

DEPARTMENT OF COMMERCE  
BUREAU OF THE CENSUS

SAM. L. ROGERS, DIRECTOR  
RESIGNED APRIL 13, 1921

W. M. STEUART, DIRECTOR  
APPOINTED APRIL 14, 1921

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FOURTEENTH CENSUS OF THE UNITED STATES  
TAKEN IN THE YEAR 1920

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VOLUME VII

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IRRIGATION AND  
DRAINAGE

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GENERAL REPORT AND ANALYTICAL TABLES  
AND REPORTS FOR STATES, WITH STATISTICS FOR COUNTIES

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PREPARED UNDER THE SUPERVISION OF WILLIAM LANE AUSTIN  
CHIEF STATISTICIAN FOR AGRICULTURE



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1922.

## REPORTS OF THE FOURTEENTH CENSUS.

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### POPULATION:

- Volume I.—NUMBER AND DISTRIBUTION OF INHABITANTS.
- Volume II.—GENERAL REPORT AND ANALYTICAL TABLES.
- Volume III.—COMPOSITION AND CHARACTERISTICS OF THE POPULATION, BY STATES.
- Volume IV.—OCCUPATIONS.

### AGRICULTURE:

- Volume V.—GENERAL REPORT AND ANALYTICAL TABLES.
- Volume VI.—REPORTS FOR STATES, WITH STATISTICS FOR COUNTIES.
  - Part 1.—THE NORTHERN STATES.
  - Part 2.—THE SOUTHERN STATES.
  - Part 3.—THE WESTERN STATES AND THE OUTLYING POSSESSIONS.
- Volume VII.—IRRIGATION AND DRAINAGE—GENERAL REPORT AND ANALYTICAL TABLES, AND REPORTS FOR STATES, WITH STATISTICS FOR COUNTIES.

### MANUFACTURES:

- Volume VIII.—GENERAL REPORT AND ANALYTICAL TABLES.
- Volume IX.—REPORTS FOR STATES, WITH STATISTICS FOR PRINCIPAL CITIES.
- Volume X.—REPORTS FOR SELECTED INDUSTRIES

### MINING:

- Volume XI.—MINES AND QUARRIES—GENERAL REPORT AND ANALYTICAL TABLES, AND REPORTS FOR STATES AND SELECTED INDUSTRIES.

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## ABSTRACT OF THE FOURTEENTH CENSUS.

## LETTER OF TRANSMITTAL.

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DEPARTMENT OF COMMERCE,  
BUREAU OF THE CENSUS,  
*Washington, D. C., September 1, 1921.*

SIR:

I transmit herewith Volume VII of the Reports of the Fourteenth Decennial Census, which contains the general report and analytical tables, and reports for states, with statistics for counties of the census of irrigation and drainage. The statistics of irrigation are also presented by drainage basins. Volume VII, together with Volumes VI and V, contains the results of the 1920 census of agriculture. Volume VI consists of three parts presenting detailed statistics, respectively, for (1) the Northern states, (2) the Southern states, and (3) the Western states and the outlying possessions. Each part contains a general summary for the United States and a brief summary for the three sections, in addition to the separate reports, with statistics by counties, for the states in the area to which it especially relates. Volume V contains the general report and analytical tables.

The census of agriculture was taken in conformity with "An act to provide for the Fourteenth and subsequent Decennial Censuses," approved March 3, 1919.

The collection and compilation of the statistics of irrigation and drainage and the preparation of the reports have been under the supervision of William Lane Austin, chief statistician for agriculture, assisted by Ray P. Teele, special agent for irrigation, and Roger D. Marsden, special agent for drainage. The chief of division for irrigation and drainage during the decennial census period was John W. Curry.

Respectfully,

W. M. STEUART,  
*Director of the Census.*

HON. HERBERT HOOVER,  
*Secretary of Commerce.*

(3)

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RAY P. TEELE

SPECIAL AGENT FOR IRRIGATION

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Irrigated areas shown in red

Scale 1:1,000,000

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# APPENDIX

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## INSTRUCTIONS AND SCHEDULES

# INSTRUCTIONS AND SCHEDULES.

For the purpose of making inquiries with regard to irrigation and drainage of lands for agriculture in connection with the Fourteenth Decennial Census of the United States, as provided by the act of Congress approved March 3, 1919, the accompanying instructions were issued for the guidance of special agents and enumerators. These instructions relate in particular to the special schedule for irrigation enterprises and the special schedule for drainage enterprises, copies of which appear herein, and set forth the pro-

cedure which was followed in obtaining reports of irrigation and drainage enterprises on these schedules.

The data relating to irrigated crops, as well as certain information concerning drainage, were obtained on the general farm schedule by the census enumerators. The instructions pertaining to irrigation and drainage which were used in connection with the general farm schedule, together with the inquiries concerning these subjects as they appeared on the schedule, are also shown herein.

## INSTRUCTIONS TO SPECIAL AGENTS.

[NOTE.—These instructions were not on the schedules themselves but in a separate pamphlet.]

### GENERAL INSTRUCTIONS.

**Supervision.**—The inquiries regarding irrigation and drainage are a part of the Census of Agriculture and therefore under the general supervision of the Chief Statistician for Agriculture.

**To whom special agents doing field work should report.**—In sections where both irrigation and drainage are practiced, the same field agents will canvass both irrigation and drainage enterprises. All special agents doing field work on irrigation or drainage will report to the Chief Statistician for Agriculture. If for any reason arising during the canvass any other arrangement shall become necessary in any individual case, the special agent in the field will be given instructions by the Chief Statistician for Agriculture.

**Obligation to secrecy.**—Special agents engaged in field work, in common with other employees of the Census Bureau, are prohibited by law from communicating to anyone, without authority of the Director of the Census, any information coming into their possession by reason of their employment in the Census Bureau. Attention is called to the penal provision of the Census act.

**Answers to inquiries to be based upon records.**—Agents may occasionally find a disposition on the part of persons furnishing information to give general statements or estimates. In no case should such estimates be accepted when it is possible to secure more exact information directly from records. It is not expected that special agents will spend much time in compiling figures from the records of independent enterprises, but they should try to get from the officials of enterprises exact information based on records, rather than general statements. In many cases, particularly with small enterprises, full records do not exist; in such cases, of course, estimates should be accepted.

In cases where one public officer has the records for a large number of enterprises, the special agent should assist as far as practicable in securing the data from the books or other records.

**Date to which information should relate.**—Where inquiries are made with regard to present conditions, the information given should represent conditions on January 1, 1920, rather than on the (later) date when the schedule is filled out.

**General reports.**—Before completing his work each special agent should prepare a brief report on conditions within the territory covered by him, showing in a general way, not in detail, the opportunities for further reclamation of land by irrigation or drainage, or both; attempts which have been made to bring about such reclamation; and proposed plans for reclamation. It is not expected that special agents will make extensive studies as a basis for these reports, but they should keep the matter in mind during their work and make notes as information of the kind desired comes to their notice. These reports are not intended for publication, but for use in discussing the results of the definite data collected.

**Mapping of irrigated areas.**—Agents will be furnished with maps of their districts. These maps have been subdivided sufficiently

to permit of indicating 40-acre tracts, and in some cases smaller tracts. When enumerating a farm on which irrigation is practiced agents should locate the ground on the map, and block in with pencil the land irrigated. This should be attended to when the farm is enumerated.

### THE CENSUS OF IRRIGATION.

**Data from general farm schedules.**—The acreage of farm land irrigated and the data regarding irrigated crops, as well as the acreage supplied with artificial drainage, are to be obtained on the general farm schedule by the census enumerators. The general farm schedule also calls for the name of the irrigation enterprise supplying water (Inquiry 56) and for the name of the company, district, etc., affording drainage (Inquiry 33).

**Special schedule for irrigation enterprises.**—A special irrigation schedule is to be obtained for each irrigation enterprise, whether it supplies water for a single farm or for many farms. Schedules are not to be returned, however, for small plants used for watering lawns or home gardens. Note that while the unit for the general farm schedule is the individual farm, the unit for the special irrigation schedule is the enterprise or organization supplying water for irrigation. Schedules should be returned for enterprises which have been organized and have begun work, although no land is yet irrigated; or in case the enterprise is a going concern with plans for proceeding with construction, even if construction has not yet begun. In such cases answer the questions which apply, and explain the facts in some blank space or on the margin of the schedule.

**Drainage schedules to be secured in connection with irrigation census.**—As indicated above, special agents engaged primarily in work on the irrigation census in the arid and semiarid regions will be expected also to secure drainage schedules for all drainage enterprises in their respective territories.

**How special schedules are to be secured.**—Most of the irrigation schedules for large enterprises will be secured by special agents, as indicated below. Irrigation schedules for enterprises supplying less than five farms, however, are to be obtained by enumerators at the same time that they secure the population and general farm schedules.

