Mapping and Characterization of Center Pivot and Lateral Move Irrigation Systems in South Carolina Using Quantum Geographic Information System

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Abstract. In recent decades, the adoption of overhead irrigation systems, especially center pivots, to irrigate row crops has been steadily increasing in South Carolina. The adoption of irrigation in the state has been enhanced by the predominance of coarse-textured soils with low water-holding capacities, which increases the likelihood of obtaining a significant and profitable crop yield response to irrigation. As the number of overhead irrigation systems in the state increases, it is vital to understand their number, location, and characteristics for better planning and managing available water resources. The objective of this project was to map and characterize the overhead irrigation systems (center pivots and lateral moves) available in each county in South Carolina. The Quantum Geographic Information System (QGIS) was used to manually locate and measure each overhead irrigation system in the state using a 2022 Google satellite image. Basic measurements included the length, number of spans, and wetted radius. In addition, the rotation angle of center pivots and the field length of lateral move systems were measured. This study found that with a few exceptions, the overwhelming majority of the overhead irrigation systems in the state were located in the central part of the Coastal Plain region, between the Fall Line and the coast, where groundwater resources are more abundant. Also, this study found a total of 2,980 center pivots and 15 lateral move irrigation systems in South Carolina. A total of 64,694 hectares were irrigated by center pivots, while lateral moves irrigated only 80 hecatares. Out of the 46 counties in the state, those with the highest number of center pivots were Orangeburg (633 pivots), Calhoun (361), Lee (296), Clarendon (249), Sumter (248), Lexington (197), Bamberg (130), Darlington (121), Hampton (117), and Barnwell (114). All the lateral move systems were located in the counties of Barnwell (11) and Darlington (4). Water stakeholders and agencies in South Carolina could use this information for long-term water resources planning at various levels. This research is also useful nationally to inform the understanding of irrigation practices in the southeastern United States.

INTRODUCTION

In recent years public attention has been paid to the utilization of water resources in South Carolina. Special attention has been devoted to the extraction of surface and groundwater resources for irrigation in agricultural production. For example, in 2020, around 53% of water (623 out of 1,177) of water users withdrew water for irrigation from 1,971 sources (1,763 groundwater and 208 surface water) (Craig and Monroe 2021). In 2015, the Edisto River was named as America's most endangered due to excessive withdrawal of water for agricultural use (Rivers 2015). The public and media attention to the use of water for agriculture prompted the initiation of a state water planning process, including public hearings to discuss the planning of water resources in the different river basins in the state. As the state embarks on this water planning process, it is essential to know the amount of water extracted for irrigation, the types of irrigation systems used, the location of the irrigation systems, and the characteristics of the irrigation systems, etc.

South Carolina is located in a humid environment, receiving an average of 1270 mm of rain per year (Runkle et al. 2022). Despite receiving this much rain, irrigation is common in the state due to high evapotranspiration rates during the summer growing season combined with the predominance of sandy and shallow soils with low organic matter contents and low water-holding capacities. Supplemental irrigation tends to increase crop productivity, reduce the probability of crop failure, and enhance product quality compared with rainfed crops (Farahani et al., 2008). In South Carolina, high-value crops, such as fruits and vegetables, are typically irrigated using low-flow systems (i.e., drip, microsprinklers or solid-set systems). In contrast, low-value row crops (i.e., cotton, corn, soybean, peanuts) are either nonirrigated or are irrigated using overhead irrigation systems (i.e., center pivots and lateral move systems). Traveling gun irrigation systems are typically used to irrigate some pasture crops, while surface irrigation systems are not commonly used in the state (Templeton 2017).

Results from the USDA irrigation surveys conducted in 2002, 2007, 2012, and 2016 indicated that the adoption of irrigation in the state had been steadily increasing (NASS 2002; 2007; 2012; 2016). These results are based on surveys and farmers' interviews and are valuable for understanding historical trends. These results, however, do not provide accurate information regarding the location and the physical characteristics of specific irrigation systems. Several local studies were conducted in 2020-21 to obtain more detailed information focusing on center pivot irrigation systems in South Carolina. For example, Pellett (2020) conducted a study to map center pivot irrigation fields in South Carolina using the Google Earth Engine and the National Agriculture Imagery Program. Pellett (2020) found that using the Google Earth Engine interface facilitated the delineation of 2,689 center pivots, which irrigated 59,352 hectares in South Carolina in 2017. Pellett (2020) also found that the delineated center pivot irrigation areas added up to 98% of the center pivot irrigation acreage estimated by the USDA. Similarly, Zurqani et al. (2021) conducted a study to map and quantify irrigated regions of South Carolina using the Google Earth Engine and the random forest technique. Zurqani et al. (2021) found that most of the irrigated areas were distributed in counties near the central region of the South Carolina Inner Coastal Plain. However, gaps exist as these studies did not obtain information about all the physical characteristics of the overhead irrigation systems and did not study lateral move irrigation systems.

