AGRICULTURAL IRRIGATION TRENDS IN GEORGIA

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Abstract. This paper discusses the results of the 1995 Georgia Irrigation Survey along with previous surveys for historical comparisons. Problems associated with estimating agricultural water use are also discussed.

INTRODUCTION

Since 1970 the University of Georgia Cooperative Extension Service has periodically conducted an irrigation survey in Georgia. The objective of this survey has been to quantify changes in the extent of irrigation practices in the state. The latest survey was conducted in the fall of 1995.

Irrigation accounts for a significant portion of water use in Georgia. Irrigation water use has been estimated at between 25% and 50% of total consumptive water use in the state. Consequently, trends in agricultural irrigation will have a definite impact on Georgia's future efforts to manage its water resources.

BACKGROUND

The first Georgia Irrigation Survey was conducted in 1970 and has been repeated at intervals of one to three years since then. During the late 1970s and early 1980s, the survey was conducted annually because of the rapid growth of irrigation during that period.

The survey is conducted by the Extension engineering unit and involves sending a survey form to all counties in Georgia. Almost all counties have at least one Extension agent who is responsible for agriculture and natural resources programs in that county. This individual fills out the survey form based on his knowledge of agricultural practices in his/her county. The forms are then returned to the Extension engineering unit where the data are compiled and distributed.

RESULTS AND DISCUSSION

Irrigated Acreage Trends

Table 1 is a compilation of the statewide summaries for selected years of the irrigation surveys from 1970 to 1995. Some years were omitted due to lack of space.

The 1995 survey indicates a total irrigated acreage in Georgia of 1,356,726 acres. This figure represents a more than nine-fold increase since 1970 and a 5.4% increase since the most recent survey in 1992 (Figure 1).

A rapid growth occurred in irrigated acreage from the mid-1970s through the early 1980s. Many factors contributed to this growth including: (1) adoption of new irrigation technologies such as center pivot and drip irrigation, (2) general growth and expansion of agriculture in the late seventies, (3) trend toward larger farms, (4) release of research findings which illustrated advantages of irrigation, and (5) a series of dry years in the late seventies and extending through the eighties.

Growth since 1982 has been slow. This is likely due to two primary factors: a generally sluggish agricultural economy and the fact that much of the land that was easiest
Table 1. Compilation of Georgia Irrigation Survey

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</tr>
</thead>
<tbody>
<tr>
<td>Acres of irrigation systems</td>
<td>144,629.00</td>
<td>193,857</td>
<td>307,416</td>
<td>592,088</td>
<td>988,356</td>
<td>1,104,992</td>
<td>1,128,584</td>
<td>1,223,835</td>
<td>1,286,707</td>
<td>1,356,726</td>
</tr>
<tr>
<td>Number of irrigation systems</td>
<td>6,572</td>
<td>7,718</td>
<td>7,038</td>
<td>8,343</td>
<td>10,599</td>
<td>11,782</td>
<td>11,886</td>
<td>13,283</td>
<td>14,159</td>
<td>14,584</td>
</tr>
</tbody>
</table>

Irrigated acreage by crop:

- **Corn**: 30,418, 39,267, 76,996, 250,227, 410,241, 319,713, 341,296, 281,135, 29,611
- **Cotton**: 2,627, 1,440, 1,116, 9,270, 17,655, 35,307, 69,554, 109,868, 178,818
- **Peanuts**: 38,227, 63,982, 91,334, 19,454, 271,323, 290,455, 375,160, 374,038, 365,221
- **Tobacco**: 42,402, 48,304, 54,518, 46,081, 46,227, 47,970, 31,605, 33,725, 38,785
- **Soybeans**: 795, 3,338, 4,725, 21,728, 13,695, 219,628, 94,349, 105,240, 63,304
- **Grain Sorghum**: - - - - - - - - -
- **Vegetables - Sprinkler**: 20,061, 28,009, 26,223, 39,727, 49,005, 92,832, 97,890, 124,737, 123,053
- **Vegetables - Drip**: - - - - - - - - -
- **Pastures**: 5,440, 3,217, 4,163, 10,668, 13,991, 22,241, 24,216, 18,442, 29,617
- **Apples**: - - - - - - - - -
- **Blueberries**: - - - - - - - - -
- **Peaches**: 1,542, 1,269, 721, 1,995, 4,594, 5,730, 5,083, 3,807, 5,347
- **Pecan - Sprinkler**: 485, 1,089, 1,356, 4,662, 16,266, 34,353, 48,213, 48,213
- **Pecan - Drip**: - - - - - - - - -
- **Nursery**: 1,453, 742, 424, 602, 1,115, 2,409, 3,013, 4,567, 4,484
- **Vineyards**: - 70 145 240 1,581 522 517 604 561
- **Turfgrass**: - 1,550 1,557 1,764 2,252 2,597 5,409 9,195 11,411
- **All Other Crops**: 1,179 955 2,121 7,411 7,665 20,180 10,163 5,014 9,507
- **Golf Courses**: - 179 291 229 250 229 257 - -
- **Athletic Fields**: - - - - - - - - -