In enumeration districts which are difficult of access and in which most of the enterprises are small, even though some may supply more than four farms, the enumerator will be instructed to get schedules for all enterprises regardless of size.

**Special agents assigned to supervisors' districts.**—A special agent will be stationed in each supervisor's district in which irrigation is extensively practiced. It will be the duty of such special agent to instruct the enumerators in his district with regard to the irrigation schedules, to check over the irrigation schedules turned in by the enumerators, to return these schedules to the enumerators for correction when necessary, and to make additions to the lists of irrigation and drainage enterprises sent him from Washington by comparing them with the names of the irrigation and drainage en-

terprises shown on the general farm schedules (Inquiries 56 and 33, respectively).

**Relations between special agents and supervisors.**—Since the enumerators in a given district are responsible to the supervisor, and not directly to the special agent, the special agent must deal with them through the supervisor. In each district, therefore, the special agent must arrange to instruct the enumerators, to return schedules for correction, and to carry on all his dealings with the enumerators in a manner that is satisfactory to the supervisor of the district. He must also arrange to use the general farm schedules for purposes of comparison with his list of irrigation and drainage enterprises at such times and in such manner as may be agreeable to the supervisor. If there is any difficulty in making satisfactory arrangements, the matter should be referred to the Chief Statistician for Agriculture, at Washington.

**Lists of irrigation enterprises.**—The special agent in each supervisor's district will be supplied with lists of irrigation enterprises in his district made up from the returns of the last preceding census, and from other available sources of information. A typewritten list is provided for the agent's use as a permanent record, and a card list, containing the same names, to be returned to Washington card by card, with the schedules as they are secured. These lists may not be complete, and they will probably contain names of enterprises which are now inactive or have changed hands since the last census.

For the purpose of completing and correcting the lists, an inquiry has been placed on the general farm schedule calling for the name of the enterprise supplying water for irrigation, in case a farm, or any part of it, is irrigated.

**Lists to be checked with general farm schedules.**—The first duty of the special agent will be to examine all the general farm schedules as they are received from the enumerators by the supervisors; to check against his list the names of enterprises reported under Inquiry 56 on these schedules; and to add to the list the names of any such enterprises which it does not already contain. New names and corrections should be promptly reported to the Washington office on the daily report card or on a memorandum attached thereto.

**Additional names to be placed on lists.**—The names of all enterprises which are to be added to the list should be inserted in their proper alphabetical places, and should be provided with the numbers by adding *a*, *b*, *c*, etc., to the last preceding number. Thus, two new names inserted between No. 16 and No. 17 would be numbered 16*a* and 16*b*, respectively.

Where the irrigation enterprise is reported as "private" in answer to Inquiry 56 on the general farm schedule, the enterprise should be entered on the lists in the name of the farm operator.

**Lists of drainage enterprises in irrigation areas.**—Lists of drainage enterprises, as well as of irrigation enterprises, will be supplied to special agents in the arid and semiarid regions. The names of drainage enterprises reported under Inquiry 33 on the general farm schedule should be checked against these lists, and the names of any drainage enterprises not already on the list should be inserted in their proper places and numbered, as already directed for additional irrigation enterprises.

**Lists to serve as records of work accomplished.**—The lists, as revised, are to be used as a guide in making the canvass, and as irrigation or drainage schedules are received, this fact should be indicated on the cards and on the typewritten lists, with the date of receipt. As the schedules are returned for correction, or are forwarded to Washington, the dates of returning or forwarding should also be recorded on the cards and on the typewritten lists.

There should be a report of some kind for every enterprise on the list. If the enterprise has ceased to operate, or if it has changed hands, or if there is any other good reason why a schedule should not be obtained, this reason should be clearly stated. When such facts are ascertained they should be entered on the cards and on the typewritten lists and also reported at once to the Chief Statistician for Agriculture, at Washington.

**Schedules to be obtained by enumerators.**—As stated in these instructions, the enumerators are to secure irrigation schedules for irrigation enterprises supplying water to less than five farms, at the same time that they get general farm schedules from the occupants of the farms which these enterprises serve. It will be the duty of the special agents to examine these schedules as they come in from the enumerators; to return them to the enumerators for completion or correction, if necessary; to check them up with the list, after the new enterprises found on the general farm schedules have been added; to see that the enumerators are making out irrigation schedules in all cases where they should; and to make proper records of the dates of receipt, return, and forwarding of schedules. In general, it will be the duty of the special agent in each supervisor's district to see that the canvass of small enterprises by the enumerators in his district is completed in a satisfactory manner.

**Duplicate schedules.**—Special agents stationed in supervisors' districts should check carefully the names of farmers reported on the irrigation schedules turned in by enumerators, as well as the names of the enterprises, to see that only one schedule is turned in for a canal supplying more than one farm. If duplicates are discovered, that fact should be brought to the attention of the supervisor, in order that he may take it into consideration in computing the pay of the enumerators turning in the duplicates.

**Schedules to be obtained by special agents.**—The special agents are to get schedules for all enterprises not covered by enumerators. The work of the enumerators is to be completed in 30 days, and after that time the special agents should devote themselves to completing the canvass in their districts.

**Forwarding of schedules.**—As soon as schedules are received, numbered, examined, and found to be complete, they should be transmitted to the Director of the Census at Washington.

#### THE IRRIGATION SCHEDULE.

The following paragraphs give detailed explanations and instructions relative to the inquiries on the irrigation schedule. Items not specifically referred to in these paragraphs are assumed to be self-explanatory.

**Questions requiring additional space.**—If the reply to any question on the schedule requires additional space, or needs explanation, use any blank spaces on the schedule (with appropriate reference marks), or, if necessary, attach a separate sheet to the schedule. If an extra sheet is used, explanations should be numbered to correspond with the inquiries to which they refer, and all explanations relating to one schedule should be written on a single sheet, if possible.

**Inquiry 1. Information concerning management.**—The first entry under this inquiry should be the name of the irrigation enterprise or canal to which the schedule relates.

**When names of farmers are to be given.**—Next should be given the name of the individual or company controlling the enterprise. Then, in case of an enterprise supplying less than five farms, the names of the farmers who are supplied with water should be given on the extra blank lines. The names of the farmers supplied are *not* to be given for enterprises supplying five farms or more.

**Farms supplied by two or more ditches.**—If a farm is supplied with water by more than one ditch, and these ditches supply water to other farms, a schedule should be made out for each ditch; but if a farm is supplied with water by more than one ditch and these ditches supply no other farm or farms, all such ditches should be included on a single schedule, the names, if the ditches are named, being written on the blank lines under Inquiry 1.

**Separate organizations controlling laterals.**—If the laterals distributing water from a main canal are controlled by separate organizations, rather than by the organization controlling the main canal, this fact should be stated on the blank lines under Inquiry 1, or on a separate sheet, but the information regarding the laterals should be included on the schedule for the main enterprise.

If there is a question whether the organization controlling the main canal and those controlling the laterals should be reported as separate enterprises (see note on schedule under Inquiry 6), the special agent should exercise his best judgment, but, in every case he should state the facts clearly and report all data in such a way that correct totals for the main and subsidiary canals will be given, without duplication.

**Inquiry 2. Source of water supply.**—If water is secured from more than one source, all should be marked and the principal source indicated by underscoring. Similarly, if water is secured from two or more streams or other sources, the names of all should be given.

**Stored storm water.**—"Stored storm water" refers to reservoirs filled by storing storm water from drainage channels that carry water only during storms, and are not classed as streams. When water is obtained from a reservoir filled from a stream, the stream should be given as the source. The other designations are self-explanatory.

**Drainage basins.**—Under "Drainage basin" the name of the smallest stream that is well known and which is shown on ordinary maps should be given, rather than that of the large river system to which the valley where the enterprise is located is tributary. For example, an enterprise in Wyoming or Montana should not be reported as in the Missouri, Colorado, or Columbia drainage basin, as the case may be, but in the drainage basin of some such stream as the Big Horn, Bitter Root, or Green River, or some of their larger tributaries.

This inquiry should be answered, even if water is not obtained from a stream.

**Inquiry 3. Class of enterprise.**—The classes into which irrigation enterprises are divided for census purposes are defined on the schedule. This is one of the most important classifications to

be made and great care should be exercised to report enterprises correctly, and to explain, in the blank spaces provided for that purpose, any changes in form of organization which may have taken place. This is particularly important in the case of Carey Act, United States Reclamation Service, and commercial enterprises which have been reorganized as irrigation districts or cooperative enterprises.

**Public records of irrigation enterprises.**—Irrigation districts are organized under public supervision, in most states that of the county commissioners, and in most states annual reports must be made to some county official. Consequently it is possible to get much of the information regarding districts from county records, and if there is difficulty in getting it from district officials, resort should be had to the public records.