Various methods and approaches have been used to identify the irrigation infrastructure and irrigated areas in South Carolina (Hassani et al. 2021; Pellett 2020; Xie and Lark 2021; Zurqani et al. 2021). However, there is still a lack of knowledge regarding specific irrigation structures used to irrigate various crops and their characteristic features. Hence, a detailed study is needed to identify, map, and characterize the overhead irrigation systems available in South Carolina. Therefore, the overall goal of this study was to create a database with information about the current location and characteristics of irrigation systems in South Carolina and make this type of information readily available to water stakeholders and agencies in the state. The specific objective of this study was to map and characterize the overhead irrigation systems (center pivots and lateral moves) available in each county in South Carolina.

MATERIALS AND METHODS

STUDY AREA

This study was conducted in 2022 in the state of South Carolina, USA. The climate in South Carolina is humid and subtropical (Köppen climate classification Cfa) with long, hot summers and short, mild winters. In summer, the daytime temperatures are often >32°C, and the nights are mild to warm in the 19 to 24°C range. The coastal regions of the state are warmer than the interior. During winters, the daytime temperatures are between 14 to 17°C and the nighttime temperatures are between 3 to 6°C. The average annual precipitation ranges from 1,143–2,032 millimeters and occurs throughout the year (US Department of Commerce 2020). South Carolina has three major physiographic provinces: Blue Ridge, Piedmont, and Coastal Plain.

MAPPING AND MEASURING IRRIGATION SYSTEMS

The Quantum Geographic Information System (QGIS) was used to manually map and measure each overhead irrigation system in South Carolina using a high resolution 2022 Google Satellite image (EPSG:3857 – WGS 84/Pseudo-Mercator-Projected). QGIS is a user-friendly open-source geographic information system that implements many geospatial data access, visualization, processing, and analysis functions. In addition to the Google Satellite image, a county line layer (EPSG:26917 - NAD83/UTM zone 17N-Projected) was used to identify and locate the overhead irrigation system in each county. In addition, a 1 kilometer x 1 kilometer grid was created and overlaid on the satellite image to facilitate locating the irrigation systems by focusing on a 1 kilometer x 1 kilometer square at a time.

In addition to the location of each system, we also measured the length, number of spans, wet radius (with end gun, if applicable), and rotation angle. Figure 1 shows an example for counting the number of towers and measuring span length. The QGIS measuring tool was used to measure the lengths and rotation angles. A portion of the attribute table used to generate a map of the center pivot system in various South Carolina counties is shown in Figure 2.

AREA IRRIGATED BY IRRIGATION SYSTEMS

Since the center pivot trajectory normally describes a circle, the area irrigated by a center pivot depends on the radius of the circle, which corresponds to the length of the pivot, including any length covered by an end boom and an end

Figure 1. Counting the number of towers and distance between each tower in the (a) center pivot and (b) lateral move irrigation systems using the 2022 Google satellite image.

gun (Figure 3). For a center pivot rotating in a full circle (360°) the area irrigated was approximated as:

$$A = (\pi \text{ x } R^2)/k \tag{1}$$

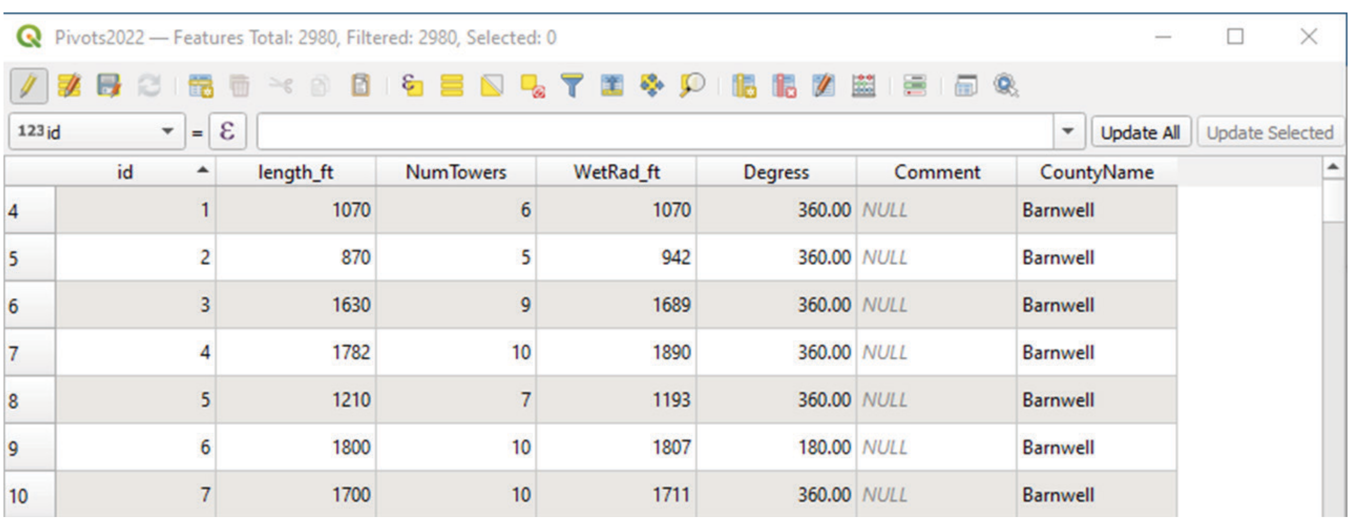
where, A = area (ha), π = 3.1416, R = length of the pivot (m), and k = 10,000 (k is a constant to convert the area from square m to ha). R can be calculated by adding the lengths of the pivot spans, the length of the end boom, and the wetted radius of the end gun, if present. A more accurate equation to calculate the area irrigated by a center pivot with an end gun was provided by Von Bernuth (1983). However, the information that could be obtained in this study was insufficient to apply this procedure, which is a limitation of the research. Ideally, a center pivot will irrigate a full circle, but due to obstacles, field shape, and other reasons, it is common for center pivots to irrigate only a partial circle (Figure 3). If the pivot is operating as a partial circle, then the area irrigated is reduced according to the angle (α = degrees) of the circle irrigated as:

