1910, and acreage included in projects are of the date July 1, 1910.

These statistics have been collected under the law of February 25, 1910, which contained the following clause relating to irrigation:

Inquiries shall also be made as to the location and character of irrigation enterprises, quantity of land irrigated in the arid region of the United States and in each state and county in that section under state and Federal laws; the price at which these lands, including water rights, are obtainable; the character and value of crops produced on irrigated lands, the amount of water used per acre for said irrigation and whether it was obtainable from national, state, or private works; the location of the various projects and methods of construction, with facts as to their physical condition; the amount of capital invested in such irrigation works.

The information called for by this law which could be supplied by farm operators was obtained on supplemental schedules by the regular census enumerators as a part of the agricultural census. The remaining data, which were supplied by the owners or officials of irrigation enterprises, were obtained on special schedules by special agents. The data relating to number of farms irrigated and irrigated crops are taken from the supplemental schedules, while all data relating to acreage irrigated and to irrigation works and their construction and operation are taken from the special schedules.

In accordance with the law, the data collected have been classified primarily by the state and Federal laws by virtue of which the land was brought under irrigation. The results are presented in detail at the end of this bulletin and summarized in text tables.

Such of the terms used as are not self-explanatory are defined below.

**Farms irrigated.**—The number of "farms irrigated" is the number of farms on which irrigation is practiced and is equivalent to the term "number of irrigators" used in previous census reports.

**Types of enterprise.**—The types of enterprise under which the lands irrigated in 1909 are classified are as follows:

*United States Reclamation Service enterprises*, which operate under the Federal law of June 17, 1902, providing for the construction of irrigation works with the receipts from the sale of public lands.

*United States Indian Service enterprises*, which operate under various acts of Congress providing for the construction by that service of works for the irrigation of land in Indian reservations.

*Carey Act enterprises*, which operate under the Federal law of August 18, 1894, granting to each of the states in the arid region 1,000,000 acres of land on condition that the state provide for its irrigation, and under amendments to that law granting additional areas to Idaho and Wyoming.

*Irrigation districts*, which are public corporations that operate under state laws providing for their organization and management, and empowering them to issue bonds and levy and collect taxes with the object of obtaining funds for the purchase or construction, and for the operation and maintenance of irrigation works.

*Cooperative enterprises*, which are controlled by the water users under some organized form of cooperation. The most common form of organization is the stock company, the stock of which is owned by the water users.

*Commercial enterprises*, which supply water for compensation to parties who own no interest in the works. Persons obtaining water from such enterprises are usually required to pay for the right to receive water, and to pay, in addition, annual charges based in some instances on the acreage irrigated and in others on the quantity of water received.

*Individual and partnership enterprises*, which belong to individual farmers or to neighboring farmers, who control them without formal organization. It is not always possible to distinguish between partnership and cooperative enterprises, but as the difference is slight this is unimportant.

**Source of water supply.**—Of the terms used in the classification according to source of water supply, none requires explanation except "reservoirs." The only reservoirs which are treated as independent sources of supply are those filled by collecting storm water or from watercourses that are ordinarily dry. When reservoirs are filled from streams or wells, the primary source is considered the source of supply.

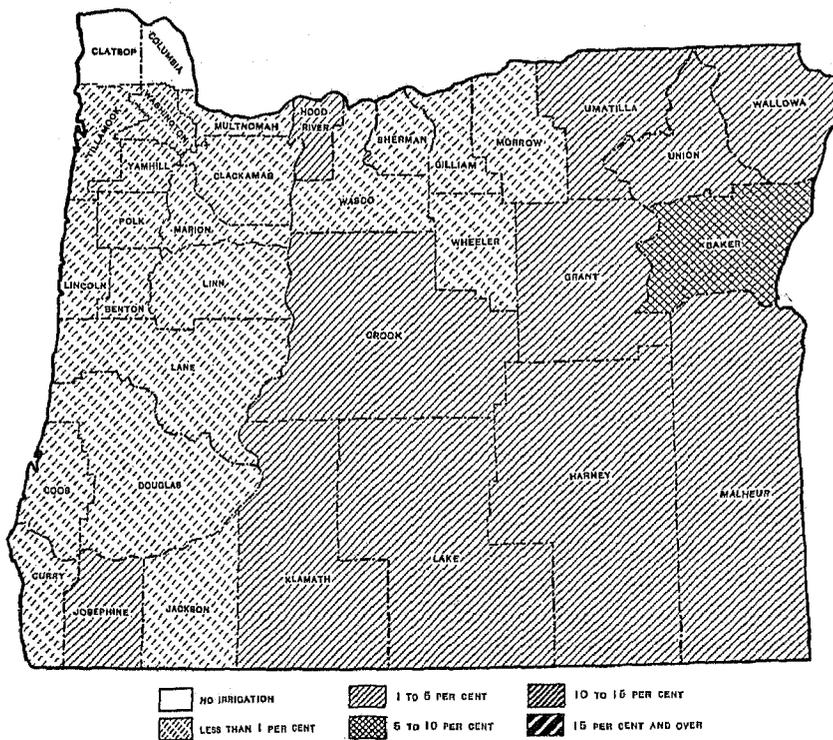
**Acre-foot.**—The "acre-foot," used to express the capacity of reservoirs, is the volume of water required to cover 1 acre to a depth of 1 foot, or 43,560 cubic feet.

**Cost.**—The cost of irrigation enterprises is that given by the owners. For the larger works the cost given is taken, in most cases, from the books of account and represents the actual cost. In the case of most of the private and partnership and many of the cooperative enterprises, however, the works were built by their owners without records of money or labor expended, and the cost given represents the owners' estimates. The cost reported for 1910 includes the cost of construction and of acquiring rights. The latter usually consists of filing fees only. In some instances it includes the purchase price of rights, but these cases are so rare that they are unimportant. The cost reported for 1899 is designated "cost of construction," but probably includes the cost of acquiring rights, as in 1910. The average cost per acre is based on the acreage enterprises were capable of irrigating in 1910 and the cost to July 1, 1910.

PER CENT OF TOTAL LAND AREA IRRIGATED, AND PER CENT OF NUMBER OF FARMS IRRIGATED,  
IN OREGON, BY COUNTIES: 1909.

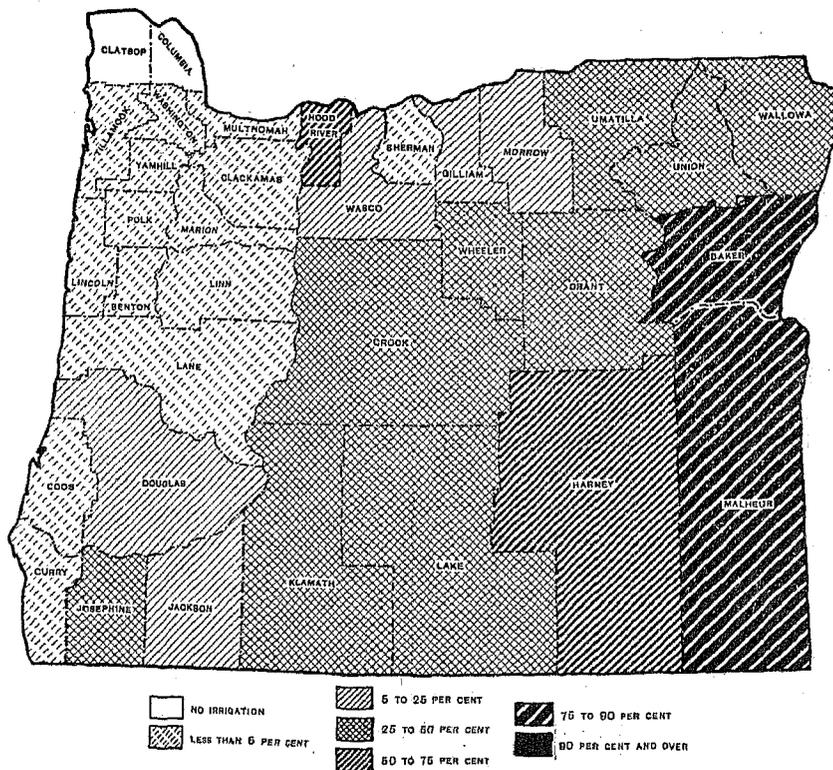
PER CENT OF TOTAL LAND AREA IRRIGATED.

[Per cent for the state, 1.1.]



PER CENT OF NUMBER OF FARMS IRRIGATED.

[Per cent for the state, 14.7.]



FARMS AND ACREAGE IRRIGATED.

The Cascade Mountain range, which parallels the coast line and extends across the state about 125 miles inland, divides Oregon into two parts, which differ widely in climatic characteristics. The western third of the state, lying between these mountains and the coast is, except in the extreme southern part, generally humid, with an average annual precipitation which is ample in most sections for the maturing of crops without irrigation. The regions east of the mountains, however, are arid or semiarid, and it is in this section of the state that irrigation is most widely practiced. Irrigation was reported in 1909 from all counties in the state except two, but of the total acreage supplied with water in that year about 96 per cent lies

east of the mountains. The location of irrigated lands is indicated in a general way by the accompanying maps, which show the class in which each county falls with reference to the percentage which irrigated land forms of the total land area and the percentage which irrigated farms represent of all farms.

The following table shows for the state as a whole the number of farms and acreage irrigated in 1909 in comparison with the total number of farms, the total land area, the total land in farms, and the total acreage of improved land in farms in 1910, together with the areas not yet irrigated for which water has been or is being made available. Comparative figures for 1900 are included as far as possible.

	CENSUS OF—		INCREASE.	
	1910	1900	Amount.	Per cent.
Number of all farms.....	<sup>1</sup> 45,502	<sup>2</sup> 35,837	9,665	27.0
Approximate land area of the state.....acres..	61,188,480	61,188,480		
Land in farms.....acres..	<sup>1</sup> 11,685,110	<sup>2</sup> 10,071,328	1,613,782	16.0
Improved land in farms.....acres..	<sup>1</sup> 4,274,803	<sup>2</sup> 3,328,308	946,495	28.4
Number of farms irrigated.....	<sup>3</sup> 6,669	<sup>4</sup> 4,636	2,033	43.9
Acreage irrigated.....	<sup>3</sup> 686,129	<sup>4</sup> 388,310	297,819	76.7
Acreage enterprises were capable of irrigating.....	<sup>5</sup> 830,526	( <sup>6</sup> )		
Acreage included in projects.....	<sup>5</sup> 2,527,208	( <sup>6</sup> )		
Percentage irrigated of—				
Number of all farms.....	14.7	12.9	1.8	
Approximate land area of the state.....	1.1	0.6	0.5	
Land in farms.....	5.9	3.9	2.0	
Improved land in farms.....	16.1	11.7	4.4	
Excess of acreage enterprises were capable of irrigating in 1910 over acreage irrigated in 1909.....	144,397			
Excess of acreage included in projects over acreage irrigated in 1909.....	1,841,079			

<sup>1</sup> April 15.

<sup>2</sup> June 1.

<sup>3</sup> In 1909.

<sup>4</sup> In 1899.

<sup>5</sup> July 1.

<sup>6</sup> Not reported.

**Number of farms irrigated.**—The number of farms irrigated is made up of the number reported on the supplemental schedules by the regular enumerators, together with an estimate of the number of farms covered by enterprises which were reported by special agents but not by the regular enumerators. This estimate was based upon the average acreage irrigated per farm as shown by the supplemental schedules. According to the figures presented in the table, irrigation was practiced on about one-seventh (14.7 per cent) of the farms in the state in 1909. In 1899 the proportion of irrigated farms was 12.9 per cent, while in 1889 the proportion was 12.3 per cent. It is evident that between 1889 and 1899 the number of irrigated farms in the state increased at about the same rate as the number of unirrigated farms. During the later decade, however, the rate of increase in the number of irrigated farms was almost twice as great as that in the number of unirrigated farms.

Of the 34 counties in the state, only 4 report more than half their farms as irrigated; in 4 the proportion is between 40 and 50 per cent and in 2 it is between 30 and 40 per cent. In only 6 out of the remaining 24 counties are as many as 10 per cent of the farms irri-

gated. In 16 counties less than 10 per cent of the farms are irrigated, while from 2 no irrigation at all is reported. The 18 counties last mentioned are all in the western part of the state, whereas the counties which have a large proportion of their farms irrigated are in the eastern part. In Baker County the irrigated farms form 80.6 per cent of the whole number of farms, and in Malheur and Hood River Counties, 77.7 and 62.4 per cent, respectively.

From 1899 to 1909 the increase in the number of farms irrigated was 43.9 per cent for the state as a whole. This percentage was exceeded in 7 counties in which no change of boundaries took place during the decade, and in the territory which comprised Wasco County in 1899 and Wasco and Hood River Counties in 1909. This high rate of increase was confined almost entirely to the counties east of the mountains, which together show an increase of 46.1 per cent. Although the counties west of the Cascades together show an increase of 32.8 per cent, the extension of irrigation in this section was confined almost entirely to Douglas, Jackson, and Josephine Counties. In the counties west of the Cascades which in the table at the end of this bulletin are included under the head of

## IRRIGATION—OREGON.

"all other counties" the total number of irrigated farms fell off 51.5 per cent. In Crook County the number of such farms increased 157.5 per cent, in Umatilla County 108.2 per cent, in Klamath County 106.2 per cent, in Morrow County 88.2 per cent, and in Josephine County 70.6 per cent. The greatest absolute increase for a single county was reported for Umatilla County, 356 farms. The territory comprising Baker and Union Counties showed an increase of 395 farms.

**Acreage irrigated.**—The acreage irrigated is taken from special schedules filled out by agents from information obtained from owners or officials of irrigation enterprises and, in some instances, from public records. The acreage thus obtained is considerably larger than the irrigated acreage reported on the supplemental schedules filled out by the farm enumerators. This difference is due in a measure to the fact that the special agents found enterprises which were not reported on any schedules returned by the enumerators, indicating that the acreage reported on the supplemental schedules is to some extent under the true figure. There is, however, a natural tendency for the officials of enterprises to report as irrigated the entire area of farms of which only a part was irrigated. Furthermore, some farms are so situated as to receive water from more than one enterprise, and may be reported as irrigated by each, which results in duplication. Owing to the two causes last enumerated, it is probable that the acreage irrigated as shown in this bulletin is somewhat excessive, but the extent of this excess can not be determined. It is believed, however, to be less than 10 per cent for the state of Oregon.

The total acreage reported as irrigated in 1909 was 686,129 acres, as against 388,310 acres in 1899 and 177,944 acres in 1889. The percentage of increase from 1889 to 1899 was 118.2 and that from 1899 to 1909, 76.7. The absolute increase during the later decade was, however, 297,819 acres, while that during the earlier decade was only 210,366 acres.

The percentage of increase between 1899 and 1909 in the acreage irrigated was considerably higher than the percentage of increase in the number of farms irrigated. This indicates that there was an increase in the acreage irrigated per farm, the average being 102.9 acres in 1909, as compared with 83.8 acres in 1899. As a decrease from 281 acres to 256.8 acres in the average size of the farms of the state was reported for the same period, it is probable that farmers are irrigating larger parts of their holdings than formerly. It is not possible, however, to determine how far this is actually the case, as the higher average size shown for 1900 was due to a considerable extent to the inclusion of the entire acreage of an Indian reservation in Crook County that was not included in the returns for 1910. The percentage which the irrigated area represented of the total improved farm acreage was 11.7 per cent in 1899, while in 1909 it was 16.1 per cent.

