

DRAINAGE

INTRODUCTION

Scope of the census of drainage.—Section 4 of the Act providing for the Fifteenth Census reads as follows: "That the fifteenth and subsequent censuses shall be restricted to inquiries relating to population, to agriculture, to irrigation, to drainage, to distribution, to unemployment, and to mines. The number, form, and subdivision of the inquiries on the schedules used to take the census shall be determined by the Director of the Bureau of the Census, with the approval of the Secretary of Commerce."

The first census of drainage enterprises was taken in 1920 as a part of the Fourteenth Census. Such improvement as was made in the second drainage census was the result of the experience gained in the first.

The second drainage census had the advantage of a more satisfactory list of drainage enterprises than did the first and some of the increases shown in the second drainage census are due to this fact, rather than to an actual increase during the decennial period.

The data for the Fifteenth Census relate to drainage conditions in 1930, and the crop year 1929.

The statistics relative to the number of all farms, the number of farms reporting drainage, all land in farms, and farm land provided with drainage were taken from the general farm schedule, and include the 48 States and the District of Columbia. The statistics relative to character of enterprise, purpose of drainage, area and condition of land in enterprises, capital invested and financing of enterprises, drainage works, operation and maintenance, arrears and delinquency, and flood protection by outside agencies were collected on a special drainage schedule. The data collected on the special drainage schedule cover the 35 States reporting organized drainage enterprises, as listed on page VII, and shall be referred to in this report as the 35 drainage States. As far as could be ascertained from State officials, there were no organized drainage enterprises located in the remaining 13 States. Since farm lands provided with drains may be either within or without an organized enterprise, and since these drains may be either supplemental to or independent of the works installed by an enterprise, the figures for the two parts of the drainage census are shown separately.

Only those enterprises having drainage works completed or partially completed on January 1, 1930, were included in the 1930 census. Nonoperative enterprises or those which had completed their organization but had not begun construction on January 1, 1930, were not included in this census.

Drainage census reports.—Preliminary drainage announcements were issued for each of the 35 drainage States. These announcements showed, by counties, for 1929, the land in drainage enterprises; the acreage fit to raise a normal crop; the acreage fit for a partial

crop; and the acreage unfit to raise any crop for lack of drainage. The acreage in occupied farms, the acreage planted, and the capital invested in enterprises were also given. The statistics given in the State announcements were later combined in a preliminary summary for the United States, which also included the mileage of ditches, levees, and tile drains for each of the 35 drainage States. An organized drainage enterprise may include timber or other unimproved land not yet in farms.

Following the preliminary reports a series of State bulletins was issued presenting statistics for each of the 35 drainage States. These bulletins include State tables, one of which shows a summary for the State, and the others show area of enterprises, by size; land and capital, by character of enterprise; land and capital, by type of drainage; pumping plants and land served, by kind of power and also by kind of pump; acreage of enterprises and area delinquent; land and capital, by purpose of drainage; land and capital, by date of organization; condition of land and land available for settlement, by date of organization; land and capital, by method of maintenance; and land and cost of operation and maintenance, by type of drainage. These bulletins also include two county tables: One showing the number of farms reporting drainage and farm land drained and also the total number of farms and all land in farms for each county; and the other showing the land in drainage enterprises, condition and use of land, capital invested and cost per acre, and drainage works.

A United States summary was prepared from the statistics in States bulletins. It contains 16 summary tables and 11 tables presenting in detail statistics by divisions and States.

This volume includes all the published statistics relative to drainage collected in the 1930 census of drainage.

Method of collecting statistics.—The statistics for organized drainage enterprises were obtained principally by special enumerators appointed by and working under the regular census supervisors. In the case of State, county, and township enterprises, much of the information was obtained from public records usually found at courthouses. The information relative to drainage districts, irrigation enterprises, and commercial developments, was largely obtained from the officers of such enterprises, and that relative to individually owned projects of 500 acres or more, was obtained usually from the owners.

The information regarding the condition of lands could seldom be secured from office records so the enumerators were instructed to question county or township officials, officers of the enterprises, farmers, or other persons familiar with the general condition of the lands in the various enterprises.