Carey Act enterprises operate under more or less close supervision of state land boards, and information regarding them can be obtained from state records.

**Inquiry 4. Water rights.**—This inquiry relates to the rights of the enterprise to take water from the stream or other source from which it is obtained. (See note on schedule.) If the right does not fall into any of the classes given, state the nature of the right on the blank line.

**Units of measure for water.**—If rights have been defined by a court, a state board, or a state official, the amounts should be given in the units in which they are defined. Otherwise, rights to flowing water should be expressed in cubic feet per second, and rights to store water in acre-feet.

**Inquiry 5. Description of works.**—Under "General description of system" should be given such information as will make clear the general character of the water supply and the works for diverting, conveying, storing, or lifting it, and distributing it to farms. In this description any important items of equipment not called for on the schedule should be noted.

Definitions of main and lateral ditches are given in the note at the head of this inquiry.

If drainage works have been built either by the organization controlling the irrigation enterprise or by a separate organization, secure a drainage schedule covering the drainage works.

**Laterals.**—Laterals should be reported here whether they form a part of the main enterprise or not, but the description should show the extent to which they are built and controlled by the agency controlling the main enterprise.

**Pipe lines.**—If pipe lines of more than one size are used, the length of pipe of each size should be given, by writing between the lines on the schedule, or on an extra sheet.

**Reservoirs.**—If capacity of reservoir is not known, it should be estimated by multiplying the area of the water surface when reservoir is full, expressed in acres, by the average depth above the level of the bottom of the outlet, expressed in feet.

**Wells.**—If capacities of either flowing or pumped wells are not known, agents should get the best estimates possible. In the case of pumped wells, where capacities are not known, and have not been determined beyond the capacities of the pumps used, the capacities of the pumps should be given as the capacities of the wells.

**Total capacity to be reported.**—In every case give the total capacity of all reservoirs, wells, or pumps belonging to the enterprise being reported—not the capacity of individual reservoirs, wells, etc.

**Kind of power.**—Under "Kind of power" state whether pumps are run by wind, water, steam, electricity, or internal-combustion engines. If electric power is obtained from a power company, report electricity, regardless of how the power is developed.

**Windmills.**—If windmills are used, under capacity give diameters of wheels rather than horsepower.

**Kind of pumps.**—Under "Kind of pumps" state whether pumps are centrifugal, rotary, plunger, or other kind. If some unusual type of pump or other water-lifting device is used, describe it briefly under "General description," or on a separate sheet to be attached to the schedule.

**Average lift.**—Under "Average lift" give the average vertical distance between the level of the water in the source of supply when the pumps are running and the point to which the water is lifted. Do not consider friction and velocity heads or horizontal distances.

**Inquiry 6. Lands.**—Particular attention should be paid to the note at the head of this inquiry. If the enterprise controls a canal or reservoir which supplies water to lands covered by other enterprises, this fact should be stated, and the names of the enterprises to which water is supplied should be given, but no acreage which is reported by another enterprise should be included. See instructions under Inquiry 1 for treatment of enterprises under which laterals are controlled by separate organizations.

**Acreage in project.**—Under "Total acreage in project" only the acreage to which it is definitely planned to supply water should be reported. Possible extensions not yet definitely planned should not be included.

**Area irrigated in 1919.**—The "Area actually irrigated during 1919" should be limited to land to which water was actually applied during that season. It should not include land which is under ditch and sometimes irrigated, but which was not watered in 1919, nor land not yet cropped and irrigated on farms that are in process of reclamation. If water is supplied to canals rather than directly to land, the names of the canals to which water is supplied should be given.

**Land watered from two or more enterprises.**—If the same land received water from more than one enterprise, the acreage should be divided among the enterprises approximately in proportion to the quantity of water received from each, except that in case land receives its main supply from a canal and gets additional water from a reservoir controlled by another enterprise the entire acreage should be reported under the enterprise controlling the canal, with a statement that the land receives stored water from the enterprise controlling the reservoir. The total must not in any case exceed the total acreage actually irrigated. Agents need not spend much time in trying to determine exactly the relative amounts of water received from different sources for the purpose of distributing the acreage, but should estimate it roughly from statements of officials of enterprises.

**Area which works are capable of irrigating in 1920.**—This item should include all land to which the enterprise is ready and able to supply water, whether land is settled or not.

**Lands available for settlement covered by this enterprise.**—This item should be limited to land for which water is available or is to be made available, and which is not yet settled. Land already settled should not be included even if it is for sale, unless the holdings are to be subdivided, when only the parts of such holdings that are to be sold for new farms should be reported as available for settlement. If the management of an enterprise is itself farming land pending its settlement, the land should be reported as available for settlement.

**Price of unimproved lands suitable for agriculture covered by this enterprise.**—This item relates strictly to land covered by the enterprise being reported, and not to other land in the vicinity. If no unimproved land is included in the enterprise this inquiry should not be answered. If land and water rights are sold together for a specified price and it is not possible to segregate the part representing land from that representing water rights, this fact should be stated and the part representing land should be estimated. If land is not for sale at a uniform price, the average price prevailing at the time of the canvass should be given.

**Average cost of preparing land for irrigation.**—Under this heading should be given the best estimate obtainable from the officials of the enterprise being reported or from farmers operating under the enterprise. Frequently this amount will vary so much from farm to farm that a strictly accurate reply to this inquiry can not be obtained; yet for any enterprise it should be possible to make a fairly representative estimate.

**Inquiry 7. Capital invested.**—For the purpose of this inquiry, "capital invested" is defined as "cost," and the original cost plus the cost of extensions and improvements should be reported, if this can be obtained. If irrigation works have been purchased by the present owners the original cost, rather than the purchase price, should be determined or estimated; but if this can not be done the purchase price plus the cost of improvements and extensions since the works came into the present ownership should be given, with a note stating that this is what the figures represent.

If drainage works have been built, report the cost of these works separately on a drainage schedule.

**Irrigation works and equipment.**—Under "Irrigation works and equipment" should be reported the cost of dams, canals, structures, pipe lines, etc., including extensions and permanent improvements; the cost of land and buildings used for maintenance and operation, such as gatekeepers' houses, roadways, etc.; the cost of machinery, tools, and work animals used principally for maintenance and operation; and all legal and administrative expenditures connected with original construction (or acquisition) or with improvements and extensions. Engineering equipment and live stock used principally for other purposes and only incidentally for canal maintenance and operations should not be included.

If laterals were not built and are not controlled as a part of the main enterprise, this fact should be stated and their cost should be obtained from the parties controlling them and reported separately.

**Water rights.**—Under "Water rights" include filing and legal fees connected with the acquisition of such rights, and if rights have been purchased give the purchase price. If canals or lands have been purchased for the purpose of acquiring the rights belonging to their former holders, that part of the purchase price properly chargeable to the water rights should be estimated and included in capital invested in water rights.

**Cost to include value of property given in exchange.**—If other property of any kind has been exchanged for either irrigation works or water rights, the fair market value of this property at the time

of the exchange should be included in computing cost. If old canals or their rights have been taken over in exchange for rights in a new enterprise, the value of the rights in the new enterprises given in exchange should be included in the cost.

**Cost to include value of owner's labor.**—If there are no records of cost, or if the owners have done all or part of the construction, the best estimate of cost obtainable should be reported, including the estimated value of the work done by the owner.

**Inquiry 8. Maintenance and operation.**—Under this inquiry only the cost of maintenance, operation, and ordinary cleaning and repairs should be reported. The cost of enlargements, rebuilding of structures, and other permanent improvements, although paid for from current assessments, should not be included here but under "Capital invested," in Inquiry 7.

**Inquiry 9. Cost of water to farmers.**—This inquiry relates to the prices at which water rights are sold to farmers by the enterprise reported, and to the current charges for water. For enterprises the plans for which do not include the sale of water rights, this inquiry should not be answered.

If there is no charge for water rights, as is sometimes the case, this fact should be stated on the schedule. For such enterprises the rates charged for supplying water should be reported under the inquiries relating to annual charges.

**Irrigation districts.**—For irrigation districts the average amount of the district bonds issued per acre should be given as the cost of water rights. If this bond issue is not spread equally on all lands in the district this fact should be explained. For annual charges in districts, the amount of the tax levy for operation, maintenance, and general expenses should be given, but levies for the payment of bonds or interest should not be included.

**Cooperative companies.**—For cooperative companies, most of which are stock companies, the price of stock should be given, if any is for sale, and if none is for sale the prevailing estimate of current value should be given, with the average per acre served. Under enterprises of this type current charges usually are in the form of assessments on stock. In such cases the total of all assessments per share should be given, with an estimate of the average amount per acre.

**Carey Act enterprises.**—Under Carey Act enterprises the prices at which rights were sold or are now for sale by the construction companies should be given. If a Carey Act enterprise has been turned over to the water users organized as a stock company, the prevailing present price of stock and the average per acre should be given.