The percentage of the total land area of the state irrigated in 1909 was 1.1, compared with 0.6 per cent in 1899 and 0.3 per cent in 1889.

The county for which the largest area of irrigated land was reported in 1909 was Baker, with an irrigated acreage of 129,673. Harney County, which in 1899 ranked first in area of irrigated land, was second in 1909, with 129,135 acres. In three other counties the area of irrigated land in 1909 exceeded 50,000 acres, while five counties contained irrigated areas of between 30,000 and 50,000 acres.

The county in which irrigated land formed the highest percentage of the total area was Baker, where 6.6 per cent of the land area was irrigated. In only 4 other counties—Harney, Hood River, Union, and Willowa—was the proportion as high as 2 per cent.

**Acreage included in projects.**—The preceding table shows that in 1910 existing enterprises were ready to supply water to 144,397 acres more than were irrigated in 1909. The acreage included in projects exceeds the acreage irrigated in 1909 by 1,841,079 acres, which is more than six times the acreage brought under irrigation in the last decade and nearly three times the total area irrigated in 1909. This acreage represents the area which will be available for the extension of irrigation in the next few years upon the completion of the projects now under construction. It indicates in a general way the area available for settlement, although much of this unirrigated land is in farms already settled.

**Acreage irrigated, classified by character of enterprise.**—The following table gives the distribution of the acreage irrigated in 1909 according to the character of the enterprise controlling the irrigation works. In Klamath County an area of 10,000 acres formerly irrigated by various enterprises has been taken over by the United States Reclamation Service and is here credited to that service.

CHARACTER OF ENTERPRISE.	ACREAGE IRRIGATED IN 1909.	
	Amount.	Per cent distribution.
All classes.....	686,129	100.0
U. S. Reclamation Service.....	22,000	3.2
U. S. Indian Service.....	429	0.1
Carey Act enterprises.....	24,750	3.6
Irrigation districts.....	1,500	0.2
Cooperative enterprises.....	149,985	21.9
Commercial enterprises.....	77,387	11.3
Individual and partnership enterprises.....	410,078	59.8

Irrigation districts, cooperative enterprises, and individual and partnership enterprises are all controlled by the water users. These supply about 82 per cent of the acreage irrigated, while United States Reclamation Service and Carey Act enterprises, which are to be turned over to the water users, supply about 7 per cent. Thus only a small percentage of the land irrigated is supplied by works which are not either

controlled by the water users or to be turned over to them ultimately. The cooperative enterprises, which supplied water for 21.9 per cent of the land irrigated in 1909, are principally stock companies, of which the stock is owned by the water users.

**Acreage irrigated, classified by source of water supply.**—The following table shows the distribution of the acreage irrigated in 1909 according to the source of water supply.

From this table it is apparent that up to the present time there has been no extensive development of any

source of water supply other than streams, although lakes and springs supply considerable areas.

SOURCE OF WATER SUPPLY.	ACREAGE IRRIGATED IN 1909.	
	Amount.	Per cent distribution.
All sources.....	686,129	100.0
Streams.....	646,866	94.3
Lakes.....	23,736	3.5
Wells.....	1,460	0.2
Springs.....	10,788	1.6
Reservoirs.....	3,279	0.5

**IRRIGATION WORKS.**

The following table summarizes the data collected relating to works for supplying water for irrigation in 1910 and 1900. As only two of the items reported in 1910 were reported in 1900, there is little opportunity for comparison between the two censuses. The figures shown for the earlier census relate only to those systems which received water from streams in 1899, but the other systems represented in the Twelfth Census report, which obtained water from wells, supplied only 199 acres of the total area reported as irrigated in 1899.

Assuming that the enterprises in operation in 1909 were identical with those reported in 1910, the average acreage irrigated per enterprise in 1909 was 183.2 and the acreage irrigated per mile of main ditch was 123.9. For the enterprises shown for 1900, the average acreage irrigated per enterprise in 1899 was 208.1 and the average per mile of main ditch was 170.

There has been little utilization of underground water for irrigation up to this time. The table shows 51 flowing wells, which irrigated 655 acres, and 92 pumped wells, which irrigated 805 acres. All but 6 of the flowing wells are in Harney and Klamath

Counties, while more than two-thirds of the pumped wells are in Jackson, Josephine, Umatilla, and Union Counties. Klamath County has the largest acreage irrigated by flowing wells—500 acres—while Umatilla has the largest acreage supplied from pumped wells—398 acres. Pumping from wells, lakes, or streams is but little practiced as yet, the total acreage supplied with pumped water being only 5,211 acres in 1909.

IRRIGATION WORKS.	CENSUS OF—		INCREASE.	
	1910	1900 <sup>1</sup>	Amount.	Per cent.
Independent enterprises.....number..	3,745	1,865	1,880	100.8
Ditches, total length.....miles..	7,591	( <sup>2</sup> )	.....	.....
Main ditches.....number..	3,582	( <sup>2</sup> )	.....	.....
Length.....miles..	5,539	2,283	3,256	142.6
Capacity.....cu. ft. per second..	39,636	( <sup>2</sup> )	.....	.....
Lateral ditches.....number..	2,518	( <sup>2</sup> )	.....	.....
Length.....miles..	2,052	( <sup>2</sup> )	.....	.....
Reservoirs.....number..	271	( <sup>2</sup> )	.....	.....
Capacity.....acre-feet..	1,024,266	( <sup>2</sup> )	.....	.....
Flowing wells.....number..	51	( <sup>2</sup> )	.....	.....
Capacity.....gals. per minute..	3,035	( <sup>2</sup> )	.....	.....
Pumped wells.....number..	92	( <sup>2</sup> )	.....	.....
Capacity.....gals. per minute..	20,883	( <sup>2</sup> )	.....	.....
Pumping plants.....number..	229	( <sup>2</sup> )	.....	.....
Engine capacity.....horsepower..	3,095	( <sup>2</sup> )	.....	.....
Pump capacity.....gals. per minute..	118,514	( <sup>2</sup> )	.....	.....

<sup>1</sup> Figures relate only to systems obtaining water from streams. <sup>2</sup> Not reported.

**COST OF CONSTRUCTION, OPERATION, AND MAINTENANCE.**

The table following shows the total cost of irrigation enterprises up to July 1, 1910, including construction of works and acquisition of rights but not operation and maintenance, with the average cost per acre, based on the acreage the enterprises were capable of irrigating in 1910; the estimated final cost of enterprises completed and enterprises now under construction, with the average cost per acre, based on the acreage included in projects; and the total cost and average cost per acre of operation and maintenance in 1909. Data relating to the cost of construction and maintenance of systems operated in 1899 are included for comparison. The figure for average cost per acre of operation and maintenance in 1899 does not cover the cost for systems receiving water from wells, but these are comparatively unimportant, having supplied only 199 acres in that year.

The cost of operation and maintenance is not reported for individual and partnership enterprises, for the reason that farmers whose land is irrigated by such systems generally clean their own ditches

at odd times without keeping any record of the time spent. In the case of the larger enterprises this cost represents a cash outlay by the farmers, while in the case of many of the smaller cooperative enterprises the cost is worked out by the farmers.

	CENSUS OF—		INCREASE.	
	1910	1900	Amount.	Per cent.
Cost of irrigation enterprises.....	<sup>1</sup> \$12,760,214	<sup>2</sup> \$1,843,771	\$10,916,443	592.1
Average per acre.....	<sup>3</sup> \$15.36	<sup>4</sup> \$4.75	( <sup>5</sup> )	.....
Estimated final cost of existing enterprises.....	\$39,216,619	( <sup>6</sup> )	.....	.....
Average per acre included in projects.....	\$15.52	( <sup>6</sup> )	.....	.....
Operation and maintenance:				
Acreage for which cost is reported.....	263,855	( <sup>6</sup> )	.....	.....
Total cost reported.....	<sup>7</sup> \$198,111	( <sup>6</sup> )	.....	.....
Average cost per acre.....	\$0.75	<sup>8</sup> \$0.22	\$0.53	240.0

<sup>1</sup> Reported July 1.  
<sup>2</sup> Cost of construction of systems operated in 1899.  
<sup>3</sup> Based on acreage enterprises were capable of irrigating in 1910.  
<sup>4</sup> Based on acreage irrigated in 1899.  
<sup>5</sup> Figures not comparable. (See explanation in text.)  
<sup>6</sup> Not reported.  
<sup>7</sup> For 1909.  
<sup>8</sup> Exclusive of systems receiving water from wells.

The cost of irrigation systems shows the largest increase of any item included in the census of irrigation, 592.1 per cent, while the average cost per acre also shows a considerable increase. It should be noted that the average cost per acre shown for the census of 1900 is based on the acreage irrigated in 1899, instead of the acreage under ditch, which forms the basis of the average for 1910, the latter acreage not being reported in 1900. If computed on the basis of the acreage irrigated in 1909, the average cost in 1910 would be \$18.60, representing an increase of 291.6 per cent over the corresponding figure for the census of 1900. The year 1899 was near the close of the period of private and cooperative construction, when most of the works were built by the water users themselves with little or no expenditure of money, and near the beginning of the present period of large-scale construction by corporations and the Federal Government. This later construction is not only on a more extensive scale but also more difficult and of a better type. Largely as a result of these influences the average cost per acre of irrigation has greatly increased. The average cost up to July 1, 1910, for Oregon, as shown in the table, is, however, below the general average reported for the entire arid region. In Oregon this cost is slightly exceeded by the average (\$15.52) based on the estimated final cost and the acreage included in projects.

As previously stated, the data relating to irrigated crops are taken from supplemental schedules filled out by the regular census enumerators. Since the special agents found enterprises which the enumerators had not reported, it is evident that the information relating to irrigated crops is incomplete to some extent. It shows, however, the relative importance of the different irrigated crops and is sufficiently complete to afford reliable averages of yields.

The table following shows the acreage, yield, and value of the principal crops reported as grown under

The highest cost of irrigation enterprises up to July 1, 1910, per acre enterprises were capable of irrigating—\$103.74—is reported from the counties grouped under the head of "all other counties" in the table at the end of this bulletin, a group which includes all the counties west of the Cascades, except Douglas, Jackson, Josephine, and Washington. In this section irrigation is an incidental, rather than an essential, feature of agriculture. Among the counties east of the Cascades, the highest average cost was reported by Umatilla County, where the unusual cost is due in a large measure to the heavy expenditures made on works which were nearly complete July 1, 1910, but on that date were ready to supply water to only a part of the land to be irrigated ultimately. The county showing the lowest average cost per acre—\$3.01—was Harney, in which county the acreage existing enterprises were capable of irrigating in 1910 was greater than in any other county.

The acreage for which cost of operation and maintenance in 1909 was reported constitutes 38.5 per cent of the total acreage reported as irrigated in 1909 and 95.6 per cent of the acreage reported as irrigated by other than individual and partnership enterprises. The cost reported can be said, therefore, to represent very fairly the average annual expense for all but individual and partnership enterprises.

#### CROPS.

irrigation in 1909, in comparison with totals for the same crops reported for the entire state. While small quantities of other crops are grown both on irrigated and un-irrigated land, the leading crops of the state, as well as the leading crops grown under irrigation, are represented in the table. In the reports of the agricultural census the acreages of seed crops are not generally given, but since the growing of these crops, especially alfalfa seed, is coming to be an important industry in the irrigated sections of the country, the acreages are presented here.

CROP.	ACREAGE.			YIELD.			VALUE.	
	Total for state.	Irrigated.		Unit.	Total for state.	On irrigated land.	Total for state.	For irrigated land.
		Amount.	Per cent of total.					
<b>Cereals:</b>								
Corn.....	17,280	666	4.0	Bushels.....	451,757	17,921	\$310,430	\$15,187
Oats.....	339,162	20,415	6.0	Bushels.....	10,881,286	896,427	5,037,164	485,870
Wheat.....	769,187	21,059	2.8	Bushels.....	12,456,751	569,942	10,849,036	507,080
Emmer and spelt.....	719	41	5.7	Bushels.....	24,746	1,140	14,972	1,111
Barley.....	108,847	18,395	16.9	Bushels.....	2,377,735	565,074	1,513,310	380,643
Rye.....	12,913	1,458	11.3	Bushels.....	147,024	17,662	132,756	14,463
<b>Other grains and seeds:</b>								
Alfalfa seed.....	2,077	1,389	66.9	Bushels.....	8,096	5,728	68,265	48,231
Clover seed.....	8,770	12	0.1	Bushels.....	18,038	60	118,276	450
Dry peas.....	436	1	0.2	Bushels.....	9,344	20	16,035	72
<b>Hay and forage:</b>								
Timothy alone.....	40,166	16,297	40.6	Tons.....	67,239	31,871	724,091	285,065
Timothy and clover mixed.....	66,652	17,592	26.4	Tons.....	129,278	31,009	1,449,854	286,819
Clover alone.....	47,435	1,549	3.3	Tons.....	83,909	3,337	420,144	41,106
Alfalfa.....	120,427	100,623	83.6	Tons.....	375,445	331,515	3,275,220	2,756,875
Other tame or cultivated grasses <sup>1</sup> .....	62,118	3,442	5.5	Tons.....	107,816	6,329	1,078,210	61,342
Wild, salt, or prairie grasses.....	218,071	138,143	63.3	Tons.....	248,917	157,100	1,684,046	1,056,442
Grains cut green.....	373,708	14,172	3.8	Tons.....	509,030	21,530	5,738,931	228,339
Coarse forage.....	10,462	28	0.3	Tons.....	57,107	60	292,920	738
<b>Sundry crops:</b>								
Potatoes.....	44,265	3,402	7.7	Bushels.....	4,822,962	413,167	2,068,648	243,019
Sugar beets.....	2,781	582	74.5	Tons.....	6,513	4,948	2,31,223	29,626
Orchard fruits and grapes.....	(9)	5,241					3,438,621	539,043
Small fruits.....	25,122	1,205	23.5				2,641,194	198,258

<sup>1</sup> Includes millet or Hungarian grass.

<sup>2</sup> Preliminary tabulation, subject to correction.

<sup>3</sup> Agricultural returns show number of trees and not acreage.

**Acreage.**—Of the entire acreage of the crops for which totals are presented in the table, slightly less than one-sixth is irrigated. The proportion irrigated varies widely for the different crops.

The cereals are very generally grown without irrigation, the irrigated acreage being only 5 per cent of the total acreage shown for these crops. The highest percentage of acreage irrigated shown for any cereal, 16.9, is reported for barley, and the next highest, 11.3, for rye. The proportions for oats and wheat are, respectively, 6 per cent and 2.8 per cent, the latter being the lowest percentage reported for any of the cereals.

Of the alfalfa acreage 83.6 per cent is irrigated, and of the land devoted to "wild, salt, or prairie grasses," 63.3 per cent. The corresponding percentage for timothy alone is 40.6, and that for timothy and clover mixed, 26.4. In the case of the remaining hay and forage crops the proportion of the total acreage irrigated is small.