DEFINITIONS AND EXPLANATION OF TERMS

The information relative to drainage done by irrigation projects under the control of the United States Bureau of Reclamation and the United States Bureau of Indian Affairs, was obtained from the Commissioners of the Bureau of Reclamation and the Bureau of Indian Affairs, who had the reports prepared by the officers in immediate charge of the projects.

Some reports were returned with questions unanswered or incorrectly answered, in such cases it was necessary to secure the missing information by direct correspondence with the officials of the enterprises or with some public officials.

Through this supplementary correspondence full answers were obtained for practically all enterprises.

The first drainage schedules were returned about June 1, 1930, and nearly a year elapsed before all reports were secured. This delay was due to the difficulty in getting reports from isolated projects, some of which were practically abandoned. In cases where the enterprises had been abandoned or dissolved, but where the works were still affording drainage to the lands once assessed, reports were secured.

DEFINITIONS AND EXPLANATION OF TERMS

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, tiles, or by open or covered trenches in the surface of the ground, or by pumping, for the purpose of improving the condition of the soil and crops.

Farm land provided with drainage is the area which has been actually benefited or made of more value for agricultural purposes by artificial drainage. Land on which only temporary work has been done, such as "bedding," is not included. Farm land provided with drainage may or may not be located within an organized drainage enterprise. Usually such drainage is the result of work done by the farm owner, and may be independent of or supplemental to the works of an organized enterprise.

A drainage enterprise is an area organized according to law for the purpose of improving the lands for agriculture, or a tract of farm land of 500 acres or more drained as a private undertaking without legal organization. An area protected by levees, but with no interior drainage ditches, tile drains, or pumps, is not considered a drainage enterprise.

For an enterprise comprising land in more than one county, the part in each county has been reported separately and is counted herein as an enterprise.

Only enterprises that had constructed all or a part of their drainage works prior to January 1, 1930, are included in the census statistics. These were called "operating enterprises" in the 1920 census.

Area of a drainage enterprise is all the land within the boundaries of the enterprise. It includes all land assessed for the cost of the enterprise, and may include land not assessed because exempted for special reasons. Where the drainage is done by an irrigation district, this district is also the drainage enterprise.

Area of enterprises in a State or county is the sum of the areas of the individual enterprises.

Overlapping of enterprises arises from the fact that some lands have been assessed in more than one enterprise.

Land in enterprises in a State or county is the actual acreage covered by the drainage enterprises.

Land unfit to raise any crop for lack of drainage may be due either to inadequacy of the drainage works of the enterprise or to lack of farm ditches supplementary to the established works.

Land drained, fit to raise a normal crop, could yield, without further drainage, crops equal to those being grown on well-drained soil of the same character. The classification with regard to fitness for raising crops does not take into consideration other improvements, such as clearing of trees or stumps, which may be required to actually fit the land for plowing.

Improved land comprises all crop land, all pasture land that has been cleared or tilled, all land used for barnyards and farm buildings, and all land occupied by ditches and roads.

Woodland includes timber and cut-over land and other lands with a growth of trees which require clearing before the land could be plowed. Lands with chaparral, sagebrush, or other woody shrubs are not classed as woodland.

Land in occupied farms includes all improved land used for agricultural purposes, also pasture land and other lands that are adjacent to the improved lands and are considered a part of the farm.

Land in planted crops includes all land in crops except those requiring no planting, such as wild-hay land.

Idle land includes all land not in productive use, such as idle crop land, land in unoccupied farms, woodland, and other unimproved land not intensively used for pasture, or farm wood lots. Practically all timber and cut-over lands are classed as idle.

Land available for settlement is drained land held for sale. Land in occupied farms is not included except where there are large holdings intended for future subdivision, or farms developed and farmed by a company, pending sale.

Capital invested is the cost reported by the owners, or officers, of the enterprise or taken from public records. It includes primarily the cost of constructing the drainage works together with engineering, legal, and organization expenses. It does not include the value of land nor the cost of operation and maintenance.

Enterprises in arrears are those which, on January 1, 1930, had not made payment of all principal and interest due up to that time on bonds or other obligations.

