

## WATER USE IN RICE, 1990

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Knowing how much water it takes to produce a rice crop in the Mississippi Delta is important for two main reasons. First, any attempt at regulation of water use can only be effective if the regulating agencies have a good estimate of how much water the farmer needs to produce the crop with a "reasonable" level of management. Second, the need for conservation makes it imperative that the farmer be provided with a "workable" amount of water to aim for when he is making both short and long term irrigation water management decisions. The key words "reasonable" and "workable" are important. Farming is a business. A farmer required to use methods that are so costly that they don't allow for a reasonable profit, or asked to achieve a water use level that is so low as to be unworkable, will not be in business long.

The demonstrations reported here were undertaken to find out how four different Delta farmers used their water to produce a rice crop. Our four fields were chosen on the basis of farmer cooperation, ease of well metering, and the ability to measure runoff. This was not a scientific study based on random sampling or having controls. The farmers were volunteers who all use some water conservation techniques.

A propeller flow meter was attached to each irrigation system either directly to the well discharge or to a riser supplying water to the field. A stage recorder and weir or flashboard riser was placed near the single drainage point from the field to monitor runoff. After the well flow rates were determined, pumping times for flushing, flooding, and maintaining the flood were calculated and provided to the farmers.

The farmers increased their pumping in the late July and early August period when it was extremely hot and dry to meet what they perceived to be an increase in water demand (evapotranspiration). In every case, the runoff amount increased along with the pumping indicating that the increased pumping was not necessary.

The biggest obstacle to water conservation is the fact that an error in using too much water costs a few dollars; an error in using too little water could cost a crop. The farmer has to be able to rely on the water use numbers we provide. Studies such as this one can provide the information we need.

The following is a listing of field characteristics, management practices, and water use for the four fields involved in the study. The graphs show amounts of water applications and runoff for each field.

### Field 1

**Irrigation Management Decisions:** This farm employs a rice water manager who often delegated actual irrigating chores but who made most of the decisions as to when and how long to water.

**Field location:** South Washington County near the Sunflower River.

**Field Description:** This field contained 48.4 acres, land formed with cross-slope at about .28 (this was done years ago and is no doubt somewhat different today), levees were spaced at .2, and run parallel. There were 20 levees.

**Drainage** at the southwest end of the field near the turnrow was through a flashboard riser into a ditch. We placed our stage recorder in front of this flashboard riser inside the field.

The well, located at the northeast corner with one riser, was an electric submersible that pumped 800 gpm at the beginning of the season and 740 gpm at the end. It was equipped with a timer. The flow meter was attached at the riser.

Soils: Forestdale silty clay loam with a sandy loam surface, some Alligator clay, Sharkey clay, and Dundee silty clay loam.

Cultural practices: Normal rotation is one year rice, two years soybeans. Rice variety Lamont was drill planted by April 25, 1990. Installed flow meter April 26, 1990, and planned to start first flush soon. Installed stage recorder April 30, 1990.

There was one true flush (2,656,800 gallons on 48.4 acres or 2.03 Ac"/Ac) from May 4, 1990 to May 7, 1990. By May 18, 1990, the rice was about 4", and no water had been pumped since the flush, we had about a 2" rain on May 12, 1990. Four million, two hundred twenty-seven thousand, one hundred gallons or 3.24 Ac"/Ac were pumped as a shallow flood from May 25, 1990, to May 29, 1990.

Total water pumped was 51,008,700 gallons or 1,053,899 gallons per acre, 39 Ac"/Ac. (Graph 1)

We recorded 5.1" rain, the May 12th rain was not recorded because we installed the rain gage on May 29, 1990.

Total runoff was 12 Ac"/Ac. (Graph 2)

Yield was "best estimated" at 130 bushels per acre.

#### Field 2

Irrigation Management Decisions: Our cooperater was the rice water manager. Although he delegated actual irrigating, he made all of the decisions.

Field location: South Washington County near Hollandale.