Of the entire acreage in potatoes, 7.7 per cent is irrigated; of that in sugar beets, 74.5 per cent; and of that in small fruits, 23.5 per cent. The relative importance of the irrigated orchard acreage can not be determined, because the total acreage of orchards in the state is not reported, but it will be observed that but little more than one-seventh of the value of all orchard fruits produced in the state is that of products grown on irrigated land.

Of the irrigated crops shown in the table, "wild, salt, or prairie grasses" have the largest acreage, the acreage of this crop being 37.8 per cent of the total acreage of irrigated crops shown in the table. Alfalfa is next with 27.5 per cent, followed by wheat with 5.8 per cent; oats, with 5.6 per cent; and barley, with 5 per cent. No other single crop covers as much as 5 per cent of the total acreage of the irrigated crops presented in the table.

While most of the crops irrigated are well distributed geographically, there is a tendency toward the concentration of certain crops in particular localities. This is shown by the following statement, which gives the counties having the largest acreages of the principal irrigated crops, with the proportions which they contain of the total irrigated acreages of these crops in the state.

**Corn.**—Jackson County, 23.5 per cent; Baker, 18.8 per cent; Josephine, 15.7 per cent.

**Oats.**—Baker County, 46.2 per cent; Wallowa, 14.3 per cent; Crook, 9.9 per cent.

**Wheat.**—Baker County, 32.6 per cent; Klamath, 14.4 per cent; Wallowa, 13.5 per cent.

**Barley.**—Harney County, 29.3 per cent; Klamath, 19 per cent; Baker, 17.7 per cent.

**Rye.**—Crook County, 42.8 per cent; Malheur, 16.2 per cent; Wallowa, 11.6 per cent.

**Timothy alone.**—Baker County, 24.5 per cent; Grant, 22.9 per cent; Union, 15.2 per cent.

**Timothy and clover mixed.**—Baker County, 28.1 per cent; Grant, 23.7 per cent; Crook, 11 per cent.

**Clover alone.**—Josephine County, 17.7 per cent; Union, 16.4 per cent; Crook, 16.3 per cent.

**Alfalfa.**—Baker County, 21.7 per cent; Malheur, 18.9 per cent; Umatilla, 9.3 per cent.

**"Other tame or cultivated grasses."**—Josephine County, 27.6 per cent; Grant, 20.5 per cent; Baker, 17.6 per cent.

**Wild, salt, or prairie grasses.**—Harney County, 27.1 per cent; Lake, 23.9 per cent; Malheur, 13.3 per cent.

**Grains cut green.**—Crook County, 30.6 per cent; Wallowa, 15.8 per cent; Harney, 9 per cent.

**Potatoes.**—Baker County, 18.3 per cent; Hood River, 12.9 per cent; Harney, 11.7 per cent.

**Sugar beets.**—Union County, 82.8 per cent; Wallowa, 17.2 per cent.

**Orchard fruits and grapes.**—Union County, 25 per cent; Hood River, 23 per cent; Baker, 14.9 per cent.

**Small fruits.**—Hood River County, 47.4 per cent; Umatilla, 23.7 per cent; Union, 7.6 per cent.

**Yield.**—In the following table the average yields per acre of crops extensively grown, both with and without irrigation, are shown. The yields on unirrigated land are obtained by subtracting the totals for irrigated crops from the totals for the state:

CROP.	AVERAGE YIELD PER ACRE.		
	On unirrigated land.	On irrigated land.	
		Amount.	Per cent of excess over yield on unirrigated land. <sup>1</sup>
Oats.....bushels..	31.3	43.9	40.3
Wheat.....bushels..	16.0	27.1	69.4
Barley.....bushels..	20.0	30.7	53.5
Rye.....bushels..	11.3	12.1	7.1
Alfalfa seed.....bushels..	3.4	4.1	20.6
Timothy alone.....tons..	1.48	1.96	32.4
Timothy and clover mixed.....tons..	2.00	1.76	-12.0
Clover alone.....tons..	1.76	2.15	22.2
Alfalfa.....tons..	2.22	3.20	48.2
Wild, salt, or prairie grasses.....tons..	1.15	1.14	-0.9
Grains cut green.....tons..	1.36	1.52	11.8
Potatoes.....bushels..	107.9	121.4	12.5
Sugar beets.....tons..	7.86	8.50	8.1

<sup>1</sup> A minus sign (-) indicates that the yield on irrigated land is less than that on unirrigated land.

All the crops in the table except two, "timothy and clover mixed" and "wild, salt, or prairie grasses," show larger average yields per acre under irrigation than without it in 1909. In the case of all of these except rye, grains cut green, potatoes, and sugar beets, the excess is at least 20 per cent.

In considering these comparisons it should be borne in mind that they are not comparisons of yields on irrigated and on unirrigated land in the same localities, but of yields under irrigation in localities where crops can not be grown successfully without it with yields in localities where irrigation is not necessary. They do not indicate, therefore, the relative advantages of farming with and without irrigation in a given community, but rather give one factor for determining the relative advantages of farming where irrigation is necessary and where it is not necessary for the successful growing of crops.

## IRRIGATION—OREGON.

## COUNTY TABLE.

The next table gives in detail, by counties, the data summarized above, except those relating to crops. For purposes of comparison the total number of farms in the state, the approximate land area of the state, the total land in farms, and the improved land in farms have been included in the table. Clatsop and Columbia Counties did not report any irrigation in 1909, but the number of farms, approximate land area, land in farms, and improved land in farms for these counties are included in the state totals and also in the last column of the table, under the heading "all other counties." These counties are all in the western part of the state, where irrigation was comparatively unimportant. The group of "all other counties" comprises for 1909 and 1910, in addition to the two named, twelve in which there was some irrigation, namely, Benton, Clackamas, Coos, Curry, Lane, Lincoln, Linn, Marion, Multnomah, Polk, Tillamook, and Yam-

hill. The counties represented under the head of "all other counties" for 1899 in the Twelfth Census Report were not named, but were all in the western section of the state.

Certain enterprises extend into more than one county, and in the case of some of these the reports do not segregate the data by counties. In such cases a distribution has been made according to the best estimates possible from all the information in the possession of the Bureau. It is believed that these estimates are approximately correct.

*Change of boundaries.*—In comparing the data secured in 1910 with those of 1900, the following changes in county boundaries should be considered: (1) The organization of Hood River County from a part of Wasco County in 1908, and (2) the annexation of a part of Union County to Baker County in 1902.

# IRRIGATION—OREGON.

## ACREAGE IRRIGATED, EXTENT AND COST OF IRRIGATION ENTERPRISES, AND COST OF OPERATION AND MAINTENANCE, BY COUNTIES: 1909 AND 1910.

[Comparative data for 1899 in italics.]

		THE STATE.	Baker. <sup>1</sup>	Crook.	Douglas.	Gilliam.	Grant.	Harney.
1	Number of all farms in 1910.....	45,502	1,304	1,355	2,124	432	773	443
2	Number of farms irrigated in 1909.....	6,669	1,051	546	132	51	341	256
3	Per cent of all farms.....	14.7	80.6	40.3	6.2	11.8	44.1	57.8
4	Number of farms irrigated in 1899.....	<i>4,686</i>	<i>594</i>	<i>212</i>		<i>32</i>	<i>527</i>	<i>228</i>
5	Per cent of increase, 1899-1909.....	43.9		167.5		59.4	4.3	12.3
<b>LAND AND FARM AREA</b>								
6	Approximate land area..... acres.	61,188,480	1,958,400	4,977,920	3,150,080	768,640	2,892,800	6,357,120
7	Land in farms..... acres.	11,685,110	297,695	571,600	577,428	434,277	446,170	562,204
8	Improved land in farms..... acres.	4,274,364	137,769	138,354	117,115	235,666	53,045	199,271
9	Acreage irrigated in 1909.....	686,129	129,673	65,900	1,708	2,087	36,069	129,135
10	Per cent of total land area.....	1.1	6.6	1.1	0.1	0.3	1.2	2.0
11	Per cent of land in farms.....	5.9	43.6	9.8	0.3	0.5	8.1	23.0
12	Per cent of improved land in farms.....	16.1	94.1	40.4	1.5	0.9	68.0	64.8
13	Acreage irrigated in 1899.....	<i>383,310</i>	<i>46,754</i>	<i>13,921</i>		<i>1,086</i>	<i>19,693</i>	<i>111,090</i>
14	Per cent of increase, 1899-1909.....	76.7		301.6		92.2	83.7	16.2
15	Acreage enterprises were capable of irrigating in 1910.....	830,526	136,014	111,360	4,500	2,367	38,681	136,621
16	Acreage included in projects.....	2,527,208	241,919	453,811	9,349	3,370	73,578	561,548
<b>ACREAGE IRRIGATED AND INCLUDED IN PROJECTS</b>								
<b>CLASSIFIED BY CHARACTER OF ENTERPRISE.</b>								
17	U. S. Reclamation Service, irrigated in 1909.....	22,000						
18	Enterprises were capable of irrigating in 1910.....	45,319						
19	Included in projects.....	185,000						
20	U. S. Indian Service, irrigated in 1909.....	429		9				
21	Enterprises were capable of irrigating in 1910.....	439		9				
22	Included in projects.....	879		9				
23	Carey Act enterprises, irrigated in 1909.....	24,750		24,750				
24	Enterprises were capable of irrigating in 1910.....	65,500		65,500				
25	Included in projects.....	623,264	60,006	378,638				
26	Irrigation districts, irrigated in 1909.....	1,500						
27	Enterprises were capable of irrigating in 1910.....	1,500						
28	Included in projects.....	5,980						
29	Cooperative enterprises, irrigated in 1909.....	149,985	41,853	3,020			1,300	1,280
30	Enterprises were capable of irrigating in 1910.....	160,944	42,008	4,725			1,500	1,280
31	Included in projects.....	390,632	55,150	22,089			2,580	102,560
32	Commercial enterprises, irrigated in 1909.....	77,387	2,188	6,390	500			
33	Enterprises were capable of irrigating in 1910.....	93,760	2,838	15,000	3,000			53,000
34	Included in projects.....	692,467	13,650	20,481	4,500		19,000	341,000
35	Individual and partnership enterprises, irrigated in 1909.....	410,073	85,682	21,731	1,208	2,087	34,769	74,855
36	Enterprises were capable of irrigating in 1910.....	454,074	91,473	26,126	1,500	2,367	37,131	82,341
37	Included in projects.....	610,985	113,053	32,594	4,849	3,370	61,998	117,988
<b>ACREAGE IRRIGATED</b>								
<b>CLASSIFIED BY SOURCE OF WATER SUPPLY.</b>								
38	Supplied from streams.....	646,866	123,739	55,795	1,686	2,046	35,894	125,103
39	By gravity.....	643,281	123,379	55,447	1,673	1,981	35,894	125,095
40	By pumping.....	3,585	360	348	13	65		8
41	Supplied from lakes.....	23,736						390
42	By gravity.....	22,915						390
43	By pumping.....	821						
44	Supplied from wells.....	1,460	64			7	1	215
45	Flowing.....	655	4					135
46	By pumping.....	805	60			7	1	80
47	Supplied from springs.....	10,788	397	55	22	34	174	2,543
48	Supplied from reservoirs.....	3,279	473	50				884
49	Total acreage supplied by pumping.....	5,211	420	348	13	72	1	88
<b>IRRIGATION ENTERPRISES</b>								
50	Independent enterprises..... number	3,745	566	202	107	43	310	228
51	Number in 1899 <sup>2</sup> .....	<i>1,865</i>						
52	Per cent of increase, 1899-1910.....	100.8						
53	Main ditches..... number	3,582	606	217	86	47	396	143
54	Number in 1899 <sup>4</sup> .....							
55	Per cent of increase, 1899-1910.....							
56	Length..... miles	5,539	1,175	504	79	54	513	306
57	Length in 1899 <sup>2</sup> ..... miles	<i>2,233</i>						
58	Per cent of increase, 1899-1910.....	142.6						
59	Capacity..... cubic feet per second	39,686	7,631	2,907	320	202	1,771	1,826
60	Laterals..... number	2,518	313	222	31	96	140	327
61	Length..... miles	2,052	309	340	8	33	37	151
62	Reservoirs..... number	271	75	11	4	4	5	28
63	Capacity..... acre-feet	1,024,266	100,938	11,856	5	2	8	363,140
64	Flowing wells..... number	51	3					25
65	Capacity..... gallons per minute	3,035	19					54
66	Pumped wells..... number	92	4			4	1	1
67	Capacity..... gallons per minute	20,883	1,003			66	35	400
68	Pumping plants..... number	229	8	5	3	10	1	2
69	Engine capacity..... horsepower	3,095	159	512	13	43	1	10
70	Pump capacity..... gallons per minute	118,514	5,904	5,548	533	2,621	35	496
<b>COST</b>								
71	Cost of enterprises up to July 1, 1910..... dollars	12,760,214	1,446,334	1,961,817	78,127	32,809	241,086	410,980
72	Cost in 1899..... dollars	<i>1,843,771</i>	<i>208,271</i>	<i>111,090</i>		<i>5,364</i>	<i>38,680</i>	<i>178,865</i>
73	Per cent of increase, 1899-1910.....	592.1	594.4	1,666.0		511.7	171.9	129.8
74	Average cost per acre enterprises were capable of irrigating in 1910..... dollars	15.36	10.63	17.62	17.36	13.87	6.24	3.01
75	Average cost per acre irrigated in 1899..... dollars	<i>4.75</i>	<i>4.45</i>	<i>7.38</i>		<i>4.04</i>	<i>4.52</i>	<i>1.61</i>
76	Estimated final cost of existing enterprises..... dollars	39,216,619	5,272,463	4,842,082	78,127	32,809	250,986	2,501,980
77	Average cost per acre included in projects..... dollars	15.52	21.79	10.67	8.36	9.73	3.41	4.46
<b>OPERATION AND MAINTENANCE</b>								
78	Acreage for which cost is reported.....	203,855	41,699	31,410	500		500	54,280
79	Total cost reported..... dollars	198,111	14,848	25,837	2,300		250	8,338
80	Average per acre for which cost is reported..... dollars	0.75	0.36	0.82	4.60		0.50	0.15
81	Average cost per acre in 1899 <sup>2</sup> ..... dollars	<i>0.22</i>						
82	Per cent of increase, 1899-1909.....	240.9						

<sup>1</sup> Change of boundary. (See explanation at close of text.)  
<sup>2</sup> Not reported by counties.

<sup>3</sup> Figures relate only to systems obtaining water from streams.  
<sup>4</sup> Not reported.

# IRRIGATION—OREGON.

## ACREAGE IRRIGATED, EXTENT AND COST OF IRRIGATION ENTERPRISES, AND

[Comparative data for 1899 in italics.]