$$A = [(\pi \text{ x } R^2)/\text{k}]\ (\alpha/360). \tag{2}$$

For the lateral move systems, the rectangular area irrigated was calculated as:

$$A = (L \text{ x } F)/k \tag{3}$$

where L = wet length of lateral (m) and F = length of the field (m).



	id	length_ft	NumTowers	WetRad_ft	Degress	Comment	CountyName
4	1	1070	6	1070	360.00	NULL	Barnwell
5	2	870	5	942	360.00	NULL	Barnwell
6	3	1630	9	1689	360.00	NULL	Barnwell
7	4	1782	10	1890	360.00	NULL	Barnwell
8	5	1210	7	1193	360.00	NULL	Barnwell
9	6	1800	10	1807	180.00	NULL	Barnwell
10	7	1700	10	1711	360.00	NULL	Barnwell

Figure 2. Attribute table used to generate center pivot maps using the Quantum Geographic Information System.

Figure 3. Example of the mix of partial-circle and full-circle center pivots used in South Carolina.

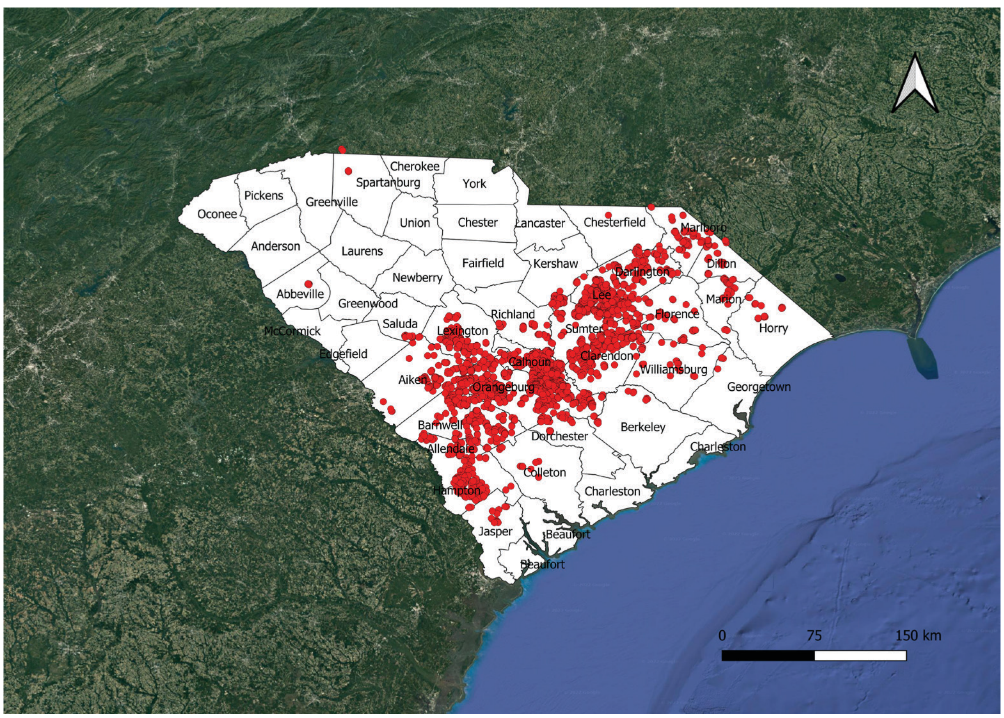


Figure 4. Geographic location of center pivots in South Carolina in 2022.