**Reclamation Service enterprises.**—For United States Reclamation Service enterprises the cost per acre fixed by the Secretary of the Interior should be given, and if the price has not been fixed this fact should be stated. If a project has been turned over to the water users organized as a stock company, the prevailing estimate of present value of stock and average per acre should be given. If organized as a district, the average amount of the bond issue per acre in the project should be reported. If the current charge for water is a mixed flat rate and quantity rate, the facts should be stated and the average amount per acre estimated.

**Where no specific annual charge is made.**—If an enterprise supplies water at rates which can not be considered an annual charge, the rates charged, with an estimate of the average annual charge per acre irrigated, should be given.

**Inquiry 10. Quantity of water used in 1919.**—The two "Yes or No" questions under this inquiry should be answered for every enterprise, and the length of the irrigation season should be given. The questions relating to the actual quantities of water are put in two forms, only one of which need be answered. That is, if average volume is given, it is not necessary also to give total quantity, either for water received by canal or for water delivered to individual irrigators. These alternative forms have been given in order that the officials of enterprises and special agents may not be called on to make computations in the field. If records are kept in some unit other than those given on the schedule, report the quantities as found, with explanatory notes. All necessary conversions to a common unit will be made after the schedules reach Washington.

**Inquiry 11. Drainage of irrigated land.**—Particular attention is called to the note under this inquiry on the schedule, stating that the inquiry relates only to land that has been irrigated, is now irrigated, or is to be irrigated by the enterprise being reported. The "Additional area in need of drainage" and the distribution of this area under the subordinate inquiries will necessarily be estimated. The special agent should make the best estimates possible, based on information furnished him by the officials of the enterprise and by others in the community, and on his own observation. He should not attempt to make surveys or extended observations. (See instructions regarding the drainage schedule on the following pages.)

If the drainage work is being done by the organization controlling the irrigation enterprise or by a separate organization, a drainage schedule must be prepared. A drainage schedule must also be prepared for drainage work being done by an individual when the area drained is 500 acres or over.

#### THE CENSUS OF DRAINAGE.

**Scope of the drainage census.**—The purpose of the census of drainage is to obtain statistics relating to enterprises or undertakings having for their object the drainage of land for agricultural uses.

**Definition of drainage.**—Drainage of agricultural lands, as defined for census purposes, is the act or process of drawing off an excess of water by underground conduits, pipes, or tiles, or by open or covered trenches in the surface of the ground for the purpose of improving the condition of the soil and crops. In this connection the area drained does not include land from which water flows without artificial aid into natural water courses; nor does it include land protected from overflow by levees, dikes, or embankments, nor areas guarded by trenches from the run-off from higher lands, unless some form of drainage works has been constructed on the protected land.

The name of an organization, or even the title of the law under which it was established, is not a reliable guide as to whether it is a drainage enterprise as defined for the purpose of this census; only the character of the works will determine whether a drainage schedule should be made out.

**Drainage enterprise.**—A drainage enterprise is that area (1) organized in one drainage district, or (2) assessed for the same public drain, or (3) under corporate or private ownership, drained by works operated or constructed as one undertaking. The term "enterprise" is also used, incidentally, to refer to the organization which has undertaken the drainage work.

**Special schedule for drainage enterprises.**—A special drainage schedule is to be obtained for each organized drainage enterprise and for each private enterprise draining 500 acres or more.

**Drainage primarily for nonagricultural purposes.**—For such an undertaking as one draining marsh lands for mosquito control, a schedule will be made out if the undertaking has drained lands used or usable for agricultural purposes, or lands that will be so usable when the drainage works have been completed in accordance with the plans already adopted and which the enterprise has authority to finance and carry out.

A drainage enterprise may include town or city property, but a city sewer system is not an enterprise to be reported.

**Land relieved from excess moisture by diversion drains.**—A drainage enterprise may comprise an area relieved by an intercepting or diversion drain that collects the water at the border of the area and carries it around instead of across the land to be drained; but an area is not a drainage enterprise if it is merely benefited by terraces or hillside ditches upon adjoining lands.

**Levees and dikes.**—Earthen embankments, concrete walls, etc., to protect lands against overflow from stream floods or other surface waters, are not strictly drainage works, but they are to be counted as such when and only when the enterprise includes both levee and drain (or pumping plant)<sup>1</sup> construction.

**Enterprises in more than one county.**—Where one enterprise embraces land in more than one county, the part in each county will be reported upon a separate schedule. However, each schedule not only must show to what county the schedule applies, but also must bear the full name of the enterprise with the names of all counties in which any part of the enterprise is located.

**Subdistricts.**—An area wholly or only partly within an organized drainage district may be organized as a subdistrict in some states. Each such subdistrict should be considered an enterprise separate from the drainage district in which the subdistrict is situated, and should be reported upon a separate schedule, if the records of the subdistricts have been kept separately.

The schedule for each enterprise (whether main district or sub-district) should show the facts regarding that enterprise, and supplementary statements should be made, on the schedules or on accompanying sheets, to make perfectly clear the relation between two or more enterprises that overlap in any respect.

**Reconstruction or extension as separate enterprise.**—Where reconstruction or extension of the drainage works has been made as a separate undertaking, it will be treated as a separate enterprise, and reported upon a separate schedule, but with notation of the relation to earlier enterprises where there is any overlap. The proper acreage (Inquiry 2) and the proper amounts of drainage works (Inquiries 4, 5, 6, and 7) should be shown for the enterprise scheduled, and additional statement should be made to show what

<sup>1</sup> Schedules received for enterprises constructing only levees and pumping plants were eliminated before the statistics were compiled.

portions are not a duplication of earlier enterprises. For example: With the name of the enterprise (Inquiry 1) would be the note, "Partial reconstruction and extension of ——— Drainage District No.—". Inquiry 2 would state the total number of acres assessed for the enterprise being reported, also "—— acres not included in earlier enterprises." Inquiry 5 should state the total length of the open ditches, both new construction and enlargement of earlier undertakings, also "—— miles of new work."

**Two or more enterprises under the same ownership.**—The same corporate or private ownership may cover two or more drainage enterprises, for each of which a separate schedule should be made out. All lands drained by the same outlet constructed or improved by the owner (or owners) of these lands should be reported as one enterprise. All lands in one continuous body under one ownership should be reported as one enterprise, unless different parts were constructed separately and are operated independently, in which case each part should be reported as an enterprise. Separate tracts of less than 500 acres each, with drainage works under private ownership, should not be reported upon, unless drainage facilities serving a total of 500 acres or more were constructed or are now operated as a unit.

**Enterprises that have not begun construction.**—For enterprises that have been organized but have not begun construction, a schedule should be made out if the enterprise is a going concern, answering those questions that apply to the case in hand.

**Method of making canvass.**—In the arid and semiarid regions the work in connection with the drainage census will be handled in conjunction with the irrigation census by special agents assigned to the supervisors' districts. The general plan of this work has already been outlined.

Each special agent doing field work in connection with the census of drainage outside these regions will be assigned a definite territory, in which he will be held responsible for securing complete information regarding all drainage enterprises. Within this territory the special agent will arrange his itinerary so as to secure the reports as economically as possible.

**Lists of drainage enterprises.**—Each of the special agents stationed in supervisors' districts in the arid and semiarid regions will be supplied with lists of the drainage enterprises in his district. These lists should be corrected and completed by comparison with the entries under Inquiry 33 on the general farm schedule, in the same way that the irrigation lists are completed by comparison with the entries under Inquiry 56.

Lists of drainage enterprises will also be supplied special agents in other districts and these agents should use every available means to make their lists complete and to correct any errors. New names and corrections are to be reported to the Washington office each day, on the daily report cards or on a memorandum attached thereto. If two or more districts or drains have been combined into one enterprise, this should be reported, with the names of the separate enterprises and of the present organization.

The names of all additional enterprises should be entered on the typewritten list in their proper alphabetical location and should be provided with numbers by adding letters *a, b, c, etc.*, as needed, to the last preceding number. Thus, if a new name is inserted between No. 27 and No. 28, it should be numbered 27*a*. Records of schedules received and forwarded should be kept.

**Drainage schedules to be obtained by enumerators.**—While most of the drainage schedules are to be obtained directly by the special agents, the enumerators will be asked in some instances to obtain schedules for isolated drainage enterprises.

**Irrigation schedules to be secured in connection with drainage census.**—In certain areas special agents assigned primarily to work on the drainage census will be expected also to secure schedules for such irrigation enterprises as may be found in their respective territories.

#### THE DRAINAGE SCHEDULE.

**Drainage work authorized but not yet constructed.**—The inquiries regarding drainage works (Inquiries 4, 5, 6, and 7) relate to works constructed or for which plans have been adopted; works that probably will be constructed, even for which plans and estimates have been made, should not be included unless their construction has been formally approved by the officers of the enterprise authorized to raise funds for the undertaking, on or before January 1, 1920.