	Hood River.	Jackson.	Josephine.	Klamath.	Lake.	Malheur.	Morrow.	Sherman.
1 Number of all farms in 1910.....	744	1,714	855	926	712	801	614	466
2 Number of farms irrigated in 1909.....	404	423	401	290	198	622	143	10
3 Per cent of all farms.....	62.4	24.0	46.9	28.7	27.8	77.7	23.3	3.4
4 <i>Number of farms irrigated in 1899.....</i>	( <sup>1</sup> )	409	235	120	272	479	76	12
5 Per cent of increase, 1899-1909.....		4.2	70.6	106.2	227.2	20.9	88.2	33.3
<b>LAND AND FARM AREA</b>								
6 Approximate land area..... acres.	347,520	1,815,040	1,120,440	3,830,360	5,068,800	6,325,120	1,206,000	535,040
7 Land in farms..... acres.	38,040	207,171	121,845	454,340	401,555	230,175	673,907	372,520
8 Improved land in farms..... acres.	14,284	103,238	30,969	176,564	104,410	81,901	230,020	273,918
9 Acreage irrigated in 1909.....	8,071	12,230	12,866	46,975	57,078	67,626	7,541	218
10 Acreage irrigated in 1899.....	2.3	0.7	1.1	1.2	1.1	1.1	0.6	( <sup>3</sup> )
11 Per cent of total land area.....	21.2	4.1	10.6	10.3	14.2	20.4	1.1	0.1
12 Per cent of land in farms.....	56.5	11.0	41.5	26.6	54.7	82.6	3.2	0.1
13 Per cent of improved land in farms.....	( <sup>1</sup> )	7.054	4.121	23.911	51.995	49.895	3.865	112
14 Acreage irrigated in 1899.....		73.5	212.2	96.5	9.8	37.2	95.1	94.6
15 Per cent of increase, 1899-1909.....		14,160	17,978	14,503	62,785	59,612	8,116	320
16 Acreage enterprises were capable of irrigating in 1910.....	48,964	82,427	24,059	208,105	273,546	208,025	14,937	459
<b>ACREAGE IRRIGATED AND INCLUDED IN PROJECTS</b>								
<i>CLASSIFIED BY CHARACTER OF ENTERPRISE.</i>								
17 U. S. Reclamation Service, irrigated in 1909.....				20,000				
18 Enterprises were capable of irrigating in 1910.....				30,000				
19 Included in projects.....				160,000				
20 U. S. Indian Service, irrigated in 1909.....				420				
21 Enterprises were capable of irrigating in 1910.....				460				
22 Included in projects.....				870				
23 Carey Act enterprises, irrigated in 1909.....								
24 Enterprises were capable of irrigating in 1910.....					141,597	42,963		
25 Included in projects.....								
26 Irrigation districts, irrigated in 1909.....	1,500							
27 Enterprises were capable of irrigating in 1910.....	1,500							
28 Included in projects.....	5,930							
29 Cooperative enterprises, irrigated in 1909.....	4,925	990	3,750	10,215	15,190	22,883		
30 Enterprises were capable of irrigating in 1910.....	10,535	3,085	4,057	12,660	15,190	25,642		
31 Included in projects.....	39,300	7,130	6,033	13,380	24,930	66,939		
32 Commercial enterprises, irrigated in 1909.....		875	445			1,000	849	
33 Enterprises were capable of irrigating in 1910.....		992	516			2,000	849	
34 Included in projects.....		55,780	1,500		50,000	20,000	6,309	
35 Individual and partnership enterprises, irrigated in 1909.....	1,040	10,374	8,665	16,340	41,888	33,743	6,662	218
36 Enterprises were capable of irrigating in 1910.....	1,815	13,901	9,930	19,305	44,422	51,568	7,207	329
37 Included in projects.....	3,684	19,517	16,500	33,555	57,013	78,073	8,628	459
<b>ACREAGE IRRIGATED</b>								
<i>CLASSIFIED BY SOURCE OF WATER SUPPLY.</i>								
38 Supplied from streams.....	7,583	11,656	12,592	21,625	54,192	66,218	7,528	118
39 By gravity.....	7,568	11,414	12,342	21,375	54,192	65,264	7,503	30
40 By pumping.....	15	242	250	250		954	25	88
41 Supplied from lakes.....			159	23,000		25		
42 By gravity.....				22,500		25		
43 By pumping.....			159	500				
44 Supplied from wells.....	15	68	32	500			3	15
45 Flowing.....								
46 By pumping.....	15	68	32	500			3	15
47 Supplied from springs.....		53	31					
48 Supplied from reservoirs.....	473	510	80	1,790	1,666	799	10	85
49 Total acreage supplied by pumping.....	30	295	440	750	1,220	584	28	103
<b>IRRIGATION ENTERPRISES</b>								
50 Independent enterprises..... number.....	75	276	269	52	171	330	121	14
51 <i>Number in 1899.....</i>								
52 Per cent of increase, 1899-1910.....								
53 Main ditches..... number.....	61	245	221	42	133	311	148	8
54 <i>Number in 1899.....</i>								
55 Per cent of increase, 1899-1910.....								
56 Length..... miles.....	86	305	220	162	247	645	123	3
57 <i>Length in 1899.....</i>								
58 Per cent of increase, 1899-1910.....								
59 Capacity..... cubic feet per second.....	369	1,748	931	2,964	2,212	4,168	542	4
60 Laterals..... number.....	50	53	35	69	99	271	94	
61 Length..... miles.....	68	67	17	100	54	350	27	
62 Reservoirs..... number.....	13	25	19	8	17	42	2	
63 Capacity..... acre-feet.....	5	45,907	7	181,274	64,901	188,443	1	
64 Flowing wells..... number.....		2	1	20				
65 Capacity..... gallons per minute.....		225	17	2,720				
66 Pumped wells..... number.....	1	14	11				3	2
67 Capacity..... gallons per minute.....	100	5,533	2,200				220	600
68 Pumping plants..... number.....	2	21	32	2		29	4	5
69 Engine capacity..... horsepower.....	10	165	168	224		410	4	70
70 Pump capacity..... gallons per minute.....	231	19,086	9,881	9,720		26,513	1,125	2,063
<b>COST</b>								
71 Cost of enterprises up to July 1, 1910..... dollars.....	361,714	457,936	239,327	1,910,580	760,906	2,032,636	187,716	9,612
72 <i>Cost in 1899.....</i>	( <sup>1</sup> )	73,239	32,267	225,242	135,187	607,435	21,628	322
73 Per cent of increase, 1899-1910.....		485.4	641.7	748.2	469.5	300.6	772.0	1,057.2
74 Average cost per acre enterprises were capable of irrigating in 1910..... dollars.....	25.58	25.47	16.50	30.43	12.92	25.66	23.13	28.91
75 <i>Average cost per acre irrigated in 1899.....</i>	( <sup>1</sup> )	11.09	7.83	9.42	2.60	10.29	5.57	7.34
76 Estimated final cost of existing enterprises..... dollars.....	392,214	1,770,936	239,327	5,110,580	7,338,681	5,057,171	187,716	9,612
77 Average cost per acre included in projects..... dollars.....	8.01	21.48	9.95	24.56	26.83	24.31	12.57	20.72
<b>OPERATION AND MAINTENANCE</b>								
78 Acreage for which cost is reported.....	6,425	1,815	3,885	30,215	15,190	20,983		
79 Total cost reported..... dollars.....	27,935	10,402	2,906	22,225	1,180	10,966		
80 Average per acre for which cost is reported..... dollars.....	4.35	5.73	0.75	0.74	0.08	0.52		
81 <i>Average cost per acre in 1899.....</i>								
82 Per cent of increase, 1899-1909.....								

<sup>1</sup> Change of boundary. (See explanation at close of text.)

<sup>2</sup> Decrease.

<sup>3</sup> Less than one-tenth of 1 per cent.

# IRRIGATION—OREGON.

## COST OF OPERATION AND MAINTENANCE, BY COUNTIES: 1909 AND 1910—Continued.

[Comparative data for 1899 in italics.]

	Umatilla.	Union. <sup>1</sup>	Wallowa.	Wasco. <sup>1</sup>	Washing- ton.	Wheeler.	All other counties.
1	2,005	1,309	1,058	1,331	2,871	387	23,278
2	685	432	293	88	9	184	65
3	34.2	33.0	27.7	6.6	0.3	47.5	0.9
4	<i>329</i>	<i>494</i>	<i>178</i>	<i>303</i>		<i>193</i>	<i>134</i>
5	108.2		64.0			<sup>2</sup> 4.7	<sup>2</sup> 51.5
<b>LAND AND FARM AREA</b>							
6	2,030,720	1,335,080	2,012,800	1,400,520	467,840	1,099,560	12,298,880
7	1,050,258	795,769	854,732	543,754	240,328	415,576	3,206,661
8	544,513	165,489	86,040	171,051	107,910	53,396	1,243,844
9	31,022	35,831	39,370	5,703	179	6,253	585
10	1.5	2.7	2.0	0.4	(3)	0.6	(3)
11	3.7	21.7	45.8	3.3	0.1	0.6	(3)
12	5.7	21.7	45.8	3.3	0.2	11.7	(3)
13	<i>5,168</i>	<i>86,735</i>	<i>11,016</i>	<i>3,342</i>		<i>4,998</i>	<i>1,215</i>
14	500.3		150.9			25.1	<sup>2</sup> 51.9
15	50,213	37,260	42,855	5,989	207	6,983	843
16	94,169	45,517	54,692	17,276	562	9,414	101,481
<b>ACREAGE IRRIGATED AND INCLUDED IN PROJECTS</b>							
<b>CLASSIFIED BY CHARACTER OF ENTERPRISE.</b>							
17	2,000						
18	15,319						
19	25,000						
20							
21							
22							
23							
24							
25							
26							
27							
28							
29	9,058	7,735	27,780				
30	10,967	7,735	29,960				
31	13,841	8,745	36,579				
32	6,750	2,200	3,180				10
33	9,150	2,500	3,900				10
34	37,341	5,000	7,900	10,000			100,000
35	13,214	25,896	8,410	5,703	179	6,253	575
36	14,777	27,025	8,695	5,989	207	6,983	833
37	17,987	31,772	9,913	7,276	562	9,414	1,481
<b>ACREAGE IRRIGATED</b>							
<b>CLASSIFIED BY SOURCE OF WATER SUPPLY.</b>							
38	20,406	34,870	39,370	5,538	164	6,177	467
39	20,213	34,747	39,273	5,453	17	6,032	389
40	283	132	97	85	147	145	78
41	80			80			2
42	80			80			2
43							25
44	398	69		48			25
45	398	69		48			25
46	1,048	883		37	15	76	91
47							
48	761	201	97	213	147	145	105
49							
<b>IRRIGATION ENTERPRISES</b>							
50	281	225	160	79	8	164	64
51							
52	275	164	144	38	7	206	36
53							
54	350	255	249	62	3	164	34
55							
56	2,267	7,062	1,913	199	26	490	134
57	263	159	62	106		64	64
58	254	87	56	26		16	2
59	10	1	1	2		1	3
60	54,154	1	12,500	1		1,120	3
61							
62							
63							
64							
65	29	12		5			5
66	7,892	2,045		459			330
67	39	22	2	15	5	6	13
68	259	96	56	169	88	69	549
69	10,840	4,136	850	3,856	2,475	4,940	7,551
70							
<b>COST</b>							
71	2,019,161	136,204	198,064	96,167	6,381	76,305	87,452
72	<i>57,112</i>	<i>80,925</i>	<i>62,980</i>	<i>46,102</i>		<i>24,335</i>	<i>2,347</i>
73	5,340.7	68.3	273.8	108.6		213.6	835.6
74	40.21	3.66	4.62	16.06	30.83	10.93	103.74
75	7.18	3.03	3.78	13.79		4.87	7.69
76	2,593,887	136,204	211,114	96,167	6,381	76,305	3,012,477
77	27.54	2.90	3.86	5.57	11.35	8.11	29.69
<b>OPERATION AND MAINTENANCE</b>							
78	16,058	9,035	30,960				
79	63,661	2,817	4,446				
80	3.96	0.28	0.14				
81							
82							

<sup>1</sup> Not reported by counties.

<sup>2</sup> Not reported.

## IRRIGATION : UTAH

FARMS AND ACREAGE IRRIGATED, IRRIGATION WORKS, COST OF CONSTRUCTION, COST OF OPERATION AND MAINTENANCE,  
AND CROPS IRRIGATED

Prepared under the supervision of LE GRAND POWERS, Chief Statistician for Agriculture, by R. P. TEELE, Special Agent in Charge of Irrigation

## INTRODUCTION.

This bulletin presents the larger part of the statistics of irrigation for Utah obtained in connection with the Thirteenth Census. These data, with additional information, will be embodied in a special report of the Census of Irrigation and in the final reports of the Thirteenth Census. The statistics of the number of farms and acreage irrigated, cost of operation and maintenance, and irrigated crops are for the calendar year 1909; those of irrigation works, cost of enterprises, acreage enterprises were capable of irrigating in 1910, and acreage included in projects are of the date July 1, 1910.

These statistics have been collected under the law of February 25, 1910, which contained the following clause relating to irrigation:

Inquiries shall also be made as to the location and character of irrigation enterprises, quantity of land irrigated in the arid region of the United States and in each state and county in that section under state and Federal laws; the price at which these lands, including water rights, are obtainable; the character and value of crops produced on irrigated lands, the amount of water used per acre for said irrigation and whether it was obtainable from national, state, or private works; the location of the various projects and methods of construction, with facts as to their physical condition; the amount of capital invested in such irrigation works.

The information called for by this law which could be supplied by farm operators was obtained on supplemental schedules by the regular census enumerators as a part of the agricultural census. The remaining data, which were supplied by the owners or officials of irrigation enterprises, were obtained on special schedules by special agents. The data relating to number of farms irrigated and irrigated crops are taken from the supplemental schedules, while all data relating to acreage irrigated and to irrigation works and their construction and operation are taken from the special schedules.

In accordance with the law, the data collected have been classified primarily by the state and Federal laws by virtue of which the land was brought under irrigation. The results are presented in detail at the end of this bulletin and summarized in text tables.

Such of the terms used as are not self-explanatory are defined below.

**Farms irrigated.**—The number of "farms irrigated" is the number of farms on which irrigation is practiced and is equivalent to the term "number of irrigators" used in previous census reports.

**Types of enterprise.**—The types of enterprise under which the lands irrigated in 1909 are classified are as follows:

*United States Reclamation Service enterprises*, which operate under the Federal law of June 17, 1902, providing for the construction of irrigation works with the receipts from the sale of public lands.

*United States Indian Service enterprises*, which operate under various acts of Congress providing for the construction by that service of works for the irrigation of land in Indian reservations.

*Carey Act enterprises*, which operate under the Federal law of August 18, 1894, granting to each of the states in the arid region 1,000,000 acres of land on condition that the state provide for its irrigation, and under amendments to that law granting additional areas to Idaho and Wyoming.

*Irrigation districts*, which are public corporations that operate under state laws providing for their organization and management, and empowering them to issue bonds and levy and collect taxes with the object of obtaining funds for the purchase or construction, and for the operation and maintenance of irrigation works.

*Cooperative enterprises*, which are controlled by the water users under some organized form of cooperation. The most common form of organization is the stock company, the stock of which is owned by the water users.