RESULTS

The results of the area irrigated and the number of center pivots and lateral move irrigation systems available in various counties in South Carolina are shown in Table 1. The maps developed using QGIS representing the geographical distribution of the number of center pivots and the area irrigated in different counties are shown in Figures 3 and 4. In 2022, a total of 2,980 center pivots (Table 1) and 15 lateral move irrigation systems (Table 2) were visually observed from Google satellite images in South Carolina. The largest number of center pivots were in Orangeburg (633 pivots), Calhoun (361), Lee (296), Clarendon (249), Sumter (248), Lexington (197), Bamberg (130), Darlington (121), Hampton (117), and Barnwell (114) counties. The fewest number (<10) of center pivots were installed in Chesterfield, Georgetown, Spartanburg, Colleton, and Abbeville counties. We found that most of the center pivot irrigation systems were in the Coastal Plain region of South Carolina (Figure 4). All the

Table 1. Statistics of area irrigated and the number of center pivots by county in South Carolina in 2022.

County	Area Irrigated by Center Pivots (ha)					Number of Center Pivots
	mean	max	min	sd	Total	Total
Abbeville	13.8	35.4	6.6	12.2	69	5
Aiken	30.6	99.8	3.2	22.9	2,599	85
Allendale	38.8	136.7	3.6	28.5	3,068	79
Bamberg	18.9	116.7	1.8	18.0	2,461	130
Barnwell	19.1	104.2	1.5	18.8	2,173	114
Berkeley	22.3	31.9	6.3	7.3	268	12
Calhoun	24.3	147.9	0.9	19.4	8,775	361
Chesterfield	10.6	10.6	10.6	-	11	1
Clarendon	21.2	144.2	0.9	20.1	5,255	249
Colleton	12.2	27.0	6.7	5.6	122	10
Darlington	23.2	74.7	3.0	12.9	2,802	121
Dillon	21.3	66.5	7.8	15.0	597	28
Dorchester	13.8	37.6	3.6	8.6	414	30
Florence	19.8	88.8	3.6	20.7	733	37
Georgetown	11.7	17.7	7.1	4.6	47	4
Hampton	24.0	77.2	3.8	14.0	2,807	117
Horry	15.6	42.0	1.5	10.1	264	17
Jasper	27.9	57.2	6.1	15.1	615	22
Kershaw	17.6	48.2	3.6	12.0	299	18
Lee	21.7	102.3	1.5	17.8	6,433	296
Lexington	16.5	83.5	1.6	13.1	3,241	197
Marion	28.5	76.6	5.6	17.0	969	34
Marlboro	26.3	72.8	5.4	14.2	1,366	52
Orangeburg	18.4	123.6	0.9	15.2	11,625	633
Richland	28.3	119.7	1.5	28.6	878	31
Saluda	17.8	58.8	2.8	15.8	214	12
Spartanburg	9.9	16.4	5.1	4.2	69	7
Sumter	23.8	166.5	1.2	22.1	5,897	248
Williamsburg	20.4	71.7	2.9	15.3	613	30
Total					**64,694**	**2,980**

lateral move irrigation systems were installed in Barnwell (11 laterals) and Darlington (4) counties.

After identifying the center pivot and lateral move irrigation systems installed in the field, we calculated the total irrigated area in each county based on the total area covered by the center pivots and lateral systems. Based on the results obtained from each county, we estimated a total of 64,694 hectares irrigated using center pivots and 80 hectares irrigated using lateral move irrigation systems in South Carolina (Tables 1 and 2). Among the counties, Orangeburg had the highest area under irrigation (11,625 ha), followed by Calhoun, Lee, Sumter, and Clarendon (8,775; 6,433; 5,897; and 5,255 ha, respectively). All these counties are located in the Coastal Plain region of South Carolina. The counties of Spartanburg, Chesterfield, Georgetown, and Abbeville had <100 hectares of land irrigated with center pivots. These counties are located in the Blue Ridge and Piedmont regions of South Carolina, except for Chesterfield and Georgetown.

The wet radius (with end gun, if applicable) and rotation angle of center pivots by county are shown in Table 3. The mean wetted radius in different counties ranged from 184–363 meters. Allendale County had the highest pivot wet-

Table 2. Statistics of lateral move irrigation systems by county in South Carolina in 2022.

County	Number of lateral move systems	Mean length of lateral move system (m)	Mean number of spans	Mean wet length (m)	Mean field length (m)	Total irrigated area (ha)
Barnwell	11	158.1	3.27	166.7	329.3	65.4
Darlington	4	107.0	2.50	107.0	327.0	14.5
Total	**15**					**79.9**

Table 3. Statistics of wetted radius and rotation angles of center pivots by county in South Carolina in 2022.