Unavoidable duplication between schedules to be indicated.—In making out the schedules it is essential not only to secure correct information regarding each enterprise but also that the sum of the figures reported shall represent the true total for all enterprises combined. Duplication between schedules must be avoided, therefore, wherever possible; but when two or more districts overlap and the areas, or the works, or the costs can not be separated, the schedule for each enterprise should show the names of the overlapping districts and the amount of duplication under the different inquiries in each case.

**Inquiry 1. Management and location.**—The name of the enterprise is for identification, and should be given exactly as it appears on the county or other public records, if the enterprise is a legally organized drain or district, or a corporation; if it is under private ownership, the correct name of the individual, firm, or company should be stated.

**Name of official or other person in control of enterprise.**—Under the section calling for "Name of individual, company, or board controlling enterprise" should be entered: (1) For an enterprise owned by an individual or by a private firm or company, the name of such individual or firm; (2) for an organized drainage district or any other drainage enterprise under direct public or quasi-public supervision, both name and official title of the officer immediately in charge; or, (3) for a cooperative association organized under a general law, both the name of the association and the name of the secretary or the chairman of the executive committee. One purpose of this item is to secure the name and address of the official or other person responsible for directing the affairs of the enterprise, from whom authoritative information regarding the enterprise may later be obtained.

**Location.**—The locations of enterprises comprising not more than a few square miles should be indicated more definitely than by merely the township name or number. The sections of the townships should be given, or the general location within the township should otherwise be made clear.

**Outlet.**—The stream used as outlet is the watercourse or lake into which the water flows from the lower end of the drainage construction or improvement made by the enterprise. If the lake or stream used as outlet is not shown on ordinary maps, the name of the stream into which the water flows next should be stated also.

**Map of enterprise.**—A map of the enterprise should be secured if available, showing the boundaries of the drainage district or other area comprising the enterprise, and the location and extent of the works undertaken, in order that the enterprise may be definitely located upon a map of the county. Care should be taken to see that the name of the enterprise, and the names of the state and the counties in which it is located, are plainly written upon every map, and that each map is securely attached to the proper schedule. A special authorization must be secured for the purchase of any map.

**Inquiry 2. Character of enterprise.**—Reference should be made, in the first section under this inquiry, to the law under which the enterprise was first organized, and if it has since been reorganized under another law this statute also should be indicated. Some states have more than one general drainage law, and some drainage districts have been created by special acts of the legislature. Drainage enterprises are sometimes operated by commercial concerns, such as land-development companies, organized under general incorporation laws; for such, the states where incorporated must be shown. Where the enterprise is not organized or incorporated under any law, this fact should be stated.

**Conditions necessitating artificial drainage.**—Among the conditions that may have made it necessary or desirable to construct artificial drains are: A very flat topography from which the rainfall flows into the natural drains very slowly; small, crooked, and obstructed natural watercourses; surface water from hill lands flowing upon flat areas; overflow from stream floods; tidal overflow and, in irrigated sections, rise of the ground-water table and lateral seepage at the foot of a bench.

**Duplication in acreage to be clearly indicated.**—If the acreages stated here include any lands that are included in other drainage enterprises (as might be for land assessed both in an organized drainage district and in a subdistrict), the amounts of such lands and the names of the other enterprises must be clearly stated.

**Year of organization.**—The year in which an enterprise was organized will be that of the decree establishing the district, in the case of one established by petition to the court or to some designated public official. It will be the date of incorporation for an incorporated company. This question refers to the year when the enterprise was first organized, not to the later date on which the form of organization may have been changed to conform to a new or more convenient statute.

In some instances the date of organization of a company or district does not represent the date of beginning the drainage undertaking. For example, in an irrigation district organized in 1887, need of drainage may not have become apparent until 1909; then the district made plans and installed a system of drains. Under such circumstances both the date of organization of the enterprise and the date of beginning drainage should be stated in answer to the last question under Inquiry 2, thus: "Year in which organized 1887; drainage begun 1909."

**Inquiry 3. Financing and assessments.**—The information which is wanted regarding the method of financing is that which will show how funds were raised with which to pay contractors' bills and other expenses when due. Answers should distinguish between district bonds issued by the drainage district and county bonds

issued by the county. Sometimes farm owners have paid their total assessments as soon as the amounts have been determined, the bond issues being reduced accordingly; under such circumstances, the percentage of the cost raised by immediate cash payments and the percentage raised by bond issue should be stated. The contractor constructing the drains sometimes has had to finance the work, and wait for his pay until the assessments have been collected, or he has had to accept warrants that he might sell to get the money with which to pay his debts.

**Method of apportioning cost.**—While the law usually specifies the basis on which the cost of construction shall be distributed over the lands or property in the district, such is not always the case, and the method actually used should be stated for each enterprise.

Often the assessments of the cost against railroads, county roads, irrigation works, etc., have been made on a basis different from those against the farm lands. The statement here should show, as definitely as possible, just how the amounts assessed against such public utilities were determined.

If a considerable part of the area is assessed on some other basis than benefits to agriculture, the part so assessed and the basis of assessment should be stated. If any considerable part of the cost is paid from some other funds than those raised by assessment against the lands benefited, the amount of that part and the source of those funds should be stated.

**Inquiry 4. Type of drainage.**—The drainage is part by gravity and part by pumping if pumps are used at all, but not for all of the drainage from all of the area. Any device for lifting the water is to be classed as a pump, in this inquiry.

**Power.**—Where a drainage enterprise purchases electricity from a company selling power, electric power should be reported.

**Pumps.**—Note that the kind of pump called for is the type, as centrifugal, rotary, or reciprocating, not the maker's name.

**Average lift.**—The average lift of the pumps is the actual average height from the water level in the sump or fore-bay to the point where the water is discharged from the pump, *not* including friction head or horizontal distance; if the end of the discharge pipe is below water level in the outlet stream or discharge bay, the lift is the average difference between the water level in the sump and that in the outlet stream.

**Area served.**—The area served is the maximum area from which water flows to the pumps.

**Inquiry 5. Open ditches.**—This inquiry refers only to those ditches constructed by or for the enterprise, not including private drains. The dimensions to be given are those of the ditches as constructed, or as last opened if they have been enlarged artificially.

**Outlet ditch.**—The outlet ditch, in this inquiry, is the main drain installed by the enterprise, and may be either an entirely new ditch or a natural watercourse that the enterprise has enlarged or cleared of obstructions; it is not the "stream used as outlet" mentioned in Inquiry 1.

**Branch ditches.**—The branch ditches referred to are those which carry the discharge from the individual farm systems to the outlet ditch defined in the preceding paragraph; they do not include the drains installed by individual farm owners, but only those paid for by the enterprise.

If all the farm drains discharge directly into the outlet ditch, the fact that there are no branch ditches should be stated.

**Inquiry 6. Tile drains.**—This inquiry, like Inquiry 5, relates only to those drains that are a part of the district system and does not include the private drains. The sizes to be stated are the inside dimensions, not the lengths of the pieces; if the shape is not circular, state the shape and give the principal dimensions.

**Inquiry 7. Levees and dikes.**—This inquiry relates only to the embankments constructed by this enterprise to protect its lands from overflow by stream floods or surface water from other lands. Works built by some other agency (e. g., by the Mississippi River Commission) should not be reported, even though lands in this drainage enterprise may have contributed toward the cost.

**Inquiry 8. Maintenance.**—Under this heading should be shown what provision is made for regular inspection and repair of the drainage works; whether the maintenance work (clean out, repair, etc.) is let by contract or is done by labor employed directly by the enterprise, either regularly or temporarily; whether funds for this work are raised by regular or by special assessments, or by what other method; and what amount and what kinds of machinery, tools, work animals, etc., are owned by the enterprise and used principally for maintenance work. Equipment used principally for other work and only incidentally for maintenance of the drainage works should not be reported.

**Inquiry 9. Capital invested.**—For the purpose of this inquiry, the capital invested is cost, including all expenditures properly chargeable to this work and paid by the enterprise. If some or all of the works were constructed by an earlier enterprise and purchased by the present district or company, the original cost should be stated, not the price for which the works were purchased by the present owners. If exact figures are not obtainable, the best possible estimate should be secured.

The cost of the enterprise includes expenses for surveys and plans; attorneys' fees and court costs; land, buildings, machinery, and tools for building, maintaining, and operating the drainage works; labor and other items for constructing and installing these works, including supervision and administration. The cost figure wanted is for the drainage undertaking only, and in reporting upon such enterprises as land-development companies, expenditures not properly pertaining to the drainage should be eliminated. Cost of the rights of way should be given at the actual cost, and not at the price of improved land in the district.