Field Description: This field contained 29 acres. The land was formed at .15 in a south to north direction, levees were spaced at .2 with 10 metal gates.

Drainage at the northwest end of the field near the turnrow was into a pipe and a ditch. We installed a 2' metal weir and placed our stage recorder in front of the weir inside the field.

The well, located at the southeast corner with one riser, was an electric that pumped close to 1100 gpm from May 7 to June 29, 1053 on August 3, 1990. It was equipped with a timer which was used sporadically at best. The flow meter was attached at the riser.

Soils: Tunica clay, nearly level phase.

Cultural practices: Normal rotation is one year rice, two years soybeans. Rice variety Maybelle was drill planted by April 25, 1990, and all levees pulled by April 27, 1990. Installed flow meter April 26, 1990, and planned to start first flush soon. Installed weir and stage recorder April 30, 1990.

There was one true flush between April 30 and May 7, 3,698,900 gallons on 29 acres or 4.72 Ac"/Ac. By May 11, the rice was about 4" and no water had been pumped since the flush. We had about a 2" rain on May 5, 1990. From May 20 to June 1, 5,012,000 gallons or 6.4 Ac"/Ac were pumped as a flood.

Total water pumped was 33,732,000 gallons or 1,163,172 gallons per acre, 43 Ac"/Ac. (Graph 3)

We recorded 4.8" rain, the May 12 rain was not recorded because we installed the rain gage May 29, 1990.

I estimate total runoff at about 15 Ac"/Ac based on water use from the other fields of 28 Ac"/Ac (43-28=15). Problems with the stage recorder left too many gaps in this data to make an accurate reporting. (Graph 4)

Yield was "best estimated" at 130 bushels per acre.

#### Field 3

Irrigation Management Decisions: Our cooperater employed a rice water manager who was required to make the irrigation decisions with as little help as possible.

Field location: South Washington County near Arcola.

Field Description: This field contained 33 acres. The land was not formed, levees were spaced at .2 with 13 plastic canvas gates. A multiple inlet water delivery system was installed by the farmer. The unit included 6 PVC gates strung together with poly pipe.

Drainage at the northwest end of the field was into a ditch. We installed a 2' metal weir and placed our stage recorder in front of the weir inside the field.

The well, located at the east end with a direct discharge, was an electric that consistently pumped 930 gpm. It was equipped with a timer. The flow meter was attached at the discharge with the poly pipe for the inlet system attached to the meter.

Soils: Sharkey clay, nearly level phase.

Cultural practices: Normal rotation is one year rice, two years soybeans. Rice variety Rexmont was drill planted by May 10, 1990, and all levees pulled by May 11, 1990. Installed flow meter by May 30, 1990. Installed weir and stage recorder June 26, 1990.

There was one true flush (1,168,000 gallons on 33 acres or 1.31 Ac"/Ac) between May 29 and May 30. By June 21, the rice was about 4" and an additional 2,074,900 gallons or 2.33 Ac"/Ac of water had been pumped. We had about a 2" rain on May 12, 1990, just after planting. From June 22 to June 29, 5,018,100 gallons or 5.6 Ac"/Ac were pumped as a flood.

Total water pumped was 31,000,000 gallons or 939,394 gallons per acre, 35 Ac"/Ac. (Graph 5)

We recorded .2" rain, rain prior to July 31, 1990, was not recorded because we installed the rain gage July 24, 1990.

Total runoff 8 Ac"/Ac. (Graph 6)

Yield was "best estimated" at 140 bushels per acre.

#### Field 4

Irrigation Management Decisions: Our cooperator was also the rice water manager.

Field location: North Washington County outside of Leland.

Field Description: This field contained 40 acres. The land was formed on .1 with straight levees spaced at .2 with 12 plastic canvas gates. A multiple inlet water delivery system was installed by Paul Rodrigue of the Soil Conservation Service (SCS) and me. The unit included 12 PVC gates strung together with polypipe.