*Commercial enterprises*, which supply water for compensation to parties who own no interest in the works. Persons obtaining water from such enterprises are usually required to pay for the right to receive water, and to pay, in addition, annual charges based in some instances on the acreage irrigated and in others on the quantity of water received.

*Individual and partnership enterprises*, which belong to individual farmers or to neighboring farmers, who control them without formal organization. It is not always possible to distinguish between partnership and cooperative enterprises, but as the difference is slight this is unimportant.

**Source of water supply.**—Of the terms used in the classification according to source of water supply, none requires explanation except "reservoirs." The only reservoirs which are treated as independent sources of supply are those filled by collecting storm water or from watercourses that are ordinarily dry. When reservoirs are filled from streams or wells, the primary source is considered the source of supply.

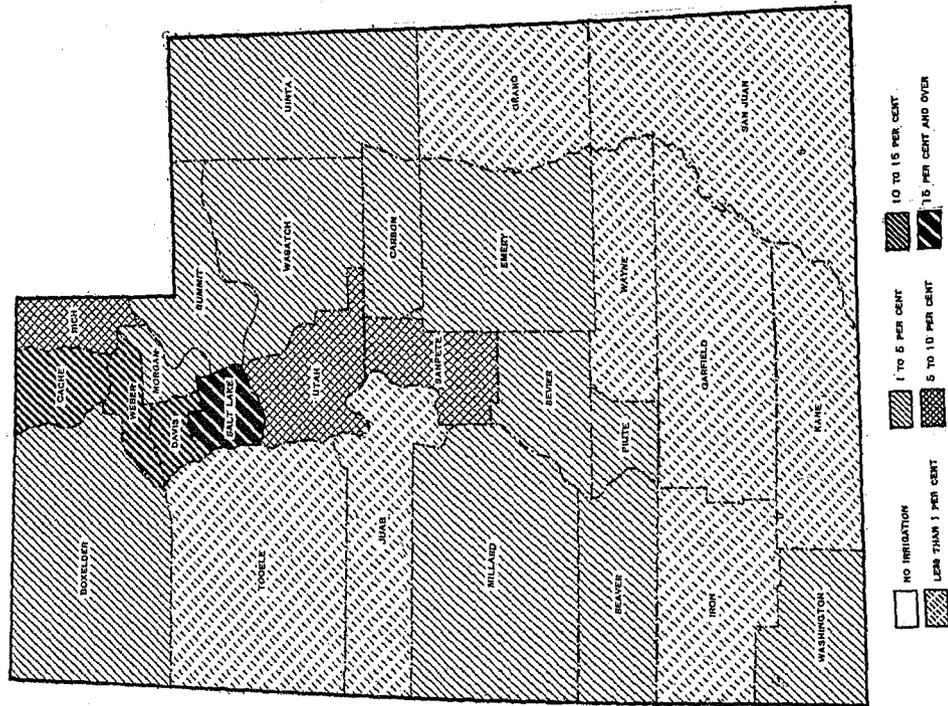
**Acre-foot.**—The "acre-foot," used to express the capacity of reservoirs, is the volume of water required to cover 1 acre to a depth of 1 foot, or 43,560 cubic feet.

**Cost.**—The cost of irrigation enterprises is that given by the owners. For the larger works the cost given is taken, in most cases, from the books of account and represents the actual cost. In the case of most of the private and partnership and many of the cooperative enterprises, however, the works were built by their owners without records of money or labor expended, and the cost given represents the owners' estimates. The cost reported for 1910 includes the cost of construction and of acquiring rights. The latter usually consists of filing fees only. In some instances it includes the purchase price of rights, but these cases are so rare that they are unimportant. The cost reported for 1899 is designated "cost of construction," but probably includes the cost of acquiring rights, as in 1910. The average cost per acre is based on the acreage enterprises were capable of irrigating in 1910 and the cost to July 1, 1910.

**PER CENT OF TOTAL LAND AREA IRRIGATED, AND PER CENT OF NUMBER OF FARMS IRRIGATED, IN UTAH, BY COUNTIES: 1909.**

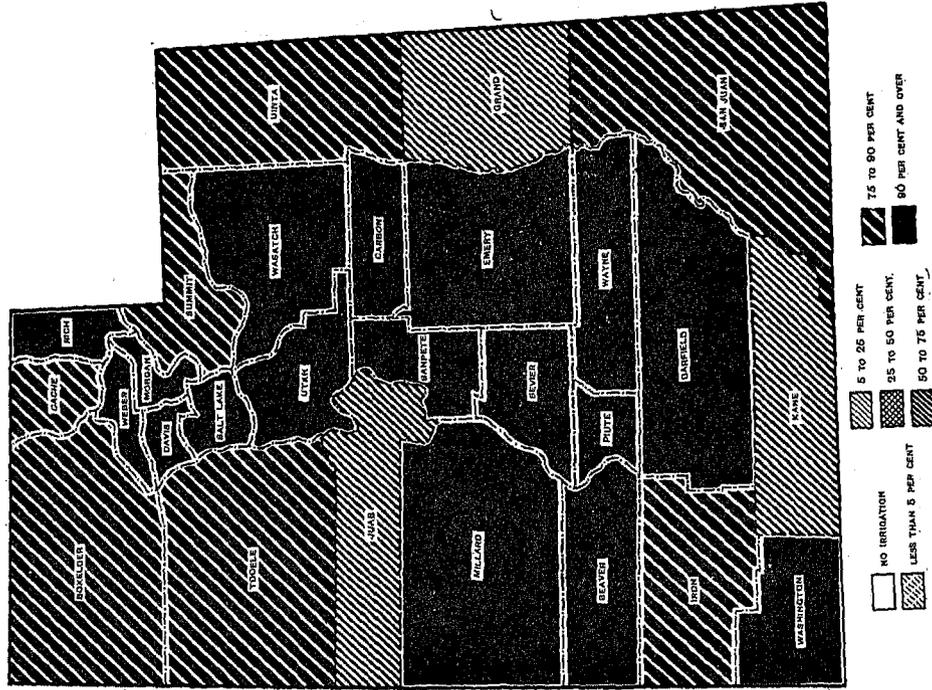
**PER CENT OF TOTAL LAND AREA IRRIGATED.**

[Per cent for the state, 1.8.]



**PER CENT OF NUMBER OF FARMS IRRIGATED.**

[Per cent for the state, 90.9.]



# IRRIGATION—UTAH.

## FARMS AND ACREAGE IRRIGATED.

The greater part of the state of Utah is mountainous. The Wasatch range extends north and south through the central part of the state and the Uinta range east and west through the northeastern part, while smaller detached ranges and groups of mountains are found throughout the state. The arable land lies in the valleys between these ranges. The larger part both of the land in farms and the irrigated land is west of the Wasatch Mountains. Irrigation is practiced in every county in the state, more than 90 per cent of the farms being irrigated. In most of the counties, however, grain crops are grown to some extent without irrigation. The annual precipitation averages from 7 to 15 inches. The location of the irrigated lands of the state is indicated in a general way by the accompanying maps, which show the class in which each county falls with reference to the percentage which irrigated land forms of the total land area and the percentage which irrigated farms represent of all farms.

The following table shows for the state as a whole the number of farms and the acreage irrigated in 1909, in comparison with the total number of farms, the total land area, the total land in farms, and the total acreage of improved land in farms in 1910, together with the areas not yet irrigated for which water has been or is being made available. Comparative statistics for the census of 1900 are included as far as possible. The figures as to the number of farms and acreage irrigated in 1899 do not cover Indian reservations, which were not shown in the irrigation report for Utah for that year, and therefore they are not strictly comparable with the figures as to total number of farms and total farm acreage in 1900, as shown in this table, or with the statistics for farms and acreage irrigated in 1909. Since the irrigated land and farms on reservations represented only small proportions of the corresponding totals for the state in 1909, however, comparisons between the two censuses are but little affected by the omission in the 1900 report.

	CENSUS OF—		INCREASE. <sup>1</sup>	
	1910	1900	Amount.	Per cent.
Number of all farms.....	<sup>2</sup> 21, 676	<sup>3</sup> 19, 387	2, 289	11. 8
Approximate land area of the state..... acres..	52, 597, 760	52, 597, 760	.....	.....
Land in farms..... acres..	<sup>2</sup> 3, 397, 699	<sup>3</sup> 4, 116, 951	-719, 252	-17. 5
Improved land in farms..... acres..	<sup>2</sup> 1, 368, 211	<sup>3</sup> 1, 032, 117	336, 094	32. 6
Number of farms irrigated.....	<sup>4</sup> 19, 709	<sup>5</sup> 17, 924	1, 785	10. 0
Acreage irrigated.....	<sup>4</sup> 999, 410	<sup>5</sup> 629, 293	370, 117	58. 8
Acreage enterprises were capable of irrigating.....	<sup>6</sup> 1, 250, 246	(?)	.....	.....
Acreage included in projects.....	<sup>6</sup> 1, 947, 625	(?)	.....	.....
Percentage irrigated of—				
Number of all farms.....	90. 9	92. 5	-1. 6	.....
Approximate land area of the state.....	1. 9	1. 2	0. 7	.....
Land in farms.....	29. 4	15. 3	14. 1	.....
Improved land in farms.....	73. 0	61. 0	12. 0	.....
Excess of acreage enterprises were capable of irrigating in 1910 over acreage irrigated in 1909.....	250, 836	.....	.....	.....
Excess of acreage included in projects over acreage irrigated in 1909.....	948, 215	.....	.....	.....

<sup>1</sup> A minus sign (-) denotes a decrease.   <sup>2</sup> April 15.   <sup>3</sup> June 1.   <sup>4</sup> In 1909.   <sup>5</sup> In 1899.   <sup>6</sup> July 1.   <sup>7</sup> Not reported.

**Number of farms irrigated.**—The number of farms irrigated is made up of the number reported on the supplemental schedules by the regular enumerators, together with an estimate of the number of farms covered by enterprises which were reported by special agents but not by the regular enumerators. This estimate was based on the average acreage irrigated per farm as shown by the supplemental schedules. According to the figures presented in the table, irrigation was practiced on 90.9 per cent of the farms in the state in 1909. In 1889 the proportion of irrigated farms was slightly higher, 92.5 per cent, at which figure it stood also in 1899. It is evident, therefore, that between 1889 and 1899 the number of unirrigated farms increased at about the same rate as the number of irrigated farms. From 1899 to 1909 the rate of increase for unirrigated farms was more than three times that for irrigated farms, but the absolute increase was in each case comparatively small.

In 17 out of the 27 counties in the state at least 90 per cent of the farms are irrigated, in 6 the proportion is between 80 and 90 per cent, while in only 4 is it less than 80 per cent. The lowest percentage shown for any county is 65.7 in Juab County, and the highest 99.7 in Emery County.

From 1899 to 1909 the increase in the number of farms irrigated in the state as a whole was 10 per cent. This rate of gain was exceeded in 11 counties which have not changed in area during the 10 years, and in the territory comprising Piute and Sevier Counties, the boundary between which has been changed since 1900. The greatest relative increases in number of farms irrigated took place in San Juan, Wasatch, and Garfield Counties, the percentages being, respectively, 183.7, 95.9, and 78.1. Boxelder County shows the greatest absolute increase in number of farms, amounting to 477. In 9 counties a decrease in the number of farms irrigated occurred. Seven of these show also a

decrease in the number of all farms. In all but 1 of the 9 counties which show a decrease in the number of farms irrigated, an increase in acreage irrigated is reported, which fact suggests the possibility of a difference in the interpretation by enumerators at the two censuses as to what should be reported as a farm, although it is probable that some increase actually occurred in the acreage irrigated per farm.

**Acreage irrigated.**—The acreage irrigated is taken from the special schedules filled out by agents from information secured from owners or officials of irrigation enterprises and, in some instances, from public records. The acreage thus obtained is considerably larger than the irrigated acreage reported on the supplemental schedules filled out by the farm enumerators. This difference is due in a measure to the fact that the special agents found enterprises which were not reported on any schedules returned by the enumerators, indicating that the acreage reported on the supplemental schedules is under the true figure. There is, however, a natural tendency for the officials of irrigation systems to report as irrigated the entire area of farms of which only a part was irrigated. Furthermore, some farms are so situated as to receive water from more than one enterprise, and may be reported as irrigated by each, which results in duplication. Owing to the two causes last enumerated, it is probable that the acreage irrigated, as shown in this bulletin, is somewhat excessive, but the extent of this excess can not be determined. It is believed, however, to be less than 10 per cent for the state of Utah.

The total acreage reported as irrigated in 1909 was 999,410 acres, as against 629,293 acres in 1899 and 263,473 acres in 1889. It should be borne in mind, however, that the acreage given for 1909 includes land lying within Indian reservations, while the figures for 1899 and 1889 do not. The percentage of increase from 1889 to 1899 was 138.8 per cent, while that reported from 1899 to 1909 was 58.8 per cent. The absolute increase shown for the later decade was 370,117 acres, as compared with 365,820 acres between 1889 and 1899.

The percentage of increase between 1899 and 1909 in the acreage irrigated was considerably higher than the percentage of increase in the number of farms irrigated, the acreage irrigated per farm increasing from 35.1 in 1899 to 50.7 in 1909. As a decrease from 212.4 acres to 156.7 acres in the average size of the farms of the state was reported for the same period, it is probable that farmers are irrigating larger parts of their holdings than formerly. It is not possible, however, to determine how far this is actually the case, as the higher average size shown for 1900 was due to some extent to the inclusion as farm land of large tracts of grazing land, while comparatively little land of this character was reported in 1910. The tendency toward the irrigation of a larger proportion of the land used for farming is shown by the increase in the ratio of the irrigated acreage to the improved

farm acreage from 61 per cent in 1899 to 73 per cent in 1909. This percentage is somewhat misleading, however, because irrigated land includes wild grass land used for pasture, whereas improved land does not. The percentage of improved land irrigated in 1909 was below the figure given above.

The percentage of the total land area of the state irrigated in 1909 was 1.9, as compared with 1.2 per cent in 1899 and 0.5 per cent in 1889.

In both 1909 and 1899 the county for which the largest area of irrigated land was reported was Utah, the acreages being 89,886 and 74,872, respectively. Four other counties show areas of irrigated land exceeding 75,000 acres in 1909, while 6 contained irrigated areas of between 40,000 and 75,000 acres.

The county in which irrigated land formed the highest percentage of the total land area was Salt Lake, where 17.1 per cent of the land area was irrigated in 1909. In only 3 other counties, Cache, Davis, and Weber, was the proportion higher than 10 per cent.

**Acreage included in projects.**—The table shows that in 1910 existing enterprises were ready to supply water to 250,836 acres not irrigated in 1909. Even after allowance is made for an increase in the area irrigated in 1910 over that in 1909, it is probable that there remained at the close of 1910 at least one-half as much land under ditch but not irrigated as had been brought under irrigation in the 10 years from 1899 to 1909. The acreage included in projects exceeds the acreage irrigated in 1909 by 948,215 acres, which is about two and one-half times the acreage brought under irrigation in the last decade and almost as much as the total area irrigated in 1909. This acreage represents the area which will be available for the extension of irrigation in the next few years upon the completion of the projects now under construction. It indicates in a general way the area available for settlement, although much of this unirrigated land is in farms already settled.