Number of irrigation systems by type:

- **Portable pipe (hand-move)**: 6,365, 6,440, 5,026, 4,179, 2,517, 1,990, 1,452, 1,352, 1,250, 593
- **Cable-tow**: 69, 664, 1,020, 2,585, 3,825, 4,060, 3,518, 3,554, 3,135, 2,851
- **Hose Reel (hose pull)**: - - - - 429 808 955 1,132 1,198, 1,276
- **Center Pivot**: 87, 238, 478, 983, 2,858, 3,597, 4,191, 4,855, 5,660, 8,167
- **Lateral Move (linear)**: - - - 7 12 28 29 23 21,120
- **Drip-Trickle**: - - - - 21 159 454 687 1,040 1,356
- **Solid Set Sprinkler**: 32, 46, 122, 135, 211, 303, 288, 429, 764, 709
- **Golf Courses**: - - - - - - - - -
- **Athletic Fields**: - - - - - - - - -

Number of irrigation systems by type of power:

- **Gasoline Engine**: 2,985, 2,991, 2,009, 1,936, 885, 835, 658, 617 506, 347
- **L.P. Gas Engine**: 1,116, 1,045, 1,377, 1,603, 822, 795, 788, 781 876, 684
- **Diesel Engine**: 2,292, 2,629, 3,434, 4,180, 6,794, 7,452, 7,485, 7,950 7,769, 9,366
- **Electric Motor**: 179, 327, 329, 441, 919, 1,472, 2,420, 3,014, 4,206, 4,187
- **Undesignated Sources**: - - 1,200 700 1,587 1,500 - - -

Number of systems by source of water:

- **Ground water**: 582, 972, 1,118, 1,771, 3,387, 4,357, 4,628, 7,260, 7,876, 8,391
- **Surface water**: 5,990, 6,084, 6,258 6,211, 6,378, 6,392, 6,666, 6,018, 6,283, 6,165
- **Waste water**: - - - - - - - - 11 177

Number of acres under chemigation:

- **Fertilizer**: - - - - - - - - -
- **Herbicide**: - - - - - - - - -
- **Fungicide**: - - - - - - - - -
- **Nematicide**: - - - - - - - - -
- **Insecticide**: - - - - - - - - -

**Golf courses and athletic fields combined for these years.
***Number of systems/average, system size in acres rounded to nearest acre.

This information was compiled from estimates supplied by county Extension agents for educational purposes only.
and least expensive to irrigate already had systems installed. A significant portion of the growth since 1982 has been on specialty crops such as vegetables and fruits.

Water Supply Sources

In 1995, 57% of the irrigation systems were supplied from ground water (wells) whereas 42% were supplied from surface water (ponds, streams, and rivers). Since 1970, the number of systems supplied from surface water has remained fairly constant, while the number of wells steadily increased (Figure 2). This could be due to the fact that most of the systems supplied from surface water utilize farm ponds which were already being used for irrigation. Therefore, when new systems were installed, it was necessary to install wells to supply the additional water. Also, many of the ponds were not adequate to supply some of the larger systems which were being installed.

Types of Irrigation Systems

Figure 3 illustrates trends in the use of various types of irrigation systems which are predominant in Georgia. In the early 1970s, most of the systems utilized portable aluminum pipe with sprinklers. These systems were highly labor intensive and were used primarily on small fields of tobacco and vegetables.

During the 1970s and early 1980s, the use of traveling guns increased dramatically, but has declined slightly since then primarily because of the high labor requirement and cost of operation.