Note that the first part of this inquiry relates to the work actually done previous to January 1, 1920, and that the second part asks for the *additional* expenditure required to carry out the drainage work for which plans have been adopted.

**Inquiry 10. Crops.**—The principal crops grown on the drained land should be listed in the order of their importance as determined by the acreage.

**Inquiry 11. Results secured.**—The percentage of the area in the drainage enterprise which still suffers from defective drainage should indicate the injury suffered in years of normal rains and floods. The carefully considered opinion of some one conversant with the conditions is all that is desired. The cause of inadequate drainage need not be considered here, nor whether it is inside or outside the area embraced in the enterprise.

Where the drainage works were under construction or newly completed in 1919, a statement of conditions in that year should be given, supplemented with a brief statement to indicate whether rains or floods were normal in that season or were greater or less than usual.

The two statements regarding the general condition of the lands before drainage and on January 1, 1920, should furnish a direct comparison to show the effect of the drainage construction, and show the progress of development of the reclaimed lands. The statements should be as complete as possible, yet definite and concise.

**Inquiry 12. Flood protection by outside agencies.**—This inquiry relates to works which furnish protection to this drainage enterprise but which were constructed by some outside agency or organization.

## INSTRUCTIONS TO ENUMERATORS.

[NOTE.—The following instructions were printed in a pamphlet containing instructions pertaining to inquiries on the general farm schedule.]

### IRRIGATION.

**Inquiry 55. Acreage irrigated.**—Report the number of acres in the farm enumerated which were irrigated in 1919. The following definition of irrigated land has been adopted for census purposes: "Land should be classed as irrigated which has water supplied to it for agricultural purposes by artificial means or by seepage from canals, reservoirs, or other irrigated lands; but land which has natural ground water sufficiently near the surface to grow crops should not be classed as irrigated unless water is actually applied. Land which is flooded during high water should be classed as irrigated, if water is caused to flow over the land by dams, canals, or otherwise, but should not be classed as irrigated, if the overflow is due to natural causes alone."

In this connection, you should observe the note at the head of the section on "Crops grown on this farm in 1919," which requires that a cross (X) be placed before the *name of each crop irrigated.*

**Inquiry 56. Irrigation enterprises.**—If the water used was supplied by a company, a corporation, or any other organization, you should enter the name of such organization or enterprise on the blank line. If water was supplied by a canal or other works belonging to the owner of the farm, the word "*Private*" should be written on this line.

The note under this inquiry calling for the securing of an irrigation schedule in certain cases applies only in the arid and semi-arid regions of the West, and enumerators in other sections should ignore this note unless instructed otherwise by the supervisor.

**Inquiry 57. Payments for water.**—The total amount of payments for water for the season of 1919 should be given in answering this inquiry. This amount should not include any part of the purchase price for equipment or water rights. If the payment for the use of the land included the cost of water to the farm operator, the cost of the water alone should be estimated and reported. For individual enterprises there should be reported the cost of pumping, maintenance, cleaning main ditches, and all other items which could reasonably be charged as a part of the cost of bringing water to the land.

## IRRIGATION AND DRAINAGE.

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### DRAINAGE.

**Inquiry 30. Area drained.**—Report the acreage which is actually benefited or made of more value for agricultural purposes by artificial drainage. This will often be less than the total area from which water flows to the drains. Do not include land on which only temporary work has been done, such as "bedding" the fields or laying out "dead furrows" to hasten the surface flow.

**Inquiry 31. Area needing drainage.**—Under inquiry 31 report the area of land in the farm not now suitable for crops which could be made available for cultivation by drainage. Report under section 1, "By drainage only," the acreage which needs no clearing or which is merely covered with grass, weeds, or other annual growth, and under section 2, as needing both "drainage and clearing," the acreage which is covered with trees, stumps, or perennial woody shrubs.

The purpose of inquiries 32 and 33 is to establish a complete list of drainage and flood-protection enterprises, such as drainage districts, levee districts, county drains, irrigation districts doing drainage work, and development companies, and to determine the number of farms in each drainage enterprise.

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### IRRIGATION AND DRAINAGE SECTIONS FROM GENERAL FARM SCHEDULE.

#### IRRIGATION, JANUARY 1, 1920.

55. If any part of this farm is irrigated, give total number of acres irrigated in 1919..... (Acres.)
56. Name of irrigation enterprise supplying water:.....  
(If enterprise supplies less than 5 farms, secure irrigation schedule.)
57. Amount expended in 1919 for irrigation water, exclusive of payment for equipment or rights..... \$
58. Were any crops grown on this farm in 1919 without irrigation?..... (Answer Yes or No.)

#### DRAINAGE, JANUARY 1, 1920.

30. Area of land in this farm which is provided with artificial drainage (tile, ditches, etc.)..... (Acres.)
31. Additional area of land in this farm which could be made suitable for crops:
1. By drainage only..... (Acres.)
2. By drainage and clearing..... (Acres.)
32. Has any part of this farm been afforded drainage or protection against overflow by a drainage or levee district, or by the state, county, or by a private company or individual?..... (Answer Yes or No.)
33. If answer is "Yes," give name of company, district, etc.:.....



<p style="text-align: center;">9-124</p> <p style="text-align: center;"><b>UNITED STATES CENSUS OF IRRIGATION</b></p> <p style="text-align: right;">(A4-577)</p> <hr/> <p style="text-align: center;"><b>EXTRACT FROM FOURTEENTH CENSUS ACT.</b></p> <p>Section 8 of the act to provide for the Fourteenth Census includes the following provision:</p> <p>"Inquiries shall be made as to the quantity of land reclaimed by irrigation and drainage and the crops produced; also as to the location and character of irrigation and drainage enterprises, and the capital invested in such enterprises."</p> <p style="text-align: center;">SAM. L. ROGERS, <i>Director of the Census.</i></p>	<p><b>DEPARTMENT OF COMMERCE</b> <b>BUREAU OF THE CENSUS</b> SAM. L. ROGERS, DIRECTOR</p> <hr/> <p><b>FOURTEENTH CENSUS OF THE UNITED STATES</b> <b>IRRIGATION</b></p> <hr/> <p>WILLIAM L. AUSTIN CHIEF STATISTICIAN FOR AGRICULTURE</p>	<p style="text-align: center;"><b>ENUMERATOR'S RECORD.</b></p> <p>State _____</p> <p>County _____</p> <p>Supervisor's District No. _____</p> <p>Enumerator's District No. _____</p> <p>Enumerated by me this _____ day of _____, 1920.</p> <p style="text-align: right;">_____ <i>Enumerator.</i></p>
<p><b>EXPLANATIONS AND INSTRUCTIONS.</b></p>		
<p><b>Census of Irrigation.</b>—The plan to be followed in the irrigation census covered by this schedule is to secure one of these schedules for each independent irrigation enterprise, whether it supplies a single farm or many farms. Enumerators are to secure schedules for enterprises supplying less than five farms and should report under Inquiry 56 on the General Farm Schedule the name and address of each enterprise supplying five or more farms operating within their districts. Special agents are to secure schedules for enterprises supplying five or more farms.</p> <p><b>Confidential.</b>—The information reported on this schedule will under all circumstances be treated as strictly confidential.</p> <p><b>Not connected with taxation.</b>—The information reported on this schedule will not be used as a basis of taxation, nor communicated to any assessor.</p> <p><b>All questions to be answered.</b>—If exact information is not obtainable in answer to any question, give the best information obtainable, indicating that it is estimated by marking it "est." If any question can not be answered in the space allotted on the schedule in such a way as to be entirely clear, explain the facts on the margin or on a separate sheet and attach it to the schedule.</p> <p><b>Definition.</b>—An irrigation enterprise, for the purpose of the census, is a canal or canal system, pumping plant, or reservoir supplying water for irrigation, or any combination of these operated under a single management by either an individual, a partnership, a company, or other organization. If a city, through its water department or its sewage department, makes a business of supplying water for irrigation, it should be reported as an irrigation enterprise, and a schedule should be returned for it. For classification of enterprises see note under Inquiry 3.</p> <p>Land should be classed as irrigated which has water supplied to it for agricultural purposes by artificial means or by seepage from canals, reservoirs, or irrigated lands, but land which has natural ground-water sufficiently near the surface to support plant life should not be classed as irrigated. Land which is flooded during high-water periods should be classed as irrigated if water is caused to flow over the land by dams, canals, or otherwise, but should not be classed as irrigated if the overflow is due to natural causes alone.</p>	<p><b>3. Class of enterprise.</b>—The types of enterprises recognized by the census are as follows:</p> <p><b>Individual or partnership enterprises,</b> which belong to individual farmers or to groups of farmers associated without formal organization. It is not always possible to distinguish between partnership and cooperative enterprises, but as the difference is slight this is unimportant.</p> <p><b>Cooperative enterprises,</b> which are controlled by the water users combined in some organized form of cooperation under state laws. The most common form of organization is the stock company, the stock of which is owned by the water users. In Arizona and New Mexico many of the cooperative enterprises are operated under laws regulating "community" ditches.</p> <p><b>Irrigation districts,</b> which are public corporations established under state laws and empowered to issue bonds to obtain funds for the purchase or construction of irrigation works, and to levy and collect taxes for the payment of bonds and interest thereon and for the payment of the cost of operation and maintenance.</p> <p><b>Carey Act enterprises,</b> established under the Federal law of August 18, 1894, granting 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.</p> <p><b>Commercial enterprises,</b> incorporated or otherwise, 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.</p> <p><b>United States Indian Service enterprises,</b> established under various acts of Congress providing for the construction by that service of works for the irrigation of land in Indian reservations.</p> <p><b>United States Reclamation Service enterprises,</b> established under the Federal law of June 17, 1902, providing for the construction of irrigation works with the receipts from the sale of public lands.</p> <p><b>State enterprises.</b>—In a few instances the states themselves have carried out irrigation enterprises under special legislation.</p> <p><b>City water or sewage disposal enterprises.</b>—This class is self-explanatory.</p> <p style="text-align: center;">(Indicate class of enterprise by X.)</p> <p>Individual or partnership _____ U. S. Indian Service _____</p> <p>Cooperative _____ U. S. Reclamation Service _____</p> <p>Irrigation district _____ State _____</p> <p>Carey Act _____ City _____</p> <p>Commercial _____</p> <p>Many enterprises were organized under one form and later changed to another form. In such cases, state the facts on the blank lines below.</p> <p>_____</p> <p>_____</p>	
<p><b>1. Information concerning management:</b></p> <p>Name of canal or enterprise _____</p> <p>Name of individual or company controlling enterprise _____ (If supplying less than five farms, give names of farmers. If two or more ditches are used for a single farm, state this last and give names of ditches.)</p> <p>_____</p> <p>_____</p> <p>Post-office address { Main office _____ Local office _____</p> <p>Location of enterprise: State _____ County _____</p> <p>Section _____ Township _____ Range _____ (Give location of head of canal, well, spring, or reservoir. If located on unsurveyed land, describe by direction and distance from some nearby town or place.)</p>	<p><b>4. Water rights (indicate class by X):</b></p> <p><small>NOTE.—Many rights will fall in more than one of the classes named. For instance: A right may have been acquired originally by appropriation and use; later the owner may have filed and posted a notice of his claim; still later the right may have been adjudicated by a court or board; and, finally, a certificate may have been issued by the state. Or a right may have been initiated on a permit from the state and the owner may have received later a certificate from the state. In each instance the right should be reported in the class in which it stands at the time of the enumeration.</small></p> <p>Notice filed and posted _____ Riparian right _____</p> <p>Right adjudicated by court _____ Certificate or license from state _____</p> <p>Permit from state _____ Appropriation and use _____</p> <p>_____</p> <p>_____</p> <p>Dates and amounts of rights _____</p> <p>_____</p>	
<p><b>2. Source of water supply (indicate class by X):</b></p> <p><small>NOTE.—If water is obtained from more than one source, mark both.</small></p> <p>Stream _____ Spring _____</p> <p>Pumped well _____ Stored storm water _____</p> <p>Flowing well _____ City water _____</p> <p>Lake _____ Sewage _____</p> <p>Name of stream or other source _____</p> <p>Drainage basin _____ (Give name of river system which drains the region where enterprise is located.)</p>	<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	