**Acreage irrigated, classified by character of enterprise.**—The following table gives the distribution of the acreage irrigated in 1909 according to the character of the enterprise controlling the irrigation works:

CHARACTER OF ENTERPRISE.	ACREAGE IRRIGATED IN 1909.	
	Amount.	Per cent distribution.
All classes.....	999,410	100.0
U. S. Indian Service.....	11,520	1.2
Carey Act enterprises.....	5,000	0.5
Irrigation districts.....	8,455	0.8
Cooperative enterprises.....	687,260	68.8
Commercial enterprises.....	64,727	6.5
Individual and partnership enterprises.....	222,448	22.3

The United States Reclamation Service is now engaged in work on a large irrigation project designed to irrigate ultimately an area of about 60,000 acres. It will take over about 20,000 acres that in 1909 were

irrigated by cooperative or partnership enterprises. In accordance with the method of classification adopted, however, the latter acreage is credited in this bulletin to the enterprises which controlled the water supply in 1909.

Irrigation districts, cooperative enterprises, and individual and partnership enterprises are all controlled by the water users. These supplied 91.9 per cent of the acreage irrigated, while Carey Act enterprises, which are to be turned over to the water users, supplied 0.5 per cent. Thus but a small percentage of the irrigated land is supplied by enterprises which are not either controlled by the water users or to be turned over to them ultimately. The cooperative enterprises, which supplied water for 68.8 per cent of the land irrigated, are principally stock companies, of which the stock is owned by the water users.

Acreage irrigated, classified by source of water supply.—The following table shows the distribution of the acreage irrigated in 1909, according to the source of water supply:

SOURCE OF WATER SUPPLY.	ACREAGE IRRIGATED IN 1909.	
	Amount.	Per cent distribution.
All sources.....	999,410	100.0
Streams.....	957,359	95.8
Lakes.....	1,671	0.2
Wells.....	4,400	0.4
Springs.....	35,412	3.5
Reservoirs.....	568	0.1

From the foregoing table it is apparent that up to the present time there has been little development of any source of water supply other than streams.

IRRIGATION WORKS.

The following table summarizes the data collected relating to works for supplying water for irrigation in 1910 and 1900, Indian reservations, as already noted, not being represented in the figures for 1900:

IRRIGATION WORKS.	CENSUS OF—		INCREASE.	
	1910	1900	Amount.	Per cent.
Independent enterprises.....number..	2,472	928	1,544	166.4
Ditches, total length.....miles..	7,709	(2)		
Main ditches.....number..	2,495	(2)		
Length.....miles..	5,887	2,838	3,049	107.4
Capacity.....cu. ft. per second..	25,081	(2)		
Lateral ditches.....number..	1,357	(2)		
Length.....miles..	1,822	(2)		
Reservoirs.....number..	480	(2)		
Capacity.....acre-feet..	583,317	(2)		
Flowing wells.....number..	1,138	(2)		
Capacity.....gals. per minute..	42,794	(2)		
Pumped wells.....number..	27	(2)		
Capacity.....gals. per minute..	4,827	(2)		
Pumping plants.....number..	69	(2)		
Engine capacity.....horsepower..	2,143	(2)		
Pump capacity.....gals. per minute..	315,057	(2)		

<sup>1</sup> Figures for 1900 relate only to systems obtaining water from streams.  
<sup>2</sup> Not reported.

As only two of the items reported in 1910 were reported in 1900, the number of independent enterprises and the length of main ditches, there is little

COST OF CONSTRUCTION, OPERATION, AND MAINTENANCE.

The table following shows the total cost of irrigation enterprises up to July 1, 1910, including construction of works and acquisition of rights but not operation and maintenance, with the average cost per acre, based on the acreage the enterprises were capable of irrigating in 1910; the estimated final cost of enterprises completed and those now under construction, with the average cost per acre based on the acreage included in projects; and the total cost and average cost per acre of operation and maintenance in 1909. Data relating to the cost of construction and maintenance of systems operated in 1899 are included for comparison. The figure for average cost per acre of operation and maintenance in 1899 does not cover the cost for systems obtaining water from wells, but,

opportunity for comparison between the two censuses. The figures shown for the earlier census relate only to those systems which received water by gravity diversion from streams in 1899; but the other systems represented in the Twelfth Census report, which obtained water from wells, supplied only 5,107 acres of the total area reported as irrigated in 1899.

Assuming that the enterprises in operation in 1909 were identical with those reported in 1910, the average acreage irrigated per enterprise in 1909 was 404.3, and the acreage irrigated per mile of main ditch was 169.8.

There has been little utilization of underground water for irrigation up to this time. The table shows 1,138 flowing wells, which are, for the most part, of small capacity, and in 1909 irrigated only 4,100 acres of land. Davis, Utah, Sanpete, Sevier, and Tooele Counties together reported 798 of these. Of the 27 pumped wells, which in 1909 irrigated a total of 300 acres, 22 were in Boxelder County. Pumping from either wells or streams has been but little practiced as yet. The total acreage irrigated with pumped water in 1909 was 2,859 acres.

as indicated above, these are comparatively unimportant, having supplied only 5,107 acres in that year. Indian reservations, as previously stated, are not covered by the figures shown for 1900.

The cost of operation and maintenance is not reported for individual and partnership enterprises, for the reason that farmers whose land is irrigated by such systems generally clean their own ditches at odd times without keeping any record of the time spent. In the case of the larger enterprises this cost represents a cash outlay by the farmers, while in that of many of the smaller cooperative enterprises the larger part of the cost is worked out by the farmers themselves, as in the case of the individual and partnership enterprises.

## IRRIGATION—UTAH.

	CENSUS OF—		INCREASE.	
	1910	1900	Amount.	Per cent.
Cost of irrigation enterprises.....	<sup>1</sup> \$14,028,717	<sup>2</sup> \$5,865,302	\$8,163,415	139.2
Average per acre.....	<sup>3</sup> \$11.22	<sup>4</sup> \$9.32	( <sup>5</sup> )	.....
Estimated final cost of existing enterprises.....	\$17,840,775	( <sup>6</sup> )	.....	.....
Average per acre included in projects.....	\$9.16	( <sup>6</sup> )	.....	.....
Operation and maintenance:				
Acreage for which cost is reported.....	<sup>7</sup> 7,080,004	( <sup>6</sup> )	.....	.....
Total cost reported.....	<sup>7</sup> \$451,283	( <sup>6</sup> )	.....	.....
Average cost per acre.....	<sup>8</sup> \$0.65	<sup>8</sup> \$0.24	\$0.41	170.8

<sup>1</sup> Reported July 1.<sup>2</sup> Cost of systems operated in 1899.<sup>3</sup> Based on acreage enterprises were capable of irrigating in 1910.<sup>4</sup> Based on acreage irrigated in 1899.<sup>5</sup> Figures not comparable. (See explanation in text.)<sup>6</sup> Not reported.<sup>7</sup> For 1909.<sup>8</sup> Exclusive of systems obtaining water from wells.

The cost of irrigation systems shows an increase of 139.2 per cent from 1899 to 1910. The average cost per acre shown for the census of 1900 is based on the acreage irrigated in 1899, instead of the acreage under ditch, which forms the basis of the figure for 1910, the latter acreage not being reported in 1900. If computed on the basis of the acreage irrigated in 1909, the average cost in 1910 would be \$14.04, representing an increase of 50.6 per cent over the corresponding figure for the census of 1900. The year 1899 was near the close of the period of private and cooperative construction, during which most of the works were

built by the water users themselves with little or no expenditure of money, and near the beginning of the present period of large-scale construction by corporations and the Federal Government. This later construction is not only on a more extensive scale, but also more difficult and of a better type. Largely as a result of these influences the average cost per acre of irrigation has greatly increased. A number of large enterprises are under construction, and on these considerable expenditures have been made, while but little land is irrigated as yet. This condition tends to make the average cost shown higher than the true average. The average based on the estimated final cost and the acreage included in projects, \$9.16 per acre, probably more truly represents the average cost per acre of irrigation in Utah. The county showing the lowest average cost per acre enterprises were capable of irrigating in 1910—\$3.37—is Iron. The highest average costs per acre are in Piute and Boxelder Counties—\$20.27 and \$19.98 per acre, respectively.

The acreage for which cost of operation and maintenance in 1909 was reported constitutes 69 per cent of the total acreage reported as irrigated in 1909 and about 89 per cent of the acreage reported as irrigated by other than individual and partnership enterprises. The cost reported can be said, therefore, to represent fairly the average annual expense for all but individual and partnership enterprises.

## CROPS.

The data relating to irrigated crops are taken from supplemental schedules filled out by the regular census enumerators. Since the special agents found enterprises which the enumerators had not reported, it is evident that the information relating to irrigated crops is incomplete. It shows, however, the relative importance of the different irrigated crops and is sufficiently complete to afford reliable averages of yields.

The table following shows the acreage, yield, and value of the principal crops reported as grown under irrigation in 1909, in comparison with totals for the same crops reported for the entire state. While small quantities of other crops are grown both on irrigated and unirrigated land, the leading crops of the state, as well as the leading crops grown under irrigation, are represented in the table.

CROP.	ACREAGE.			YIELD.			VALUE.	
	Total for state.	Irrigated.		Unit.	Total for state.	On irrigated land.	Total for state.	For irrigated land.
		Amount.	Per cent of total.					
<b>Cereals:</b>								
Corn.....	7,267	6,752	92.9	Bushels.....	169,688	155,890	\$134,396	\$125,379
Oats.....	80,816	74,687	92.4	Bushels.....	3,221,289	3,085,554	1,671,065	1,578,417
Wheat.....	178,423	72,203	40.5	Bushels.....	3,943,910	2,059,709	3,765,017	2,006,852
Barley.....	26,752	15,938	59.6	Bushels.....	891,471	678,249	472,816	369,201
Rye.....	5,234	1,396	26.7	Bushels.....	65,754	27,412	46,388	18,206
<b>Other grains and seeds:</b>								
Alfalfa seed.....	13,297	8,083	60.8	Bushels.....	51,812	36,366	310,109	213,194
Clover seed.....	112	15	13.4	Bushels.....	422	65	2,595	500
Dry edible beans.....	196	106	54.1	Bushels.....	3,352	999	10,006	2,989
Dry peas.....	126	34	27.0	Bushels.....	3,222	697	5,753	1,648
<b>Hay and forage:</b>								
Timothy alone.....	16,819	10,852	64.5	Tons.....	34,214	23,685	302,980	211,763
Timothy and clover mixed.....	11,508	3,429	29.8	Tons.....	24,115	7,745	204,659	63,165
Clover alone.....	728	281	38.6	Tons.....	1,793	629	14,789	5,221
Alfalfa.....	284,182	250,210	88.0	Tons.....	791,355	724,395	5,950,250	5,425,453
Other tame or cultivated grasses <sup>1</sup> .....	19,587	15,756	80.4	Tons.....	31,848	26,384	224,198	198,068
Wild, salt, or prairie grasses.....	67,883	64,160	94.5	Tons.....	91,315	89,609	530,029	525,401
Grains cut green.....	1,541	1,057	68.6	Tons.....	2,625	1,861	20,500	14,470
Coarse forage.....	591	307	51.9	Tons.....	1,329	607	9,218	5,183
<b>Sundry crops:</b>								
Potatoes.....	14,210	13,264	93.3	Bushels.....	2,409,093	2,237,609	878,961	805,094
Sugar beets.....	<sup>2</sup> 27,442	26,032	94.9	Tons.....	413,811	393,897	1,857,316	1,777,435
Orchard fruits and grapes.....	( <sup>3</sup> )	7,482	.....	.....	.....	.....	669,030	482,619
Small fruits.....	<sup>3</sup> 1,416	1,268	89.5	.....	.....	.....	217,327	180,385

<sup>1</sup> Includes millet or Hungarian grass.<sup>2</sup> Preliminary tabulation, subject to correction.<sup>3</sup> Agricultural returns show number of trees, not acreage.

**Acreage.**—Of the entire acreage of the crops for which totals are presented in the table, 74.6 per cent is irrigated. The proportion irrigated varies widely for the different crops.

Of the acreage covered by the cereals shown in the table, 57.3 per cent is irrigated. Among these crops corn shows the highest proportion of acreage irrigated—92.9 per cent—and oats, comprising a considerably greater area, the next highest, 92.4 per cent. For wheat, which covers the largest total acreage of any of the grain crops, the percentage is 40.5.

In the case of the crops designated "Other grains and seeds," the irrigated acreage forms 60 per cent of the total. The highest percentage, 60.8 per cent, is reported for alfalfa seed, which is the only seed crop of this class covering any considerable area.

The hay and forage crops are much more generally raised on irrigated land, the irrigated acreage of such crops given in the table being 85.9 per cent of their total acreage. In the case of all of these except timothy and clover mixed and clover alone, more than half of the total acreage is irrigated. For "wild, salt, or prairie grasses" the percentage is 94.5. Very little alfalfa is grown without irrigation, the irrigated area being 88 per cent of the total for this crop. The proportions for "other tame or cultivated grasses," grains cut green, and timothy alone are 80.4, 68.6, and 64.5 per cent, respectively.

Of the acreage in sugar beets, 94.9 per cent is irrigated, and of that in potatoes 93.3 per cent. For small fruits, of which the total acreage is small, the percentage is 89.5.

Of the crops shown in the table, alfalfa covers the largest irrigated acreage, representing 43.6 per cent of the total for the crops given. The oats crop is next, with 13 per cent of this total; followed by wheat with 12.6 per cent, and "wild, salt, or prairie grasses," with 11.2 per cent. No other single crop covers as much as 5 per cent of the total acreage of the irrigated crops presented in the table.

While most of the irrigated crops are well distributed geographically, there is a tendency toward the concentration of certain crops in particular localities. This is shown by the following statement, which gives the counties having the largest acreages of the principal irrigated crops, with the proportions which they contain of the total irrigated acreages of these crops in the state.

**Corn.**—Utah County, 9.7 per cent; San Juan, 9.6 per cent; Grand, 9.5 per cent.

**Oats.**—Sanpete County, 9.5 per cent; Sevier, 9.3 per cent; Boxelder, 8.1 per cent.

**Wheat.**—Sanpete County, 15.1 per cent; Utah, 11.6 per cent; Cache, 10.1 per cent.

**Barley.**—Utah County, 21.5 per cent; Davis, 16.9 per cent; Boxelder, 13.8 per cent.

**Alfalfa seed.**—Emery County, 55.2 per cent; Millard, 20.9 per cent; Cache, 5.2 per cent

**Timothy alone.**—Summit County, 22.4 per cent; Wasatch, 17.5 per cent; Cache, 16.7 per cent.

**Timothy and clover mixed.**—Wasatch County, 40.7 per cent; Cache, 20.9 per cent; Summit, 19.3 per cent.

**Clover alone.**—Emery County, 54.1 per cent; Utah, 17.4 per cent; Davis, 6.4 per cent.

**Alfalfa.**—Sanpete County, 11.3 per cent; Utah, 10.5 per cent; Salt Lake, 8.4 per cent.

**"Wild, salt, or prairie grasses."**—Rich County, 33.4 per cent; Sanpete, 11.2 per cent; Summit, 8.1 per cent.

**Potatoes.**—Utah County, 19.6 per cent; Davis, 12.7 per cent; Salt Lake, 11.6 per cent.

**Sugar beets.**—Boxelder County, 31.6 per cent; Cache, 19.2 per cent; Utah, 17.6 per cent.

**Orchard fruits and grapes.**—Boxelder County, 16.9 per cent; Davis, 15.6 per cent; Weber, 13 per cent.

**Small fruits.**—Salt Lake County, 22.8 per cent; Utah, 21.6 per cent; Weber, 15.7 per cent.

**Yield.**—In the following table the average yields per acre of crops extensively grown, both with and without irrigation, are shown. The yields on unirrigated land are obtained by subtracting the totals for irrigated crops from the totals for the state.

