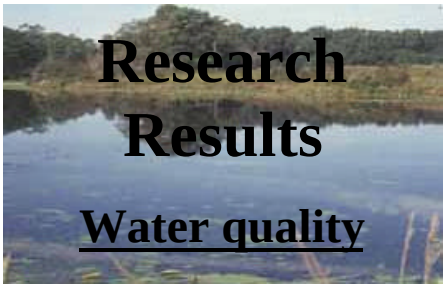

INTRODUCTION

Clean surface and ground waters are essential to the continued rapid growth in population and tourism in the Coastal Plain. New technologies and production practices can reduce the risk of water-quality problems caused by crop production. Improvements in planting equipment have allowed farmers to use environmentally friendly cropping practices such as conservation tillage and narrow row widths, both of which reduce erosion, increase rainwater infiltration, and make the crop more competitive with weeds (reducing herbicide use). Advances in global positioning systems (GPS) and global information systems (GIS) now make it possible to precision apply nutrients and pesticides to specific areas of fields where computer technology has determined they are needed (increasing farmer profits and reducing environmental risks). Breakthroughs in biotechnology have resulted in the development of crop varieties having natural herbicide and insect resistances, thereby reducing farmer reliance on chemical-pesticide applications. When used collectively, these practices and technologies should result in less risk of sediment, nutrients, and pesticides entering South Carolina's water resources.

OBJECTIVE

To determine whether traditional crop production practices contribute to water-quality problems on the southeastern Coastal Plain and to quantify the level of water-quality protection that can be achieved with new cropping practices and technologies.

APPROACH

Runoff water was collected and analyzed during the 1999 (corn), 2000 (cotton) and 2001 (corn) growing seasons from a split-landscape study being conducted at the Pee Dee Research and Education Center near Florence, SC. The field was split in half, with one half of the field receiving Innovative production practices and the other half Traditional production practices. The treatments used to produce the corn and cotton crops on the two sides of the field are shown in Table 1. Runoff water was collected from three plots (1/8 acre each) on each side of the field. Using aluminum borders, water is diverted through an H-flume in each plot and sampled every 2 minutes using automatic (ISCO) samplers.

Table 1. Treatments imposed on split landscape study.

Traditional	**Innovative**
Disking, cultivating, bedding (cotton only)	No surface tillage
In-row subsoiling	Broadcast deep tillage with ParaTill
Conventional variety for cotton and corn	Bt/glyphosate-tolerant variety for cotton, conventional hybrid for corn.
Broadcast P application	Precision application of P using GPS
Atrazine, nicosulfuron corn herbicides. Fluometuron, pendimethalin, sethoxydim, pyrithiobac, cyanazine cotton herbicides.	Atrazine, nicosulfuron corn herbicides. Glyphosate, pendimethalin cotton herbicides.
30-inch (corn) and 38-inch (cotton) row widths.	15-inch (corn) and 38-inch (cotton) row widths.

RESULTS

1999

The 1999 growing season was dry, with only four rainfall events producing measurable water runoff during the growing season with the Traditional production system and one event with the Innovative production system (Fig. 1). Although Hurricanes Floyd and Irene delivered substantial rainfall amounts, rainfall intensities were not sufficient to produce runoff from either weather event. The combined results from all four runoff events are shown in Table 2. The amount of water runoff from the Innovative production system was near zero and minimal from the Traditional production system. Considerably less soil, nitrogen, and phosphorus were lost from the Innovative production system than from the Traditional production system.

2000

More rainfall occurred during the 2000 growing season than the 1999 growing season (Fig. 2). Runoff occurred during 19 rainfall events with the Traditional production system and during 9 events with the Innovative production system (Fig. 2). The combined results from all runoff events in 2000 are shown in Table 3. There was very little water runoff with the Innovative production system. In contrast, a total of 2.4 inches of runoff water was collected with the Traditional production system. Considerably less soil, nitrogen (ammonium and nitrate), and phosphorus were lost from the Innovative production system than from the Traditional production system.

