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Water storage structures, such as this one in east Mississippi, where drilling wells is often economically impractical, can help producers achieve more consistent, and often higher, yields.

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On-farm water storage can help ease drought risk

With on-farm storage, farmers can capture rain and store until needed for crop irrigation.

Hembree Brandon | Nov 13, 2017

Are on-farm water storage reservoirs for crop irrigation economically feasible? The answer, says Dr. Brian Williams, Extension assistant professor of agricultural economics at Mississippi State University: "It depends."

There are a couple of considerations, he said at the Water Resources Management Forum held in conjunction with the annual meeting of the Mississippi Agricultural Economics Association. "One is the land you have to take out of production for the reservoir; the other, on the flip side, is the risk management benefit — irrigation can give you more consistent, and often higher, yields."

While Mississippi is a rainfall-rich state, says Williams, who grew up on a Nebraska farm where water wasn't so plentiful, "about 70 percent of the rainfall here occurs in the winter and spring, but in the summer, when you need it for your crops, you often don't get it. With on-farm storage, you can capture rain and store until you need it for crop irrigation."

Dr. Steve Martin, left, associate director of the Mississippi Extension Service, and Dr. Brian Williams, Extension assistant professor of agricultural economics, were among those attending the annual meeting of the Mississippi Agricultural Economics Association.

While farmers in the Delta area of the state have readily accessible groundwater that can be pumped for irrigation, and tailwater recovery systems are also being used to capture runoff from fields, in the eastern part of the state the cost of drilling deep wells is often prohibitive, and precision leveling of fields is usually not feasible due to the contours of the land. "But producers can take advantage of the natural contours of the land and use gravity for rainfall runoff to flow directly into a water storage system.

"In a cooperative project with producers at Brooksville, Miss., who had on-farm water storage systems in place, we scaled their system down for our research and ran simulations of weather, crop prices, and other factors to determine if the systems are economically feasible."

Many on-farm storage systems were put in place when crop prices were a lot higher, Williams notes. "Things look a lot different with $14 soybeans than with $9 or $10 soybeans. The systems were absolutely feasible when soybeans were $14, but with the prices we're seeing now it's a bit more questionable."

"These systems also serve as a risk management tool — you can think of them as another form of crop insurance. A lot of producers are willing to give up that extra $15 to $30 per acre over the course of 25 years, for land taken out of production for the water storage system, in order to have steadier yields."

In most cases in the study, he says, non-irrigated systems beat out irrigated, mainly due to crop income lost from land that was taken out of production for the storage facility. "These on-farm water systems are profitable — just not quite as much as with dryland production. But the numbers were very close, and when you look at them statistically, there's not much difference.

"A factor that comes into play is that these systems also serve as a risk management tool. So, you can think of them as another form of crop insurance. A lot of producers are willing to give up that extra $15 to $30 per acre over the course of 25 years, for land taken out of production for the water storage

system, in order to have steadier yields. They give up a little bit of profit, but with irrigation capability they avoid the risk of drought over the long term."

One thing that does change the results toward the positive side, Williams says, is the environmental benefit. "At the same time you're capturing rainfall in runoff from the fields, you're also capturing sediment, nutrients, and chemicals — keeping them out of streams and rivers. That has a positive value."

In the Delta, he notes, NRCS has cost-sharing programs for constructing systems. "When you incorporate a 20 percent to 40 percent NRCS cost-share for constructing the system, that makes it a lot more favorable from an economic standpoint. And there are societal benefits from cleaner water, reduced runoff contributing to hypoxia in the Gulf of Mexico, etc."

Williams expressed appreciation to the Mississippi Soybean Promotion board for its sponsorship of the on-farm water storage work.

He noted another project, in cooperation with the USDA Office of the Chief Economist, to evaluate the feasibility or return on investment of crops irrigation — "drilling a well, furrow irrigating, center pivot irrigating, the various scenarios widely used in the Southeast. We're doing this in parallel with the Water Resources Center at the University of Nebraska. They're looking at the entire Midwest corn belt, but the USDA chief economist wanted some comparable data from the Southeast, where agriculture is fundamentally different from the Midwest. We're just getting under way with this."

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