County	Pivot Wetted Radius (m)				Pivot Rotation Angle (Degrees)			
	mean	max	min	sd	mean	max	min	sd
Abbeville	200	351	145	86	354	360	330	12.0
Aiken	334	594	101	121	285	360	90	84.2
Allendale	363	660	107	124	310	360	90	74.9
Bamberg	259	746	91	119	283	360	45	81.4
Barnwell	246	576	70	109	311	360	180	73.0
Berkeley	344	451	164	88	222	360	180	54.3
Calhoun	289	686	53	112	298	360	90	80.6
Chesterfield	184	184	184	-	360	360	360	0.0
Clarendon	263	745	53	115	305	360	90	77.9
Colleton	228	427	146	78	285	360	170	78.0
Darlington	298	581	130	89	292	360	160	81.4
Dillon	262	460	157	79	330	360	180	54.4
Dorchester	228	375	107	82	299	360	136	79.4
Florence	248	532	107	116	313	360	180	70.5
Georgetown	193	238	160	34	350	360	320	17.3
Hampton	304	701	110	94	294	360	90	85.1
Horry	224	377	70	80	335	360	180	56.4
Jasper	324	536	197	84	291	360	180	84.6
Kershaw	231	392	119	67	331	360	101	69.1
Lee	276	599	85	102	300	360	90	78.9
Lexington	240	595	78	88	296	360	160	80.3
Marion	317	494	163	83	306	360	180	76.1
Marlboro	302	482	131	87	323	360	180	65.0
Orangeburg	255	652	64	95	295	360	60	82.5
Richland	349	652	107	137	223	360	56	95.7
Saluda	238	433	152	96	314	360	118	83.0
Spartanburg	214	323	137	74	266	360	180	82.6
Sumter	279	728	61	112	308	360	150	74.6
Williamsburg	263	478	96	93	305	360	180	80.6
Average	**267**	**519**	**115**	**94**	**303**	**360**	**155**	**69**

Table 4. Statistics of the number of spans, span length, and length of center pivots by county in South Carolina in 2022.

County	Number of Spans				Span Length (m)				Pivot Length (m)			
	Mean	Max	Min	sd	Mean	Max	Min	sd	Mean	Max	Min	sd
Abbeville	4.4	10	2	3.2	50.2	61.6	35.0	9.7	197	350	123	89
Aiken	5.9	10	2	2.1	56.1	65.9	45.2	4.2	333	593	101	121
Allendale	6.7	15	2	2.6	55.4	70.9	40.6	6.4	362	658	106	124
Bamberg	4.7	13	2	2.1	54.9	86.9	40.7	6.9	255	718	91	119
Barnwell	4.6	11	1	2.2	54.6	71.4	40.7	6.3	243	547	70	106
Berkeley	5.5	7	3	1.3	62.3	71.4	53.5	6.0	343	447	163	87
Calhoun	5.0	13	1	2.0	57.9	79.0	40.4	6.3	288	685	53	112
Chesterfield	3.0	3	3	-	54.3	54.3	54.3	-	163	163	163	-
Clarendon	4.4	13	1	1.9	60.1	103.4	34.1	9.8	262	743	53	115
Colleton	4.1	7	2	1.4	57.4	73.0	35.3	12.6	227	426	146	78
Darlington	4.9	11	2	1.6	61.4	79.8	40.9	6.1	297	579	129	89
Dillon	4.5	9	3	1.5	59.2	67.6	51.0	4.1	262	459	157	79
Dorchester	4.0	6	2	1.3	57.2	67.9	48.6	5.2	227	374	106	81
Florence	4.4	9	2	1.5	52.4	67.6	30.8	12.2	248	530	106	116
Georgetown	3.3	4	3	0.5	59.2	66.4	53.2	5.5	192	237	160	34
Hampton	5.2	11	2	1.6	59.1	71.6	38.8	5.6	303	699	109	94
Horry	3.7	6	1	1.4	61.3	73.0	46.7	7.0	223	376	70	80
Jasper	5.4	9	3	1.4	60.3	75.5	47.9	7.2	323	535	196	84
Kershaw	4.1	7	2	1.2	57.1	65.9	50.2	5.6	230	391	119	67
Lee	4.7	12	1	1.8	57.5	85.1	31.0	6.4	270	593	85	102
Lexington	4.6	13	1	1.8	52.2	71.4	18.2	6.5	235	579	54	88
Marion	5.4	9	3	1.3	57.5	67.2	38.2	7.1	307	492	163	82
Marlboro	5.3	10	2	1.6	56.7	67.9	41.8	5.3	297	480	131	85
Orangeburg	4.6	13	1	1.8	54.0	91.2	33.1	5.8	246	650	58	95
Richland	6.1	12	2	2.6	57.1	67.9	44.2	5.2	346	642	88	136
Saluda	4.0	7	2	1.5	59.5	76.0	50.7	8.2	237	432	152	95
Spartanburg	4.0	6	3	1.3	53.1	56.7	45.6	3.8	213	322	137	74
Sumter	4.9	14	1	2.1	55.3	98.8	30.7	7.5	270	717	61	111
Williamsburg	4.4	8	1	1.6	58.3	95.8	47.6	8.8	251	454	96	93
Average	**4.7**	**9.6**	**1.9**	**1.7**	**57.0**	**74.2**	**41.7**	**6.8**	**264**	**513**	**120**	**94**