CROP.	AVERAGE YIELD PER ACRE.		
	On unirrigated land.	On irrigated land.	
		Amount.	Per cent of excessive <sup>1</sup> yield on unirrigated land. <sup>1</sup>
Oats.....bushels..	25.4	41.1	61.8
Wheat.....bushels..	17.5	28.5	60.1
Barley.....bushels..	19.7	42.0	116.2
Alfalfa seed.....bushels..	1.76	2.19	24.4
Timothy alone.....tons..	1.76	2.18	23.9
Timothy and clover mixed.....tons..	2.03	2.26	11.3
Alfalfa.....tons..	1.97	2.90	47.2
Wild, salt, or prairie grasses.....tons..	0.46	1.40	204.3
Potatoes.....bushels..	181.3	168.7	-5.9
Sugar beets.....tons..	14.12	15.13	7.2

<sup>1</sup>A minus sign (-) indicates that the yield on irrigated land is less than that on unirrigated land.

All of the crops included in the table, except potatoes, show greater average yields on irrigated land than on unirrigated land; only a small acreage of potatoes was reported as not receiving water in 1909. The relative excess shown is more than 20 per cent in the case of all the crops except timothy and clover mixed and sugar beets, for which it is, respectively, 11.3 per cent and 7.2 per cent.

In considering these comparisons it should be borne in mind that they are not comparisons of yields on irrigated and on unirrigated land in the same localities, but of yields under irrigation in localities where crops can not be grown successfully without it, with yields in localities where irrigation is not necessary. They do not indicate, therefore, the relative advantages of farming with and without irrigation in a given community, but rather give one factor for determining the relative advantages of farming where irrigation is necessary and where it is not necessary for the successful growing of crops.

## IRRIGATION—UTAH.

## COUNTY TABLE.

The next table gives in detail, by counties, the data summarized above, except those relating to crops. For purposes of comparison the total number of farms in the state, the approximate land area of the state, the total land in farms, and the improved land in farms have been included in the table.

Certain enterprises extend into more than one county, and in the case of some of these enterprises the reports do not segregate the data by counties. In such cases a distribution has been made according to the best estimates possible from all the information in the possession of the bureau. It is believed that these estimates are approximately correct.

Attention is again directed to the fact that totals for the preceding census do not cover Indian reservations, no report as to irrigation on reservations

in Utah having been made at the Twelfth Census. Since, however, the figures for the present census show that the irrigation operations conducted on reservations were unimportant relatively to those in the state as a whole, it is believed that the shortage is not of material consequence as concerns comparisons between the two censuses. For this reason the percentages of increase have been computed without attempt to estimate the extent of Indian Service irrigation in 1899, and without the elimination from the 1909 and 1910 totals of the figures representing irrigation on reservations.

*Change of boundaries.*—In comparing the data secured in 1910 with those for the preceding census it should be borne in mind that part of Piute County was annexed to Sevier County in 1902.

# IRRIGATION—UTAH.

## ACREAGE IRRIGATED, EXTENT AND COST OF IRRIGATION ENTERPRISES, AND COST OF OPERATION AND MAINTENANCE, BY COUNTIES: 1909 AND 1910.

[Comparative data for 1899 in italics.]

	THE STATE.	Beaver.	Boxelder.	Cache.	Carbon.	Davis.	Emery.	Garfield.	Grand.
1	Number of all farms in 1910.....	21,076	319	1,527	1,907	1,302	666	409	172
2	Number of farms irrigated in 1909.....	19,709	313	1,271	1,501	1,193	664	383	126
3	Per cent of all farms.....	90.9	98.1	83.2	78.7	91.6	99.7	93.0	73.3
4	<i>Number of farms irrigated in 1899.....</i>	<i>17,024</i>	<i>293</i>	<i>794</i>	<i>1,632</i>	<i>802</i>	<i>449</i>	<i>216</i>	<i>97</i>
5	Per cent of increase, 1899-1909.....	10.0	6.8	60.1	5.1	32.3	47.9	78.1	29.9
<b>LAND AND FARM AREA</b>									
6	Approximate land area..... acres.	52,597,760	1,702,400	3,484,160	744,960	176,000	2,849,920	3,849,760	2,362,880
7	Land in farms..... acres.	3,307,690	45,086	345,185	284,180	56,653	127,257	96,708	59,073
8	Improved land in farms..... acres.	1,368,211	19,354	143,922	131,348	13,824	55,376	39,386	19,109
9	Acres irrigated in 1909.....	999,410	24,430	75,620	77,330	11,620	25,291	40,776	20,437
10	Per cent of total land area.....	1.9	1.4	2.2	10.4	1.2	14.4	1.6	0.8
11	Per cent of land in farms.....	29.4	53.1	22.1	26.3	20.5	19.9	48.4	44.1
12	Per cent of improved land in farms.....	73.0	2126.2	53.1	42.0	84.1	45.7	2118.8	2138.3
13	<i>Acres irrigated in 1899.....</i>	<i>629,293</i>	<i>11,402</i>	<i>29,708</i>	<i>58,653</i>	<i>6,350</i>	<i>25,100</i>	<i>21,840</i>	<i>10,745</i>
14	Per cent of increase, 1899-1909.....	58.8	113.1	155.6	31.8	82.8	114.2	146.0	125.0
15	Acres enterprises were capable of irrigating in 1910.....	1,250,246	26,630	94,133	82,503	30,862	25,447	50,524	33,532
16	Acres included in projects.....	1,947,625	31,031	129,034	110,304	40,778	35,245	87,303	49,322
<b>ACREAGE IRRIGATED AND INCLUDED IN PROJECTS</b>									
<b>CLASSIFIED BY CHARACTER OF ENTERPRISE.</b>									
17	U. S. Reclamation Service, irrigated in 1909.....								
18	Enterprises were capable of irrigating in 1910.....								
19	Included in projects.....								
20	U. S. Indian Service, irrigated in 1909.....	11,520							
21	Enterprises were capable of irrigating in 1910.....	86,600							
22	Included in projects.....	106,000							
23	Carey Act enterprises, irrigated in 1909.....	5,000							
24	Enterprises were capable of irrigating in 1910.....	20,000							
25	Included in projects.....	48,000							
26	Irrigation districts, irrigated in 1909.....	8,455			8,455				
27	Enterprises were capable of irrigating in 1910.....	8,455			8,455				
28	Included in projects.....	10,802			10,802				
29	Cooperative enterprises, irrigated in 1909.....	637,260	6,940	7,593	62,230	6,778	21,922	42,088	15,520
30	Enterprises were capable of irrigating in 1910.....	700,865	7,710	7,593	63,767	25,592	21,922	44,554	21,545
31	Included in projects.....	1,259,361	11,554	9,329	97,521	31,596	31,114	73,993	28,055
32	Commercial enterprises, irrigated in 1909.....	64,727		45,705	1,022				
33	Enterprises were capable of irrigating in 1910.....	87,070		60,648	1,022				
34	Included in projects.....	151,970		88,048	1,022				
35	Individual and partnership enterprises, irrigated in 1909.....	222,448	17,481	22,628	5,623	4,842	3,369	4,688	10,917
36	Enterprises were capable of irrigating in 1910.....	267,266	18,011	25,892	9,259	5,270	3,525	5,970	11,957
37	Included in projects.....	376,502	20,377	31,057	9,959	9,182	4,131	13,310	21,267
<b>ACREAGE IRRIGATED</b>									
<b>CLASSIFIED BY SOURCE OF WATER SUPPLY.</b>									
38	Supplied from streams.....	957,359	24,420	66,764	73,369	11,620	24,420	46,770	25,787
39	By gravity.....	954,800	24,420	66,764	73,369	11,620	24,420	46,324	25,787
40	By pumping.....	2,559						446	
41	Supplied from lakes.....	1,671							
42	By gravity.....	1,671							
43	By pumping.....								
44	Supplied from wells.....	4,400		503	45		835	6	
45	Flowing.....	4,100		222	45		835		
46	By pumping.....	300		281				6	
47	Supplied from springs.....	25,412	10	8,659	3,916		36		650
48	Supplied from reservoirs.....	508							
49	Total acreage supplied by pumping.....	2,859		281				452	
<b>IRRIGATION ENTERPRISES</b>									
50	Independent enterprises..... number..	2,472	109	218	137	45	116	46	107
51	<i>Number in 1899<sup>1</sup>.....</i>	<i>938</i>	<i>43</i>	<i>41</i>	<i>91</i>	<i>22</i>	<i>41</i>	<i>22</i>	<i>35</i>
52	Per cent of increase, 1899-1910.....	166.4	153.5	431.7	341.9	104.5	182.9	109.1	205.7
53	Main ditches..... number.....	2,495	125	185	139	50	47	51	106
54	<i>Number in 1899<sup>1</sup>.....</i>								
55	Per cent of increase, 1899-1910.....								
56	Length..... miles.....	5,837	208	354	324	123	139	236	202
57	<i>Length in 1899<sup>2</sup>.....</i>	<i>2,333</i>	<i>64</i>	<i>191</i>	<i>129</i>	<i>42</i>	<i>110</i>	<i>154</i>	<i>93</i>
58	Per cent of increase, 1899-1910.....	107.4	225.0	85.3	151.2	192.9	11.2	53.2	117.2
59	Capacity..... cubic feet per second.....	25,081	611	2,107	1,303	600	495	1,065	971
60	Laterals..... number.....	1,357	37	84	153	3	41	2	60
61	Length..... miles.....	1,822	31	116	142	6	59	1	34
62	Reservoirs..... number.....	430	13	69	1	4	28	15	18
63	Capacity..... acre-feet.....	588,317	12,945	260	1,566	26,746	14,611	13,850	43,477
64	Flowing wells..... number.....	1,138		77	33		242		
65	Capacity..... gallons per minute.....	42,794		1,768	734		9,551		
66	Pumped wells..... number.....	22						1	
67	Capacity..... gallons per minute.....	4,827		3,964				480	
68	Pumping plants..... number.....	69		23				11	
69	Engine capacity..... horsepower.....	2,143		206				376	
70	Pump capacity..... gallons per minute.....	315,057		3,987				62,000	
<b>COST</b>									
71	Cost of enterprises up to July 1, 1910..... dollars.....	14,028,717	91,922	1,880,966	304,285	449,291	408,483	509,285	262,095
72	<i>Cost in 1899<sup>3</sup>.....</i>	<i>3,865,502</i>	<i>45,724</i>	<i>1,291,773</i>	<i>162,260</i>	<i>29,335</i>	<i>283,394</i>	<i>33,560</i>	<i>10,765</i>
73	Per cent of increase, 1899-1910.....	139.2	101.0	45.6	87.5	1,481.6	43.9	32.0	681.0
74	Average cost per acre enterprises were capable of irrigating in 1910..... dollars.....	11.22	3.45	10.98	3.69	14.56	16.05	7.82	15.33
75	<i>Average cost per acre irrigated in 1899<sup>3</sup>.....</i>	<i>9.32</i>	<i>8.99</i>	<i>43.64</i>	<i>2.77</i>	<i>4.64</i>	<i>12.12</i>	<i>17.66</i>	<i>3.12</i>
76	Estimated final cost of existing enterprises..... dollars.....	17,840,775	96,922	1,880,966	304,285	494,151	408,483	587,485	266,075
77	Average per acre included in projects..... dollars.....	9.16	8.04	14.58	2.55	12.12	11.50	6.73	5.39
<b>OPERATION AND MAINTENANCE</b>									
78	Acres for which cost is reported.....	689,994	6,949	44,963	63,507	4,634	10,327	42,088	14,520
79	Total cost reported..... dollars.....	451,283	3,805	23,477	26,974	7,521	12,098	36,912	7,464
80	Average per acre for which cost is reported..... dollars.....	0.65	0.55	0.52	0.42	1.62	0.63	0.88	0.51
81	<i>Average cost per acre in 1899<sup>4</sup>.....</i>	<i>0.24</i>							
82	Per cent of increase, 1899-1909.....	170.8							

<sup>1</sup> Decrease.

<sup>2</sup> Acreage irrigated includes wild grass, while improved land does not.

<sup>3</sup> Figures relate only to systems obtaining water from streams.

<sup>4</sup> Not reported in 1899.

<sup>5</sup> State total includes \$142,966, representing cost of well systems not distributed by counties. County figures relate only to systems obtaining water from streams.

<sup>6</sup> Not reported by counties in 1899. Figure relates only to systems obtaining water from streams.

IRRIGATION—UTAH.

ACREAGE IRRIGATED, EXTENT AND COST OF IRRIGATION ENTERPRISES, AND

(Comparative data for 1899 in italics.)