Area delinquent in payment of drainage taxes is the land on which taxes, levied by an enterprise, were due and unpaid, and which, on January 1, 1930, were classed as delinquent according to the laws of the State in which the land is located.

Drainage works include all varieties of underground conduits, pipes, or lines of tile; all open ditches, canals, and pumping equipment for drainage; and all accessory levees, dikes, dams, weirs, and gates, and other devices for draining away or controlling surface and soil waters.

Gravity drainage relates to the drainage of land without the use of pumps at any time.

Area served by pumps is the land in an enterprise that, at least part of the time, is dependent for drainage upon the operation of pumps.

Drainage wells are wells from which water is pumped into a drain (which may be also an irrigation ditch) on or near the ground surface, in order to lower the ground-water table.

Cost of operation and maintenance includes all expenditures for the year 1929, except payments of

principal and interest on bonds and notes, and except money charged to capital investment. In some cases this cost was not reported. The average cost where shown is based on the acreage reporting costs, combined with the acreage for which it was definitely stated that no costs were incurred during the year.

ACCURACY OF THE STATISTICS

It is difficult to appraise the accuracy of results based on the answers to the questions on the special drainage schedule, for there is little information of a similar nature with which comparisons can be made. However, by comparing the 1930 census reports with those of 1920 for the same enterprises, by correspondence in cases of doubt, by comparing reports for intercounty projects, and by observing the consistency in the answers to questions, a fair idea of the accuracy of the results has been reached.

Questions relating to matters of public or corporate record have been reported accurately, but answers to items based on estimates by persons familiar with the condition of lands within an enterprise, are necessarily approximate. However, it is believed that the statistics collected on the special drainage schedule are reasonably accurate and that reliable deductions may be made from the data presented.

A short discussion of the principal subjects on the drainage schedule, concerning which statistics were obtained, will serve both to show the difficulties which the enumerators encountered and the accuracy of the data obtained.

Character of enterprise.—The inquiries relative to the particular type of organization under which an enterprise is classed were generally answered in a satisfactory manner. Approximately 96 per cent of all enterprises were either drainage districts, having executive officers exclusively their own, chosen according to State drainage laws; or State, county, or township projects under the control of public officials. The remaining enterprises were either irrigation projects, with both irrigation and drainage under the same officials; commercial developments; or individually owned projects of 500 acres or more.

In cases where the enumerator failed to obtain a definite classification, or classified the project under two types, the correct answer usually could be determined by noting the individual, board, or company reported as in charge of the enterprise. In some cases the reference to the law under which the project was operating served to give the correct classification.

Purpose of drainage.—Often two or more purposes of drainage were given instead of one principal purpose. However, from the location of the enterprise and the condition of land, the principal purpose could be satisfactorily determined.

Area of enterprises.—These areas were usually a matter of record. In a few cases, however, the records had been destroyed or lost and estimates were used. The inquiries relative to the portion of the area not assessed and the reasons for nonassessment, were not so accurately answered, consequently the data in Table 16, page 23, are only approximate.

Overlapping of enterprises.—In a number of States, particularly Ohio, Indiana, and Michigan, there was considerable overlapping of enterprises. The amount of overlap was difficult for the enumerator to deter-

mine. For this reason, the areas reported were plotted on county maps to a scale of a half inch to the mile and the overlap was either checked or determined in the Washington office. The description of the location of the enterprise given on the schedule was general, and, therefore, the amount of overlap so determined is approximate, but it is believed that the results will not vary more than 5 per cent from the correct amount.

Condition of land in enterprises.—The condition of land was seldom a matter of record and hence had to be determined by inquiry of persons familiar with the enterprise or section in which the land was located. Therefore the enumerator was instructed to make the best estimate possible after questioning a county surveyor, drainage commissioner, county auditor, township trustee, farmer, or other person familiar with the lands of the enterprise. In sections of the country where the land is practically all in improved farms, the question relative to present conditions could be readily answered, but in sections where many swampy and cut-over lands are found, it is more difficult to answer inquiries relative to the condition of these lands. Thus the reported condition of land in enterprises of Ohio, Indiana, Michigan, Illinois, and Iowa, is more nearly accurate than that shown for enterprises in the States of the Coastal Plain region and the Mississippi Delta, where many cut-over, swampy, and other unimproved lands are found. The reported condition of land in drainage enterprises of the irrigated West is quite accurate, for such land is largely improved and in farms.