2001

The 2001 corn growing season was very dry at the Pee Dee Research and Education Center (Fig. 3), similar to 1999. For the entire year of 2001, six rainfall events resulted in runoff with the Traditional production system and six events with the Innovative production system. The combined results from all runoff events are shown in Table 4. The total amount of water runoff with the Innovative production system was small compared to the amount with the Traditional production system. Considerably less soil and nitrogen were lost with the Innovative production system, whereas phosphorus loss was similar for the two systems.

CONCLUSIONS

In all years, use of the Innovative production system resulted in substantially less water, sediment, and nutrient runoff during rainstorm events. Even with the Traditional production system, water runoff was not substantial. Each year is different with respect to rainfall amount, frequency, and intensity. Because of this variation, we will continue to monitor the effects of cropping systems on water quality in coming years.

Fig.1. Amount of rainfall and water runoff during the 1999 growing season. Runoff shown is for when Innovative versus Traditional production practices were used.

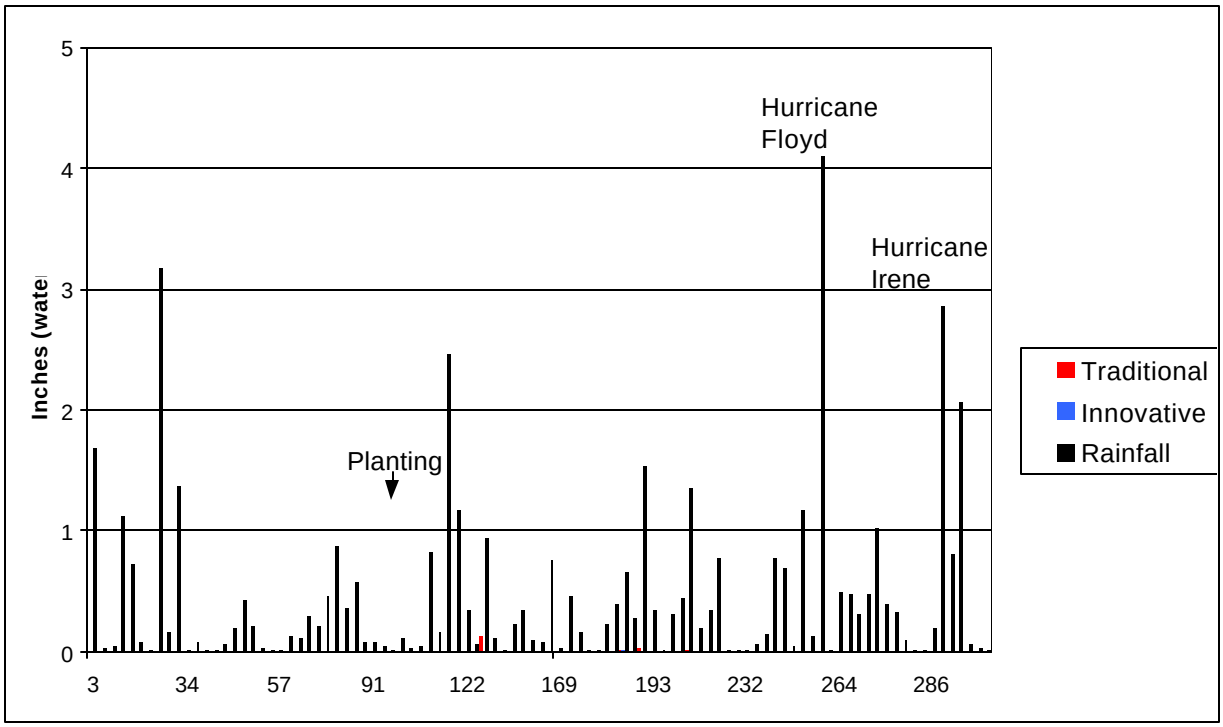

Table 2. Amount of water, sediment, and nutrient runoff for each cropping system during the corn growing season in 1999

Cropping System	Water Runoff	Suspended Solids (Sediments)	Total Nitrogen	Phosphate
	Inches	lbs/acre		
Traditional	0.175	301	0.339	0.01
Innovative	0.0006	0.1	0.0005	0.00007
Source: J. Hayes, and J. Novak, 1999, unpublished data				

Fig. 2. Amount of rainfall and water runoff during the 2000 growing season. Runoff shown is for when Innovative versus Traditional production practices were used.