Note that the use of center pivot systems and drip irrigation has steadily increased. Although their use has increased for a variety of reasons, these systems are considered to be the most efficient available today both in terms of energy consumption and water use, especially with the increased use of low pressure center pivot systems. Changes in sprinkler technology have also made certain sprinkler packages on center pivots more efficient in their water delivery.

Estimated Agricultural Water Use

Based on the acreage irrigated and the inches applied for each crop (Table 2), the total amount of water used for irrigation in 1995 was 9,832,307 acre-inches. Therefore the

<table>
<thead>
<tr>
<th>Crop</th>
<th>Inches Applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>7.4</td>
</tr>
<tr>
<td>Cotton</td>
<td>6.7</td>
</tr>
<tr>
<td>Peanuts</td>
<td>6.4</td>
</tr>
<tr>
<td>Tobacco</td>
<td>4.8</td>
</tr>
<tr>
<td>Soybeans</td>
<td>3.9</td>
</tr>
<tr>
<td>Grain Sorghum</td>
<td>3.6</td>
</tr>
<tr>
<td>Vegetables - Sprinkler</td>
<td>8.3</td>
</tr>
<tr>
<td>- Drip</td>
<td>11.0</td>
</tr>
<tr>
<td>Pastures</td>
<td>5.3</td>
</tr>
<tr>
<td>Apples</td>
<td>3.7</td>
</tr>
<tr>
<td>Blueberries</td>
<td>5.8</td>
</tr>
<tr>
<td>Peaches</td>
<td>7.1</td>
</tr>
<tr>
<td>Pecan - Sprinkler</td>
<td>2.3</td>
</tr>
<tr>
<td>- Drip</td>
<td>8.2</td>
</tr>
<tr>
<td>Nursery</td>
<td>19.3</td>
</tr>
<tr>
<td>Vineyards</td>
<td>10.7</td>
</tr>
<tr>
<td>Turfgrass</td>
<td>14.9</td>
</tr>
<tr>
<td>Greenhouses</td>
<td>32.2</td>
</tr>
<tr>
<td>Golf Courses</td>
<td>40.0</td>
</tr>
<tr>
<td>Athletic Fields</td>
<td></td>
</tr>
<tr>
<td>All Other Crops</td>
<td>12.6</td>
</tr>
</tbody>
</table>

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average amount of water applied to an acre in 1995 was 7.3 inches. The 1995 total water use is calculated to be 266.85 billion gallons of water or about 731 mgd on average.

CONCLUSIONS/DISCUSSION

Even though Georgia receives a relatively abundant amount of annual rainfall, the patterns of rainfall are very inconsistent, particularly during the summer growing season. Consequently, irrigation is increasingly being viewed as a necessary input for profitable agricultural production in Georgia.

Irrigated acreage in the state has increased more than nine-fold since 1970, but indications are that future growth will occur at a much slower pace (Figure 1). Increasingly, farmers are using more efficient methods of irrigation which should help improve the effectiveness of the irrigation water applied.

The amount of irrigation water applied will vary tremendously from year to year depending on the amount of rain received in the agricultural areas during the growing season. Estimates of yearly average water applications indicate that annual irrigation water use fluctuates between 100 and 300 billion gallons. The annual water use calculation is from individual estimates that could be very subjective, depending on the perceived rainfall received. High irrigation use will generally occur during periods of lower than normal rainfall. Since high use typically coincides with periods when water tables are naturally low, this may present an interesting challenge in managing the area’s water resources.

A second problem that arises is the unit of measurement for agricultural water use. In some areas of the nation, agricultural water use is expressed in area-depth units (i.e. acre-feet), but in Georgia the units of water measurement have traditionally been volume per unit of time (i.e. million gallons per day-MGD). This has slowed communication efforts between agencies and commodity groups but should improve in time. Thus far, relatively few conflicts have occurred, and where they have it has typically been isolated incidences during extremely dry years.

Since 1991, all large agricultural water users have been required to obtain a withdrawal permit from the Environmental Protection Division, Georgia Department of Natural Resources (DNR). In 1994 DNR indicated that over 20,000 permits had been issued to agricultural water users. Attempts to define agricultural usage have been difficult due to the number and variety of agricultural permits. However, this permitting process should ultimately allow state agencies to more accurately estimate