Drainage at the southwest end of the field was into a flashboard riser (3.83' weir), then into a ditch. We installed our stage recorder in front of the weir inside the field.

The well, located at the northeast end with a system of four alfalfa valves into four adjacent 40 acre fields, was a diesel that consistently pumped 2300 gpm at 1900 rpm, 2000 gpm at 1760 rpm, and 1670 gpm at 1470 rpm. The flow meter was attached at the alfalfa valve into the test field with the polypipe for the inlet system attached to the meter.

Soils: Alligator clay.

Cultural practices: Normal rotation is one year rice and two years soybeans. Rice variety Lamont was drill planted and all levees pulled by June 29, 1990. Rains at all the wrong times delayed planting and caused us to change fields before the tests could be started. Installed flow meter by June 29, 1990; however, the farmer removed the meter until sometime around July 24, 1990. Installed stage recorder by June 29, 1990.

We have no record of water use prior to July 24, 1991. The farmer used well flow rates and hours of operation to estimate that he used a total of 9 Ac"/Ac to flush. By July 30 to August 7, the rice was about 4" and we recorded 6,224,000 gallons or 5.76 Ac"/Ac of water were pumped as a flood.

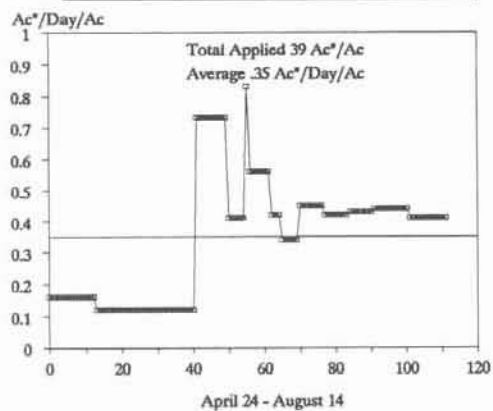
Total water recorded as pumped was 33,529,000 gallons or 838,225 gallons per acre, 31 Ac"/Ac. I added the farmer's 9 Ac"/Ac estimate to get 40 Ac"/Ac. (Graph 7)

We recorded no rainfall information.

Total runoff 9 Ac"/Ac. (Graph 8)

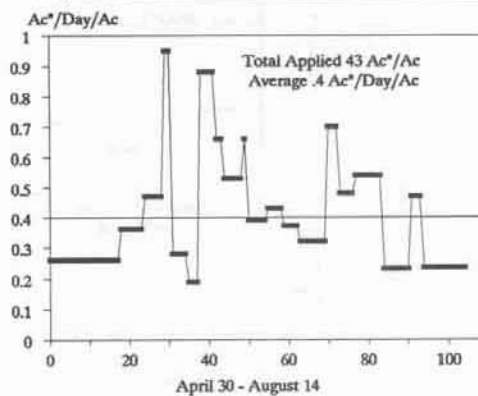
Yield was "best estimated" at 130 bushels per acre.