The inquiry relative to the condition of land prior to drainage was difficult to answer, particularly for older enterprises, since reliable witnesses as to the original condition of the land could not always be found. For the same reason it was often difficult to obtain accurate data relative to the area of timber land cleared and cultivated since the enterprise was organized. Statistics relative to the present condition of land are therefore more nearly accurate than those relative to conditions before drainage.

Inquiries as to whether land is fit or unfit to raise crops, or fit only for a partial crop, due to drainage conditions, are of course quite general, and competent persons would vary considerably in their classification of such land.

Inquiries relative to acreage of improved land, woodland, land in occupied farms, and idle land, were generally answered more satisfactorily in the largely improved sections of the country than in sections less developed, for the conditions in such improved sections are more nearly uniform than those in the partially improved sections.

In some counties in the North Central States, largely covered by drainage enterprises, the condition of land was determined for the entire drained portion of the county as a unit rather than for separate enterprises. This was done by county surveyors or others whose

official duties required them to be well acquainted with land conditions, and the results are almost as accurate as if determined for each enterprise.

The inquiry relative to land available for settlement was not clearly understood in many instances. However, in the States having any considerable acreage of such lands the data were consistently reported and, therefore, the net result for all drainage enterprises is sufficiently complete to serve the purpose of the inquiry.

Costs and financing of drainage enterprises.—The investments reported often represent the money spent over a considerable period of years; hence it should be noted that the unit of measuring capital has been a rather elastic dollar, the purchasing power of which has varied considerably during the past 40 years. Therefore, the investment reported by an enterprise is not necessarily the capital that would have been required to construct the improvements in 1929. This fact explains in part the large increase in investment per acre as shown by a comparison of the 1930 and 1920 census data. The cost of enterprises constructed after January 1, 1920, was affected by a period of very high contract prices.

The inquiry relative to the additional investment required to complete works authorized referred to works under construction on the census date, but some enumerators reported the estimated cost of future improvements which the enterprise hoped to construct when money was available. Such answers were corrected when the additional investment was not accompanied by a description of the works as required by the schedule. Since little work was under construction on the census date, no serious error could arise from such estimates.

The statistics shown for enterprises in arrears in payment of principal or interest on bonds or other obligations are based on satisfactory answers. Figures relative to the area delinquent in drainage taxes, however, include some land delinquent in both the original

and overlapping enterprises. This duplication could not be accurately determined, hence, no deduction was made from the totals; but the duplicated delinquent acreage given for the States of Florida, Minnesota, Missouri, and Arkansas in the order named, where most of the duplication occurs, are estimates. These estimates are based on a close checking of the locations of enterprises, as reported on the schedules, and a plotting of the areas on county maps.

Drainage works.—The inquiries relative to length of ditches, levees, and tile, resulted in satisfactory answers except in some counties of Ohio, Indiana, and Michigan, having considerable overlapping. In these counties there was some duplication of ditch lengths due to failure to report the length of ditches dug by the earlier enterprises. In such cases an estimate was made of the length of earlier ditches taken over by later enterprises.

Most of the inquiries relative to pumping plants were answered in a very satisfactory manner. The kind of power, capacity of engines or motors, kind of pumps, and number of pumps, could be easily ascertained; but the capacity of pumps and average lift were more difficult questions. It is probable that maximum lifts were sometimes reported instead of average lifts, and that the lifts reported were seldom based on systematic records. However, where a large number of plants were reported in a State, the averages are approximately correct. When the sizes of the pumps were given in addition to other data, the discharge could be computed. In a few cases some outside lands which drained onto the lands of the enterprise were reported in pumping districts but were eliminated in editing the schedules.

The reports of pumps were compared with those of the 1920 census where possible, and with special reports when available. In cases of doubt, the facts were ascertained by correspondence. The pumping statistics are believed to be substantially correct.