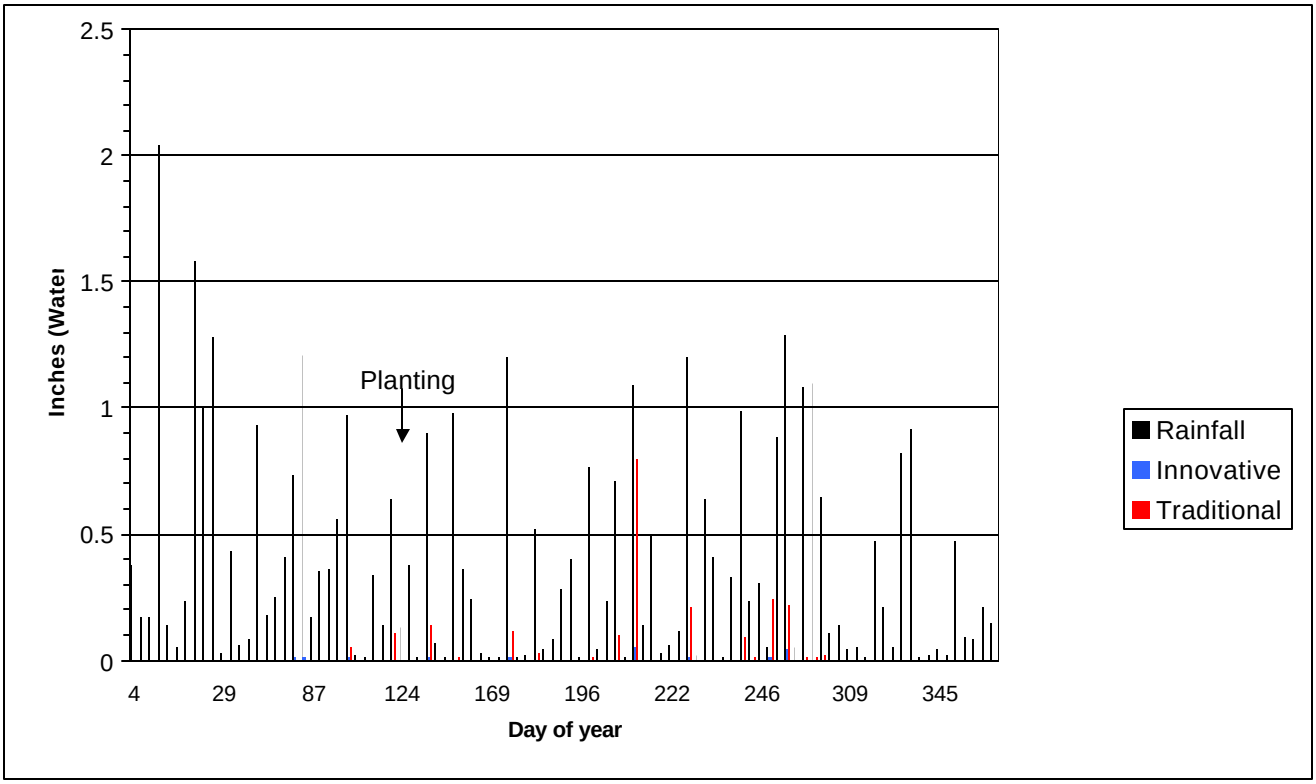

Table 3. Amount of water, sediment, and nutrient runoff for each cropping system during the cotton growing season in 2000.

Cropping System	Water Runoff	Suspended Solids (Sediments)	Total Nitrogen	Phosphate
	Inches	lbs/acre		
Traditional	2.4	1176	5.5	0.05
Innovative	0.1	12	0.09	0.001
Source: J. Novak, and J. Hayes, 2000, unpublished data.				

Fig. 3. Amount of rainfall and water runoff during the 2001 growing season. Runoff shown is for when Innovative versus Traditional production practices were used.