	Iron.	Juab.	Kane.	Millard.	Morgan.	Piute. <sup>1</sup>	Rich.	Salt Lake.	San Juan.
1 Number of all farms in 1910.....	373	507	166	736	242	198	219	2,180	157
2 Number of farms irrigated in 1909.....	317	333	118	689	240	193	212	2,048	139
3 Per cent of all farms.....	85.0	65.7	71.1	93.6	99.2	97.5	96.8	93.9	88.5
4 Number of farms irrigated in 1899.....	203	312	103	627	277	187	205	2,110	49
5 Per cent of increase, 1899-1909.....	56.2	6.7	<sup>2</sup> 38.9	9.9	<sup>2</sup> 13.4	.....	<sup>2</sup> 20.0	<sup>2</sup> 2.9	183.7
<b>LAND AND FARM AREA</b>									
6 Approximate land area.....acres..	2,083,840	2,182,400	2,097,600	4,226,500	400,040	488,320	657,280	483,840	4,907,040
7 Land in farms.....acres..	88,027	108,564	24,773	106,627	95,648	25,869	149,500	160,262	48,707
8 Improved land in farms.....acres..	17,934	53,466	8,685	54,540	11,691	16,964	81,770	121,221	6,698
9 Acreage irrigated in 1909.....	11,624	14,216	3,220	48,992	11,909	13,262	63,030	82,710	8,915
10 Per cent of total land area.....	0.6	0.7	0.1	1.2	2.8	2.7	9.6	17.1	0.2
11 Per cent of land in farms.....	13.2	13.1	13.0	29.4	11.8	51.3	42.2	48.9	18.3
12 Per cent of improved land in farms.....	64.8	26.6	37.1	89.8	66.7	78.2	77.1	68.2	<sup>3</sup> 133.1
13 Acreage irrigated in 1899.....	5,620	10,612	3,321	30,655	8,649	10,161	38,901	54,568	1,573
14 Per cent of increase, 1899-1909.....	106.8	34.0	<sup>2</sup> 3.0	60.4	30.8	.....	62.0	51.5	466.8
15 Acreage enterprises were capable of irrigating in 1910.....	12,321	16,949	3,330	91,788	11,606	15,406	68,780	100,555	9,336
16 Acreage included in projects.....	19,652	21,699	6,633	241,922	12,058	51,253	30,791	121,452	21,254
<b>ACREAGE IRRIGATED AND INCLUDED IN PROJECTS</b>									
CLASSIFIED BY CHARACTER OF ENTERPRISE.									
17 U. S. Reclamation Service, irrigated in 1909.....									
18 Enterprises were capable of irrigating in 1910.....									
19 Included in projects.....									
20 U. S. Indian Service, irrigated in 1909.....									
21 Enterprises were capable of irrigating in 1910.....									
22 Included in projects.....									
23 Carey Act enterprises, irrigated in 1909.....				5,000					
24 Enterprises were capable of irrigating in 1910.....				20,000					
25 Included in projects.....				43,000					
26 Irrigation districts, irrigated in 1909.....									
27 Enterprises were capable of irrigating in 1910.....									
28 Included in projects.....									
29 Cooperative enterprises, irrigated in 1909.....	9,604	8,995	2,841	37,530	4,864	8,318	20,130	73,650	4,000
30 Enterprises were capable of irrigating in 1910.....	9,534	11,520	2,351	61,575	4,864	8,410	27,630	91,132	4,000
31 Included in projects.....	15,292	11,720	3,436	183,940	4,864	20,940	30,618	110,515	10,000
32 Commercial enterprises, irrigated in 1909.....							15,900		300
33 Enterprises were capable of irrigating in 1910.....							2,000	18,700	300
34 Included in projects.....							22,000	21,000	800
35 Individual and partnership enterprises, irrigated in 1909.....	2,120	5,221	879	6,402	6,445	4,944	21,000	9,060	4,615
36 Enterprises were capable of irrigating in 1910.....	2,787	5,429	979	10,213	6,742	4,996	22,450	9,302	5,036
37 Included in projects.....	4,360	9,979	3,197	14,982	7,194	8,313	20,173	10,937	10,454
<b>ACREAGE IRRIGATED</b>									
CLASSIFIED BY SOURCE OF WATER SUPPLY.									
38 Supplied from streams.....	10,814	13,579	2,843	45,966	10,704	13,037	62,830	81,709	8,695
39 By gravity.....	10,814	13,579	2,843	45,966	10,704	13,037	62,830	81,709	8,695
40 By pumping.....									
41 Supplied from lakes.....				480					
42 By gravity.....				480					
43 By pumping.....									
44 Supplied from wells.....	348	15		1		120		75	95
45 Flowing.....	348	15				120		68	90
46 By pumping.....				1				7	5
47 Supplied from springs.....	462	622	250	2,546	515	105	200	926	105
48 Supplied from reservoirs.....			127						20
49 Total acreage supplied by pumping.....				1				7	5
<b>IRRIGATION ENTERPRISES</b>									
50 Independent enterprises.....number..	47	43	7	47	77	39	48	112	75
51 Number in 1899 <sup>4</sup> .....	19	30	10	35	25	32	51	40	9
52 Per cent of increase, 1899-1910.....	147.4	115.0	<sup>2</sup> 56.3	34.3	208.0	94	54.8	180.0	733.3
53 Main ditches.....number..	31	47	33	50		51	60	95	47
54 Number in 1899 <sup>5</sup> .....									
55 Per cent of increase, 1899-1910.....									
56 Length.....miles..	58	101	42	282	134	154	186	298	77
57 Length in 1899 <sup>4</sup> .....	28	61	29	151	27	58	150	222	21
58 Per cent of increase, 1899-1910.....	107.1	65.6	44.8	115.3	396.3	43.1	23.1	34.2	260.7
59 Capacity.....cubic feet per second..	144	376	168	1,437	432	694	769	1,746	252
60 Laterals.....number..	8	31	6	52	35	18	39	89	2
61 Length.....miles..	9	30	4	154	18	13	66	123	1
62 Reservoirs.....number..	21	5	11	12	7	3	12	5	12
63 Capacity.....acre-feet..	2,229	79	199	173,518	74	131,040	10,631	932	292
64 Flowing wells.....number..	86	6				10		68	10
65 Capacity.....gallons per minute..	2,137	100				3,600		1,910	774
66 Pumped wells.....number..				1					1
67 Capacity.....gallons per minute..				110					200
68 Pumping plants.....number..				1					67
69 Engine capacity.....horsepower..				2					3
70 Pump capacity.....gallons per minute..				116					67
<b>COST</b>									
71 Cost of enterprises up to July 1, 1910.....dollars..	41,569	156,298	63,064	1,654,652	53,197	312,310	268,005	1,817,542	78,337
72 Cost in 1899 <sup>4</sup> .....	5,530	147,730	22,825	235,300	28,067	32,180	117,080	306,675	17,150
73 Per cent of increase, 1899-1910.....	651.7	5.8	176.3	632.8	89.6	870.5	128.9	125.3	66.1
74 Average cost per acre enterprises were capable of irrigating in 1910.....dollars..	3.37	9.22	18.94	18.03	4.58	20.27	3.90	18.08	8.39
75 Average cost per acre irrigated in 1899 <sup>4</sup> .....dollars..	1.02	13.93	6.37	7.43	3.24	9.17	3.01	14.38	30.09
76 Estimated final cost of existing enterprises.....dollars..	44,468	156,298	65,397	2,088,652	53,197	450,648	268,005	1,827,542	90,337
77 Average per acre included in projects.....dollars..	2.26	7.20	9.86	8.63	4.41	8.79	2.98	15.05	4.25
<b>OPERATION AND MAINTENANCE</b>									
78 Acreage for which cost is reported.....	8,754	8,995	2,341	24,976	4,320	6,790	42,030	61,676	4,300
79 Total cost reported.....dollars..	4,390	5,517	3,249	29,100	1,708	3,292	9,167	37,284	4,963
80 Average per acre for which cost is reported.....dollars..	0.50	0.61	1.39	1.17	0.40	0.48	0.22	0.60	1.15
81 Average cost per acre in 1899 <sup>6</sup> .....dollars..									
82 Per cent of increase, 1899-1909.....									

<sup>1</sup> Change of boundary. (See explanation at close of text.)

<sup>2</sup> Decrease.

<sup>3</sup> Acreage irrigated includes wild grass, while improved land does not.

# IRRIGATION—UTAH.

## COST OF OPERATION AND MAINTENANCE, BY COUNTIES: 1909 AND 1910—Continued.

[Comparative data for 1899 in italics.]

	Sanpete.	Sevier.	Summit.	Tooele.	Uinta.	Utah.	Wasatch.	Washington.	Wayne.	Weber.
1	Number of all farms in 1910.....									
2	1,708	1,059	447	320	675	2,873	964	598	246	1,535
3	Number of farms irrigated in 1909.....									
4	1,650	1,034	396	272	586	2,717	946	568	235	1,396
5	Per cent of all farms.....									
6	96.6	97.6	88.6	85.0	86.8	94.6	98.1	95.0	95.5	90.9
7	Number of farms irrigated in 1899.....									
8	1,560	921	563	408	531	2,675	483	463	256	1,417
9	Per cent of increase, 1899-1909.....									
10	6.5		28.4	33.3	10.4	1.6	95.9	25.4	8.2	1.5
<b>LAND AND FARM AREA</b>										
11	Approximate land area.....acres..									
12	1,000,960	1,285,920	1,191,680	4,383,300	3,350,400	1,301,760	2,786,560	1,577,600	1,584,000	346,240
13	Land in farms.....acres..									
14	261,771	122,332	261,050	88,332	82,072	234,717	154,083	50,273	31,617	148,359
15	Improved land in farms.....acres..									
16	105,807	50,328	32,645	34,239	35,748	124,496	43,220	13,632	11,588	59,781
17	Acreage irrigated in 1909.....									
18	88,959	51,922	37,245	12,318	48,469	89,886	39,031	18,686	13,842	47,505
19	Per cent of total land area.....									
20	8.9	4.1	3.1	0.3	1.4	6.9	1.4	1.2	0.9	13.7
21	Per cent of land in farms.....									
22	34.0	42.2	14.3	13.9	59.1	38.3	25.3	37.2	43.8	32.0
23	Per cent of improved land in farms.....									
24	84.1	91.6	114.1	36.0	135.6	72.2	90.3	137.1	120.0	79.5
25	Acreage irrigated in 1899.....									
26	61,460	38,133	23,695	8,487	20,185	74,872	17,614	7,904	8,095	33,111
27	Per cent of increase, 1899-1909.....									
28	44.7	52.4	30.3	29.8	140.1	20.1	121.6	136.4	52.2	43.5
29	Acreage enterprises were capable of irrigating in 1910.....									
30	90,389	52,425	30,313	13,006	139,850	102,926	49,539	24,662	15,980	48,131
31	Acreage included in projects.....									
32	133,589	68,993	46,312	18,523	186,886	127,020	106,841	67,681	34,617	56,160
<b>ACREAGE IRRIGATED AND INCLUDED IN PROJECTS</b>										
CLASSIFIED BY CHARACTER OF ENTERPRISE.										
33	U. S. Reclamation Service, irrigated in 1909.....									
34	Enterprises were capable of irrigating in 1910.....									
35	Included in projects.....									
36	U. S. Indian Service, irrigated in 1909.....									
37	Enterprises were capable of irrigating in 1910.....									
38	Included in projects.....									
39	Carey Act enterprises, irrigated in 1909.....									
40	Enterprises were capable of irrigating in 1910.....									
41	Included in projects.....									
42	Irrigation districts, irrigated in 1909.....									
43	Enterprises were capable of irrigating in 1910.....									
44	Included in projects.....									
45	Cooperative enterprises, irrigated in 1909.....									
46	Enterprises were capable of irrigating in 1910.....									
47	Included in projects.....									
48	Commercial enterprises, irrigated in 1909.....									
49	Enterprises were capable of irrigating in 1910.....									
50	Included in projects.....									
51	Individual and partnership enterprises, irrigated in 1909.....									
52	Enterprises were capable of irrigating in 1910.....									
53	Included in projects.....									
<b>ACREAGE IRRIGATED</b>										
CLASSIFIED BY SOURCE OF WATER SUPPLY.										
54	Supplied from streams.....									
55	87,872	47,516	35,581	10,492	47,893	82,309	38,058	18,020	13,092	46,420
56	By gravity.....									
57	87,872	47,516	35,581	10,492	47,708	82,299	38,058	17,960	13,092	46,420
58	By pumping.....									
59					185	10		60		
60	Supplied from lakes.....									
61		1,100					91			
62	By gravity.....									
63		1,100					91			
64	By pumping.....									
65										
66	Supplied from wells.....									
67	209	451		200		1,238				169
68	Flowing.....									
69	209	451		200		1,238				169
70	By pumping.....									
71	Supplied from springs.....									
72	878	2,555	1,664	1,536		6,324	882	646	720	916
73	Supplied from reservoirs.....									
74					356	15		20	30	
75	Total acreage supplied by pumping.....									
76					185	10		60		
<b>IRRIGATION ENTERPRISES</b>										
77	Independent enterprises..... number.....									
78	106	78	173	77	66	230	162	105	39	107
79	Number in 1899.....									
80	78	32	110	18	15	83	19	32	26	55
81	Per cent of increase, 1899-1910.....									
82	35.9	57.3	327.8	340.0	177.1	752.6	228.1	50.0	205.7	
83	Main ditches..... number.....									
84	177	69	173	70	90	226	166	138	49	75
85	Number in 1899.....									
86										
87	Per cent of increase, 1899-1910.....									
88										
89	Length.....miles.....									
90	394	234	277	168	371	460	365	263	141	192
91	Length in 1899.....miles.....									
92	208	205	133	110	91	155	67	101	70	166
93	Per cent of increase, 1899-1910.....									
94	89.4	108.3	52.7	307.7	196.8	489.6	160.4	101.4	15.7	
95	Capacity.....cubic feet per second.....									
96	1,630	1,300	635	239	3,130	1,730	1,303	437	366	688
97	Laterals..... number.....									
98	118	44	138	36	160	70	38	17	17	50
99	Length.....miles.....									
100	139	55	58	28	384	133	69	15	21	106
101	Reservoirs..... number.....									
102	30	17	22	37	5	56	17	16	18	26
103	Capacity.....acre-feet.....									
104	33,816	11,925	488	443	464	48,612	1,484	44,242	14,274	320
105	Flowing wells..... number.....									
106	156	103	102			195				50
107	Capacity.....gallons per minute.....									
108	4,070	5,125	2,102			9,316				1,007
109	Pumped wells..... number.....									
110										
111	Capacity.....gallons per minute.....									
112										
113	Pumping plants..... number.....									
114					3	5		3		1
115	Engine capacity.....horsepower.....									
116					54	958		102		25
117	Pump capacity.....gallons per minute.....									
118					3,700	202,900		2,330		8,700
<b>COST</b>										
119	Cost of enterprises up to July 1, 1910.....dollars.....									
120	630,936	404,501	143,499	165,573	989,427	1,868,232	442,162	372,362	113,935	463,000
121	Cost in 1899.....dollars.....									
122	272,800	295,240	99,305	49,000	121,825	572,905	64,160	133,115	63,605	390,533
123	Per cent of increase, 1899-1910.....									
124	131.5	37.0	43.8	288.7	671.1	226.1	589.2	202.5	79.4	18.6
125	Average cost per acre enterprises were capable of irrigating in 1910.....dollars.....									
126	6.98	7.72	3.65	12.17	7.18	18.15	8.93	15.10	7.13	9.62
127	Average cost per acre irrigated in 1899.....dollars.....									
128	4.45	8.31	5.51	4.59	6.04	7.78	3.64	15.61	6.08	11.91
129	Estimated final cost of existing enterprises.....dollars.....									
130	658,214	404,501	143,499	165,573	995,635	4,613,401	525,965	507,362	146,925	463,000
131	Average per acre included in projects.....dollars.....									
132	4.93	5.86	3.10	8.94	5.33	36.32	4.02	7.50	4.24	8.25
<b>OPERATION AND MAINTENANCE</b>										
133	Acreage for which cost is reported.....									
134	76,628	42,094	13,519	4,907	27,694	77,084	20,096	12,755	10,470	42,307
135	Total cost reported.....dollars.....									
136	28,171	29,873	5,269	30,980	10,515	49,189	18,328	17,276	10,272	31,318
137	Average per acre for which cost is reported.....dollars.....									
138	0.37	0.71	0.39	6.32	0.38	0.64	0.91	1.35	0.98	0.74
139	Average cost per acre in 1899.....dollars.....									
140										
141	Per cent of increase, 1899-1909.....									
142										

Figures relate only to systems obtaining water from streams.

Not reported.

Not reported by counties.