# IRRIGATION AND DRAINAGE.

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[Page 2 of the Special Schedule for Irrigation.]

<p><b>5. Description of works</b></p> <p><small>Note.—Under "general description" give the character of the water supply; the type of diverting, conveying, storing, or water-lifting works, and their relation to each other. Report also any important items of equipment not called for specifically in the list. A main ditch is any irrigating channel conveying water from the source of supply to the tract of land to be irrigated. A lateral is a branch of a main ditch conveying water from a main ditch to one or more farms. A farm ditch is a ditch conveying water from a lateral to an individual farm and distributing water on the farm.</small></p> <p>General description of system .....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>Date of construction: Begun ..... Finished ..... (Year.) (Year.)</p> <p>Diversion dams: Number ..... Material .....</p> <p>Storage dams: Number ..... Material .....</p> <p>Main ditches: Capacity (cubic feet per second) .....</p> <p>Number ..... Length (miles) .....</p> <p>Lateral ditches:</p> <p>Number ..... Length (not including farm ditches) (miles) .....</p> <p>Pipe lines: Size ..... Length .....</p> <p>Material .....</p> <p style="text-align: center;"><small>(As wood-stave, concrete, metal, etc.)</small></p> <p>Reservoirs: Number ..... Capacity (acre-feet) .....</p> <p>Flowing wells: Number ..... Capacity (gallons per minute) .....</p> <p>Pumped wells: Number ..... Capacity (gallons per minute) .....</p> <p>Pumping plants: Kind of power .....</p> <p style="text-align: center;"><small>(Wind, water, steam, electric, etc.)</small></p> <p>Capacity (horsepower) .....</p> <p>Kind of pumps .....</p> <p style="text-align: center;"><small>(Centrifugal, rotary, reciprocating, etc.)</small></p> <p>Number of pumps ..... Capacity (gallons per minute) .....</p> <p>Average lift (feet) .....</p> <p><b>6. Lands:</b></p> <p><small>Note.—If this enterprise supplies water to other enterprises, and not directly to land, so that reporting the acreage here would cause duplication, state the facts on the blank lines below; and do not report the acreage here.</small></p> <p>Number of farms supplied by this enterprise .....</p> <p>Total acreage in project (acres) .....</p> <p>Area actually irrigated during 1919 (acres) .....</p> <p><small>(Actual area irrigated, not area for which water was available nor total holdings of persons entitled to water.)</small></p> <p>Area which the works are capable of irrigating in 1920 (acres) .....</p> <p>Lands available for settlement covered by this enterprise (acres) .....</p> <p>Price of unimproved lands suitable for agriculture covered by this enterprise, exclusive of water rights (per acre) .....</p> <p>Terms of payment and rates of interest .....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>Average cost of preparing land for irrigation (per acre) .....</p> <p><small>(Include clearing and grading land and building farm ditches and farm irrigation structures.)</small></p>	<p><b>7. Capital invested:</b></p> <p>Irrigation works and equipment ..... \$ .....</p> <p><small>(Include irrigation works, and also equipment, buildings, and land used for maintenance and operation, but not water rights. If works are not completed, give investment to December 31, 1919.)</small></p> <p>If works are not completed, estimate additional investment required for completion ..... \$ .....</p> <p>Water rights ..... \$ .....</p> <p><b>8. Maintenance and operation:</b></p> <p>Cost of maintenance and operation in 1919 ..... \$ .....</p> <p><small>(If work was done by owner, estimate cost of labor and material.)</small></p> <p><b>9. Cost of water to farmers:</b></p> <p>What is the basis of the charge for water rights? .....</p> <p><small>(Area to be served, quantity of water to be delivered, or proportional cost of enterprise.)</small></p> <p>.....</p> <p>Price of water rights: Unit ..... \$ .....</p> <p>If price is based on something other than area, give approximate price per acre irrigated ..... \$ .....</p> <p>What is the basis of annual charges? .....</p> <p><small>(By area, by share of stock, or by quantity of water.)</small></p> <p>.....</p> <p>If charges are fixed by public authority, give name of body: .....</p> <p><small>(County commissioners, court, railway commission, etc.)</small></p> <p>Is annual charge fixed or variable? (state which) .....</p> <p>Amount of annual charge per acre, share, or other unit, in 1919. \$ .....</p> <p>If charge is based on something other than area, give approximate average charge per acre served ..... \$ .....</p> <p><b>10. Quantity of water used in 1919:</b></p> <p>Was the water measured as it was received by the canal? .....</p> <p><small>(Answer Yes or No.)</small></p> <p>Average volume of water entering canal during season of 1919 (cubic feet per second) .....</p> <p>Total quantity of water entering canal during season of 1919 (acre-feet) .....</p> <p>Length of season during which water was run for irrigation in 1919:</p> <p>From ..... 1919, to ..... 1919.</p> <p>Is water measured as it is delivered to each irrigator? .....</p> <p><small>(Answer Yes or No.)</small></p> <p>Average head of water delivered to individual irrigators in 1919 (cubic feet per second) .....</p> <p>Total quantity of water delivered to irrigators during season of 1919 (acre-feet) .....</p> <p><b>11. Drainage:</b></p> <p><small>Note.—This inquiry relates only to lands that have been irrigated, are now irrigated, or are to be irrigated by this enterprise.</small></p> <p>Area for which drains have been installed (acres) .....</p> <p>Additional area in need of drainage (acres) .....</p> <p>Wholly unproductive (acres) .....</p> <p>Available for pasture only (acres) .....</p> <p>Producing partial crop (acres) .....</p> <p style="text-align: center;"><b>CERTIFICATE.</b></p> <p style="text-align: center;">This is to certify that the information contained in this schedule is complete and correct to the best of my knowledge and belief.</p> <p style="text-align: center;">.....</p> <p style="text-align: center;"><small>(Signature of person furnishing information.)</small></p> <p style="text-align: center;">.....</p> <p style="text-align: center;"><small>(Title and address.)</small></p> <p style="text-align: center;">.....</p> <p style="text-align: center;"><small>(Signature of Special Agent.)</small></p>
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<p>9-214</p> <p style="text-align: center;"><b>UNITED STATES CENSUS OF DRAINAGE, 1920</b></p> <p style="text-align: right;">[AG-563]</p> <p style="text-align: center;"><b>EXTRACT FROM FOURTEENTH CENSUS ACT.</b></p> <p>Section 8 of the act to provide for the Fourteenth Census includes the following provision:          "Inquiries shall be made as to the quantity of land reclaimed by irrigation and drainage and the crops produced; also as to the location and character of irrigation and drainage enterprises, and the capital invested in such enterprises."</p> <p style="text-align: center;">SAM. L. ROGERS, Director of the Census.</p>	<p><b>DEPARTMENT OF COMMERCE</b>  <b>BUREAU OF THE CENSUS</b>          SAM. L. ROGERS, DIRECTOR</p> <hr/> <p><b>FOURTEENTH CENSUS OF THE UNITED STATES</b>  <b>DRAINAGE</b></p> <hr/> <p>WILLIAM L. AUSTIN          CHIEF STATISTICIAN FOR AGRICULTURE</p>	<p style="text-align: center;"><b>ENUMERATOR'S RECORD.</b></p> <p>State .....</p> <p>County .....</p> <p>Supervisor's District No. ....</p> <p>Enumerator's District No. ....</p> <p>Enumerated by me this ..... day          of ....., 1920.</p> <p style="text-align: right;">.....  <i>Enumerator or Special Agent.</i></p>
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**EXPLANATIONS AND INSTRUCTIONS.**