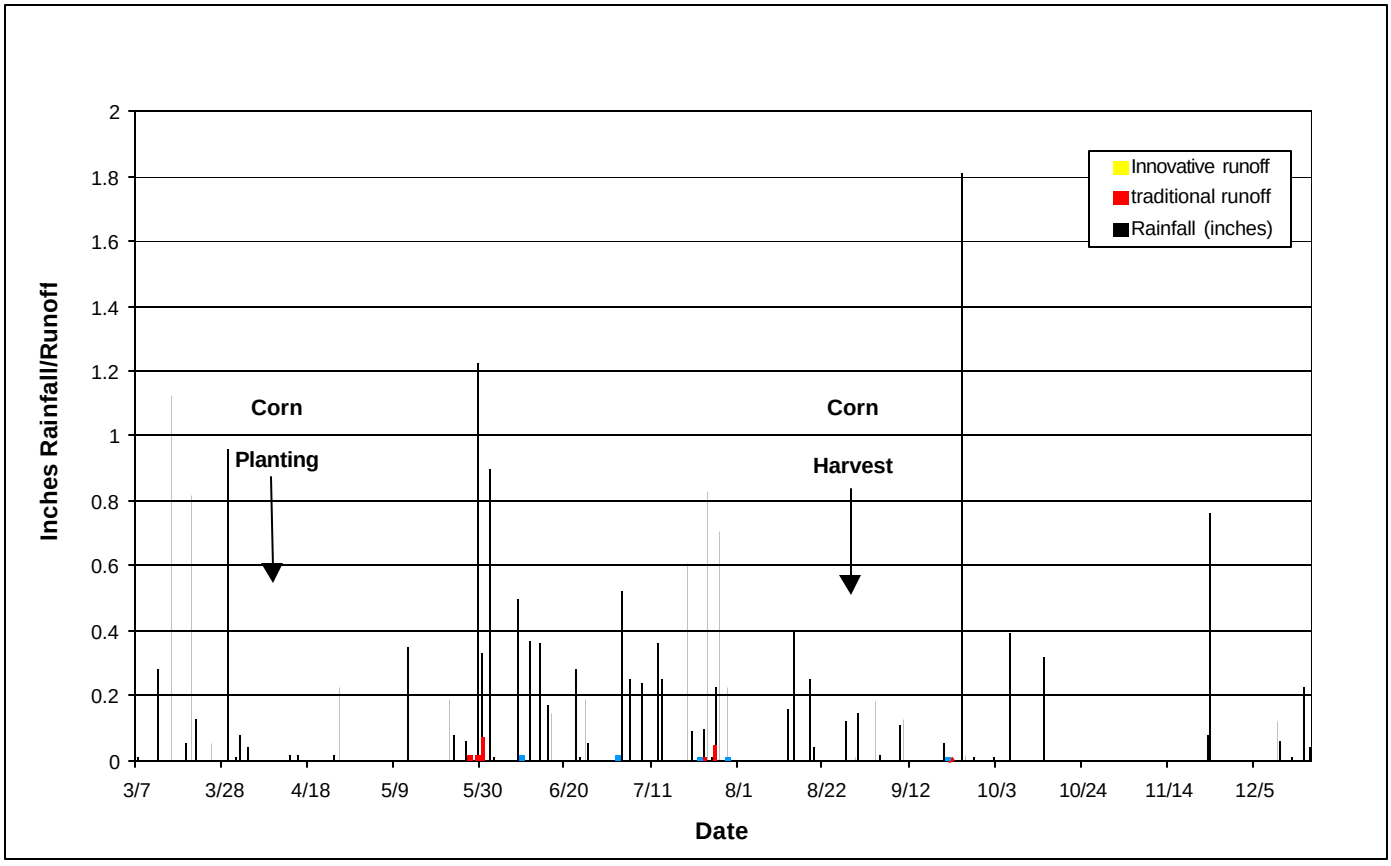

Table 4. Amount of water, sediment, and nutrient runoff for each cropping system during the corn growing season in 2001.

Cropping System	Water Runoff	Suspended Solids (Sediments)	Total Nitrogen	Phosphate
	Inches	lbs/acre		
Traditional	0.114	248	0.31	0.004
Innovative	0.013	6	0.03	0.004
Source: J. Novak, and J. Hayes, 2001, unpublished data.				