ted radius followed by Richland, Berkely, Aiken, and Jasper counties, and the lowest pivot wetted radius was observed in Chesterfield and Georgetown counties. The mean pivot rotation angle ranged from 222–360 degrees in different counties.

The length, number of spans, and pivot length by county are shown in Table 4 and Figure 5. The average number of spans by county ranged from 3.0–6.7, and the mean span length in different counties ranged from 50.2–62.3 meters. The mean pivot length in different counties ranged from 163–362 meters. Chesterfield County, located in the northeastern region of South Carolina, had the smallest number of spans, span length, and pivot length. The Coastal Plain counties had the largest pivot length, especially in counties like Allendale, Richland, Aiken, Berkely, Jasper, and Marion, which had pivot lengths of >300 meters.

DISCUSSION

Approximately one-third of all irrigation in the United States depends on self-propelled sprinkler irrigation systems, mostly center pivots (Evans 2001). These sprinkler irrigation systems have allowed farmers to irrigate lands unsuitable for surface irrigation from light sandy soils and heavy clay soils with significant topographical and soil type variations within

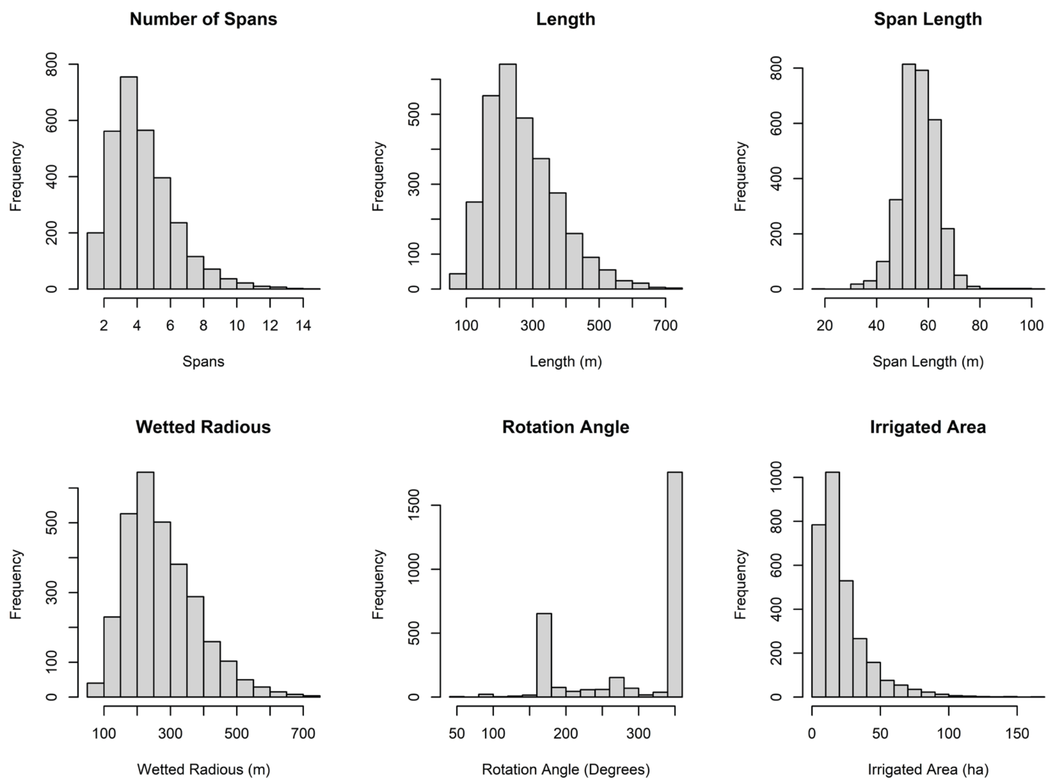


Figure 5. Histograms of the number of spans, length, span length, wetted radius, rotation angle, and irrigated area of center pivots in South Carolina in 2022.

the field and where rainfall is insufficient for good crop production (Albaji et al. 2015; Albaji and Hemadi 2011). This is the main reason for the increase of center pivot irrigation systems by more than 50% in the USA from 1986–1996 (Evans 2001).