<p><b>Confidential.</b>—The information reported on this schedule will be treated under all circumstances as strictly confidential.</p> <p><b>Not connected with taxation.</b>—The information reported on this schedule will not be used as a basis of taxation, nor communicated to any assessor.</p> <p><b>All questions must be answered.</b>—If exact information is not obtainable, get the best estimate possible and write "est." beside the answer. Use the margin of the schedule or a separate sheet when additional space is necessary to make the answers clear, definite, and complete.</p> <p><b>Drainage of agricultural lands</b> is the act or process of drawing off an excess of water by underground conduits, pipes, or tiles, or by open or covered trenches in the surface of the ground for the purpose of improving the condition of the soil and crops. In this connection the <i>area drained does not include</i> land from which water flows without artificial aid into natural water courses; nor does it include land protected from overflow by levees, dykes, or embankments, nor areas guarded by trenches from the run-off from higher lands, unless some form of drainage works has been constructed on the protected land.</p> <p><b>Drainage enterprise</b> is defined, for the purpose of this census, as comprising that area (1) organized in one drainage district, or (2) assessed for the same public drain, or (3) in corporate or in private ownership drained by works operated as</p>	<p>one undertaking. This census relates only to the drainage of agricultural lands. A report is to be secured, on one of these schedules, for each such drainage enterprise organized under a general or a special drainage law, or as a corporation, and for each drainage enterprise under private ownership draining as much as 500 acres.</p> <p><b>Drainage works</b> of an enterprise include all varieties of underground conduits, pipes, or lines of tile, or drains of stone, wood, or other material; also open ditches and canals, together with accessory levees, dykes, dams, weirs, pumping machinery, gates, and other devices for the draining away or control of surface and soil waters.</p> <p><b>Tile</b> as here used includes pipes of earthenware, concrete, or other material buried beneath the surface in such a way as to permit the excess water to flow away. The size, if circular, is expressed by the inside diameter in inches.</p> <p><b>Ditches</b> include all open artificial trenches usually with sloping sides—the width is that of the bottom.</p> <p><b>Pumping district</b> is one where all or a part of the water from the drains collecting at a low point must be raised by some form of machinery in order that it may be removed from the area.</p> <p><b>Kind of pumps</b> is intended to bring out the facts as to the kind of machinery or other device for lifting the drainage water.</p>
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**INQUIRIES ON DRAINAGE.**

**1. Management and location:**

Name of drainage district or enterprise .....

Name of individual, company, or board controlling enterprise .....

Post-office address { Main office .....

Local office .....

Location of enterprise: State .....

County .....

Townships, ranges, or other minor political subdivisions .....

Name of lake or stream used as outlet .....

Map secured (to be obtained if possible) .....  
(Answer Yes or No.)

**2. Character of enterprises:**

Give dates of laws or references to acts under which enterprise was organized .....

State nature of enterprise (as "Land development corporation," "Drainage district," "County drain," etc.) .....

State conditions that necessitated artificial drainage .....

Number of acres in enterprise .....

Number of acres assessed .....

Year in which organized .....

IRRIGATION AND DRAINAGE.

[Page 2 of the Special Schedule for Drainage.]

<p><b>3. Financing and assessments:</b></p> <p>State method of financing (as "District Bonds," "County Warrants," "One assessment," etc.)..... (If two or more methods were used, give appropriate percentages).</p> <p>How were assessments for cost apportioned against the lands (as "According to benefits to each tract," "At a uniform rate per acre," "According to assessed value of the lands," etc.)?</p> <p>How were assessments made against railroads, highways, etc.?</p> <p>Does this enterprise include any land that did not need drainage for itself, but was assessed as responsible for damage to other lands? What area was assessed on this basis only?..... (acres)</p>	<p><b>9. Capital invested:</b></p> <p>Give total cost of the enterprise to December 31, 1919 (including costs of engineering, organization, rights of way, construction of drainage works, damages, legal and administrative expenditures, lands and buildings, but not including lands for sale or farming) \$.....</p> <p>If works not completed December 31, 1919, give estimate of additional investment to complete..... \$.....</p>
<p><b>4. Type of drainage:</b></p> <p>By gravity..... By pumping..... (<i>"All," "Part," or "None."</i>) (<i>"All," "Part," or "None."</i>)</p> <p>If by pumping:</p> <p>Kind of power..... (<i>Steam, electric, etc.</i>)</p> <p>Capacity of plant (horsepower).....</p> <p>Kind of pumps..... (<i>Centrifugal, rotary, reciprocating, etc.</i>)</p> <p>Number of pumps.....</p> <p>Total capacity of pumps (gallons per minute).....</p> <p>Average lift (feet).....</p> <p>Acres served by pumps.....</p>	<p><b>10. Crops:</b></p> <p>State the principal crops grown on drained land in the enterprise, in order of their importance.....</p>
<p><b>5. Open ditches:</b></p> <p>Total length of open ditches (miles).....</p> <p>Maximum width of ditch (bottom width, feet).....</p> <p>Average depth of outlet ditch (feet).....</p> <p>Average depth of branch ditches (feet).....</p>	<p><b>11. Results secured:</b></p> <p>What percentage of the area suffers annually a loss of crops due to defective drainage? .....</p> <p>If construction of the drainage works is not finished on December 31, 1919, state what percentage has been completed.....</p> <p>Specify general condition of the lands before drainage—that is, percentages timbered and prairie, percentage cultivated, areas swampy or subject to overflow, etc. ....</p> <p>Specify general condition of lands on January 1, 1920, with respect to the same points .....</p>
<p><b>6. Tile drains:</b></p> <p>Total length of tile drains (miles).....</p> <p>Maximum size (inches)..... Minimum size (inches).....</p>	<p><b>12. Flood protection by outside agencies:</b></p> <p>Area in this enterprise protected by levees or dykes built by State or other outside agency (acres).....</p> <p>Name of such outside agency.....</p>
<p><b>7. Levees and dykes:</b></p> <p>Total length of levees and dykes constructed by this enterprise (miles).....</p> <p>Average height of fill (feet).....</p>	<p style="text-align: center;"><b>CERTIFICATE.</b></p> <p>This is to certify that the information contained in this schedule is complete and correct to the best of my knowledge and belief.</p> <p>..... (Signature of person furnishing information.)</p> <p>..... (Official title.)</p> <p>..... (Address.)</p> <p>..... (Signature of Examiner or Special Agent.)</p> <p style="text-align: right;">11-414</p>
<p><b>8. Maintenance:</b></p> <p>Are the ditches being systematically maintained, and how (by contract or by district forces)?.....</p> <p>How are funds raised for maintenance work?.....</p> <p>What equipment for maintenance is owned by the district? .....</p>	