**Water Applied to Field 1**



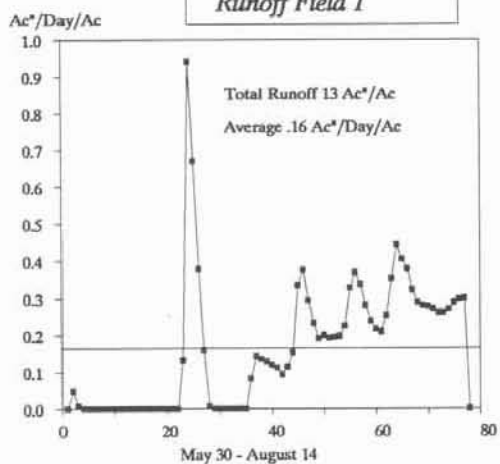
**Graph 1**

**Water Applied to Field 2**



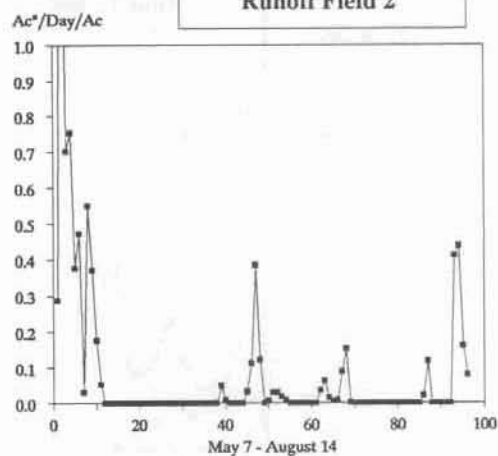
**Graph 3**

**Runoff Field 1**



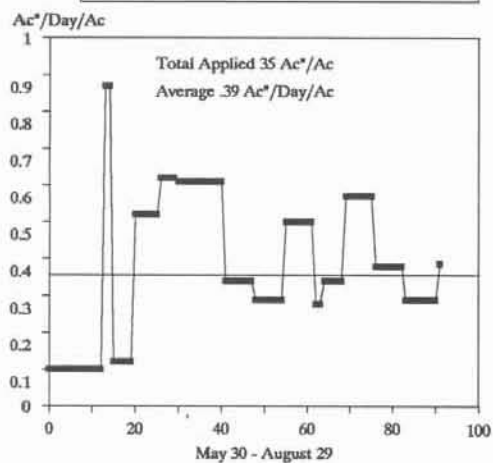
**Graph 2**

**Runoff Field 2**



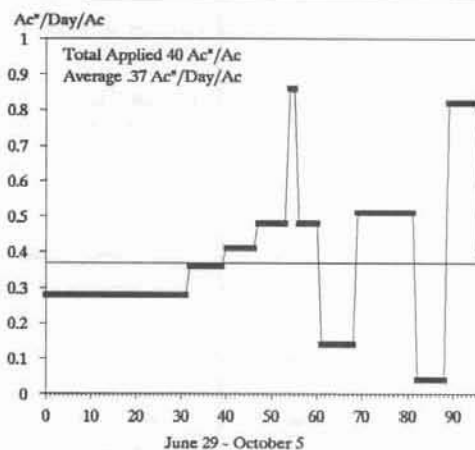
**Graph 4**

Water Applied to Field 3



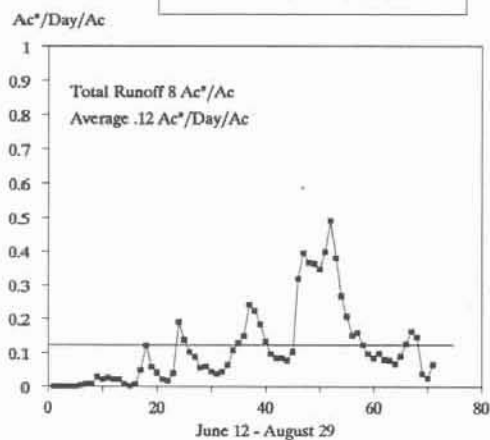
Graph 5

Water Applied to Field 4



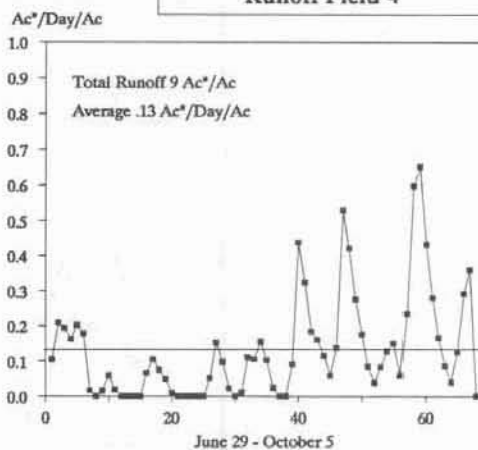
Graph 7

Runoff Field 3



Graph 6

Runoff Field 4



Graph 8