In the present study, QGIS was used to manually map and measure each overhead irrigation system in the state using a 2022 Google satellite image (Zurqani et al. 2021). In addition to the location of each system, we also calculated the total irrigated area with center pivots and lateral move irrigation systems, the number of spans, span length, and pivot length. We found 2,980 center pivot and 15 lateral move irrigation systems located in South Carolina in 2022 (Tables 1 and 2). This study shows that 64,694 hectares of land were irrigated using the center pivot irrigation system and only 80 hectares using lateral move irrigation systems in 2022 in South Carolina. Similarly, Pellett (2020) observed 2,540 center pivots in 2017 in South Carlina irrigating 54,891 hectares. In our study, we observed a 17% increase in the number of center pivot systems (440 additional pivots) and a 9% increase in the total irrigated area (an additional 5,342 hectares) in South Carolina when compared to Pellett (2020).

The center pivot and lateral move irrigation systems had variable sizes and lengths. We found that most of the center pivots were installed in the Coastal Plain region of South Carolina (Orangeburg, Calhoun, Lee, Clarendon, Sumter, Lexington, Bamberg, Darlington, Hampton, and Barnwell). The number of center pivots installed in the Blue Ridge and Piedmont regions was comparatively less. Some counties in these regions did not have a single center pivot installed (Figure 4). The number of spans, span length, and pivot length was also higher in the counties of the Coastal Plain. The main reason for adopting more center pivots in the Coastal Plain regions could be more availability of groundwater and more favorable topography compared with the Blue Ridge and Piedmont regions of South Carolina (Arguez et al. 2012).

The Coastal Plain aquifers contain approximately 95% of the state's total groundwater (Wachob et al. 2020). Between 2011 and 2018, most of the wells in South Carolina were located in the Coastal Plain province, and a few wells were found in the Blue Ridge and Piedmont provinces (Wachob et al. 2020). Figures 4, 6, and 7 show the result of the center pivot irrigation systems located in different geographical locations of South Carolina. More than 98% of the center pivots were located in the Coastal Plain regions compared to other Blue Ridge and Piedmont regions. The results corroborate with the state's groundwater availability, number of wells, topography, and soil type. Center pivot systems are suitable

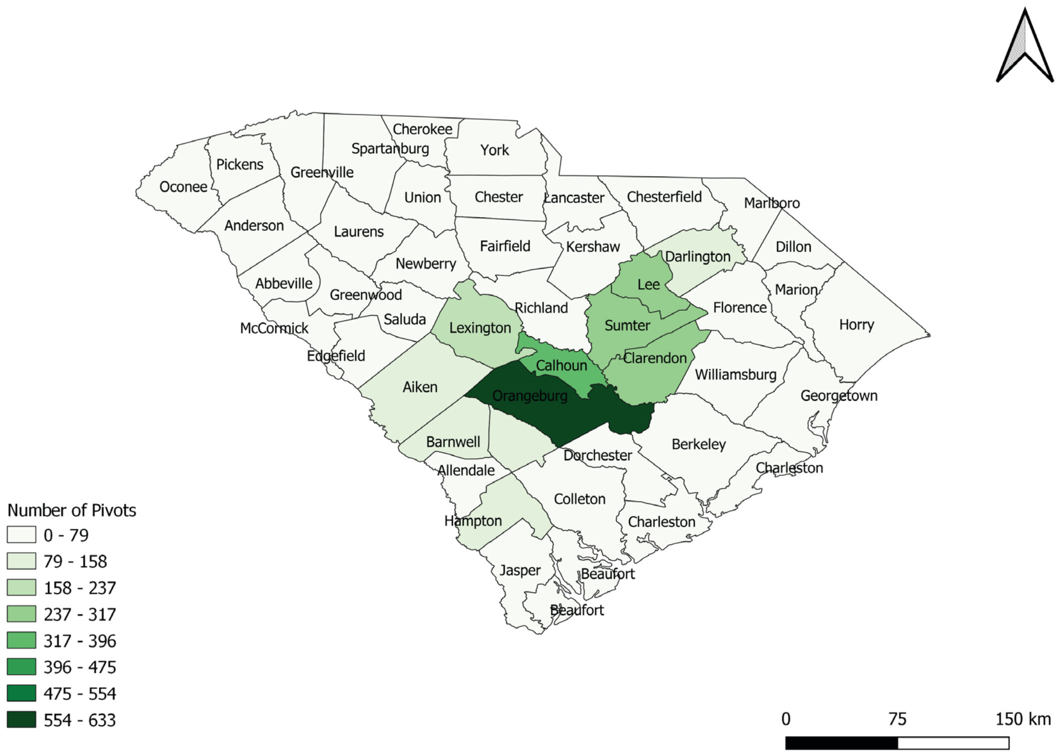


Figure 6. Geographic distribution of the number of center pivots by county in South Carolina in 2022.

