

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.

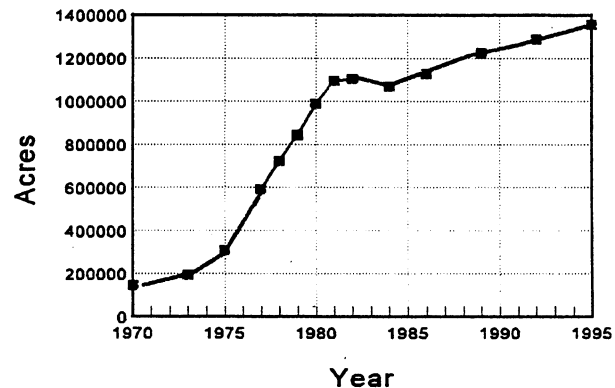


Figure 1. Trends in irrigated acreage in Georgia.

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

For Years: 1970, 1973, 1975, 1977, 1980, 1982, 1986, 1989, 1992, 1995

	1970	1973	1975	1977	1980	1982	1986	1989	1992	1995
Acres of irrigation systems	144,629.00	193,857	307,416	592,088	988,356	1,104,992	1,128,584	1,223,835	1,286,707	1,356,726
Number of irrigation systems	6,572	7,718	7,038	8,343	10,599	11,782	11,886	13,283	14,159	14,584
Irrigated acreage by crop:										
Corn	30,418	39,267	76,996	250,227	410,241	319,713	341,296	281,135	290,505	143,611
Cotton	2,627	1,440	1,116	9,270	17,655	35,307	69,554	109,868	178,818	543,308
Peanuts	38,227	63,982	91,334	19,544	271,323	290,455	375,160	374,398	365,221	313,064
Tobacco	42,402	48,304	54,518	46,081	46,522	47,970	31,605	33,725	36,926	37,885
Soybeans	795	3,338	4,725	21,728	133,695	219,628	94,349	105,240	63,504	20,637
Grain Sorghum	-	-	-	-	-	-	12,758	36,006	21,933	7,283
Vegetables - Sprinkler	20,061	28,009	26,223	39,727	49,005	92,832	97,890	124,737	123,053*	106,563
- Drip	-	-	-	-	-	-	-	-	9,596*	12,497
Pastures	5,440	3,217	4,613	10,668	13,991	22,241	24,216	18,442	29,617	26,172
Apples	-	525	152	1,100	1,378	1,243	677	514	365	54
Blueberries	-	-	-	-	-	-	1,130	1,936	2,201	2,669
Peaches	1,542	1,269	721	1,995	4,594	5,730	5,343	5,083	3,807	5,347
Pecan - Sprinkler	485	1,089	1,356	4,662	16,266	34,353	48,538	69,335	22,269*	22,774
- Drip	-	-	-	-	-	-	-	-	45,668*	48,213
Nursery	1,453	742	424	602	1,115	2,409	3,013	4,567	4,307	4,484
Vineyards	-	70	145	240	1,581	522	517	604	561	665
Turfgrass	-	1,650	1,557	1,764	2,252	2,597	5,409	9,195	11,411	15,389
All Other Crops	1,179	955	2,121	7,411	7,665	20,180	10,163	5,014	9,507	1,728
Golf Courses	-	-	-	6,069	7,638	8,655	**	**	**	**
Athletic Fields	-	-	-	-	614	1,157	6,966	15,111	18,795	21,015
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	599/32
Cable-tow	69	694	1,090	2,585	3,825	4,060	3,618	3,554	3,135	2,851/73
Hose Reel (hose pull)	-	-	-	-	429	808	955	1,132	1,198	1,276/93
Center Pivot	87	238	478	983	2,858	3,597	4,191	4,855	5,660	8,167/108
Lateral Move (linear)	-	-	-	-	7	12	28	29	23	21/120
Drip-Trickle	-	-	-	21	159	454	687	1,040	1,356	1,083/67
Solid Set Sprinkler	32	46	122	135	211	303	288	429	764	709/37
Golf Courses	-	179	291	229	250	229	257	-	-	-
Athletic Fields	-	113	120	175	256	311	405	892	766	579/37
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	1,033	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	-	-	-	-	1,179	1,228	5	3	4	-
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	-	-	-	-	-	128,927	136,618	133,285	155,749	106,164
Herbicide	-	-	-	-	-	27,766	31,958	20,077	15,810	16,870
Fungicide	-	-	-	-	-	14,039	6,617	9,200	12,026	6,975
Nematicide	-	-	-	-	-	-	1,200	700	1,587	1,500
Insecticide	-	-	-	-	-	8,308	4,819	7,615	4,112	3,003

*Drip and Sprinkler acreage separated beginning 1992.

**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.

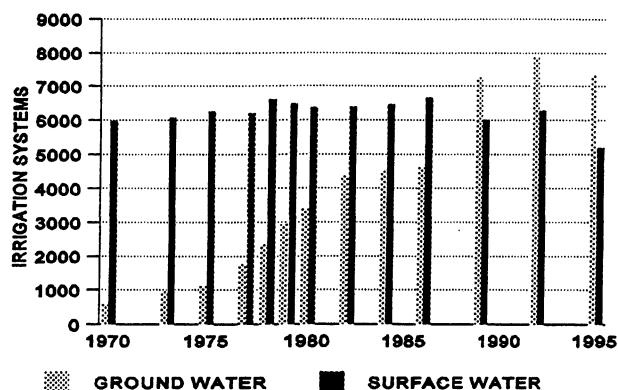


Figure 2. Trends in irrigation water sources in Georgia

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

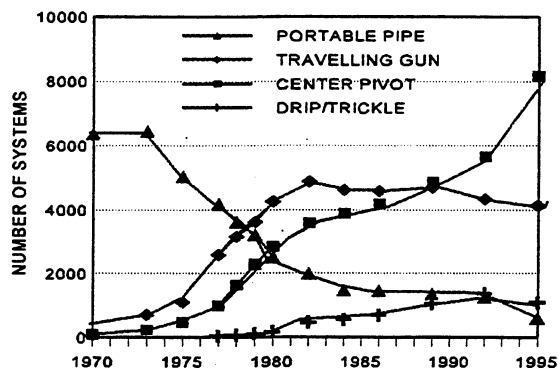


Figure 3. Trends in the use of the most predominant irrigation methods in Georgia.

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 2: Water Applied in 1995

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

This information was compiled from estimates supplied by county Extension agents for educational purposes only.

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.

agricultural water use in Georgia.

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