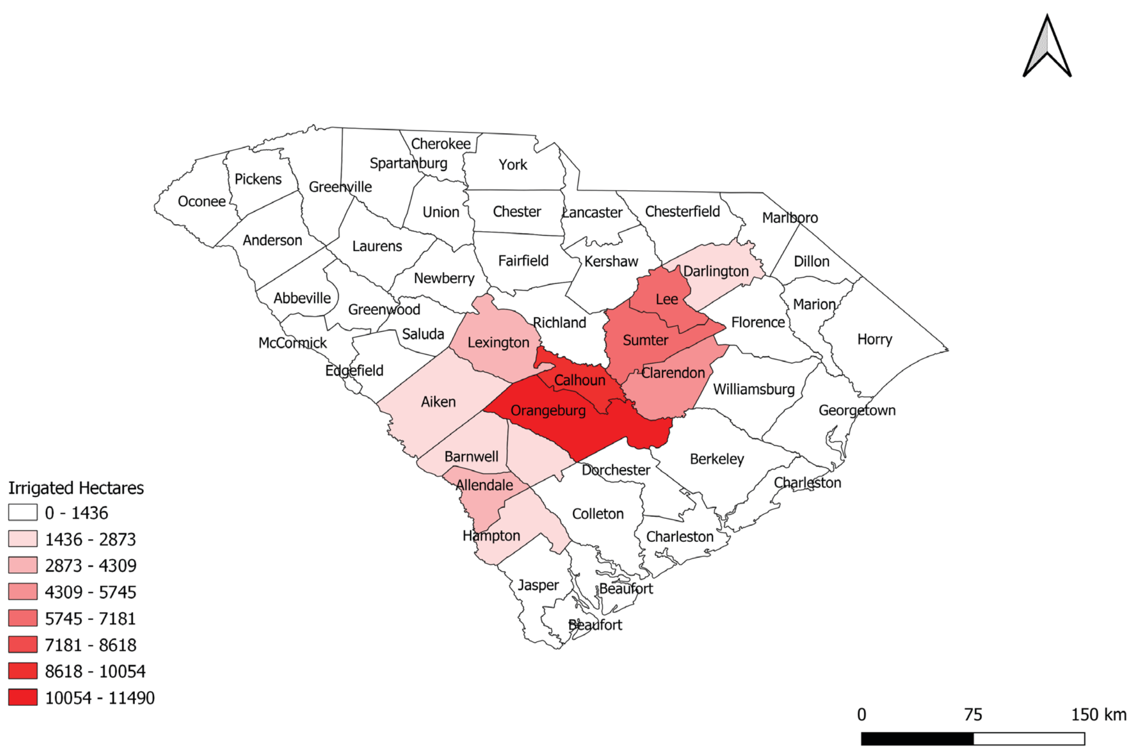


Figure 7. Geographic distribution of the hectares irrigated using center pivots by county in South Carolina in 2022.

for the coarse-textured soils predominant in the coastal regions, where it is impractical to adopt surface irrigation systems (McKnight 1979).

We also found 15 lateral move irrigation systems located in Barnwell and Darlington counties in 2022, which irrigated 80 hectates of land. These lateral move irrigation systems, which are mainly used for field plot research, were all located at Clemson University's Edisto and Pee Dee Research and Education Centers. Farmer's adoption of lateral move irrigation systems is much less attractive than the adoption of center pivots in South Carolina. Field shape, topography, and ease-of-use are probably the most significant factors that determine the adoption of either a lateral or center pivot system.

Adopting a center pivot irrigation system in the Coastal Plain region can increase productivity (i.e., yield per unit volume of water consumed by the crop) and reduce evaporation loss compared to other surface irrigation systems (Nikolaou et al. 2020). As center pivot irrigation systems increase, their accurate mapping is essential to support irrigation management and allocate available water resources (Zhang et al. 2018). The information generated from this study could be used to plan and adjust future water policies and regulations, and to develop and conduct research and extension programs to address relevant water management issues targeted to specific areas of the state.

CONCLUSION

We have manually mapped the locations of center pivot irrigation systems installed in all counties of South Carolina using QGIS and a 2022 Google satellite image. We found that farmers installed the greatest number of center pivots in the Coastal Plain regions of South Carolina. Adopting center pivots for irrigation in the Blue Ridge and Piedmont region was less feasible compared with the Coastal Plain region. We also estimated that 64,694 hectates of land were irrigated with center pivot irrigation systems in South Carolina in 2022. Orangeburg County had the highest area under irrigation with center pivot irrigation systems, followed by Calhoun and Lee counties. We also found 15 lateral move irrigation systems located in Barnwell and Darlington counties, which irrigated 80 hectares of land in 2022. These lateral move systems were located at two Clemson University's experimental stations. County extension agents, farmers, scientists, and other water stakeholders in South Carolina could use this information to study and identify farms with center pivot and lateral move irrigation systems and plan effective water resource management.

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