# Rotation *Makes ~~Sense~~* Cents

## *Switching Crops Can Increase Yields By 12-15 Percent, Some Years As High as 40-50 Percent*

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A corn-cotton rotation study had its eighth year at Stoneville under the supervision of Dr. Wayne Ebelhar, Research scientist agronomist working in soil fertility with corn, cotton and soybeans.

"This study is actually funded through the Mississippi Cotton Incorporated State Support Program," he said. "The year 2000 was the beginning of this project at two different locations. We are looking at five nitrogen rates and four potassium rates on corn and cotton in a rotation system."

The rotation consists of one year of corn followed by two years of cotton. The research focuses not only on the nitrogen and potassium rates for each of the crops, but how they relate to each other.

"We have seen rotation responses where we average across all the N and K rates," he said. "We are looking at cotton following corn versus cotton following cotton." We have this test at two locations, here at the experiment station at Stoneville on the Delta Research and Extension Center a Boskit very fine sandy loam soil, and this study is repeated at out satellite farm near Tribbett on a mixed soil, Forestdale/Dundee silty clay loam. So we do see variations."

He said that from the potassium side of things no response has been seen on either corn or cotton. However, these are soils that are at least medium to high in potassium based on soil testing.

Recommendations are already being made from the study.

"We have seen cotton yield responses, in dry years as high as 30-50 percent," Ebelhar said. "The average on rotations is usually about 12-15 percent advantage to cotton following corn as compared to cotton following cotton. We have seen that range from negative yields, cases where we are actually reducing yields in a rotation situation."

He explained the increases are usually in the driest years even though the areas can be irrigated. However, timely irrigation is not always possible, since irrigation comes out of a surface water source utilizing equipment that has to be moved around and shared.

"The years that we have actually reduced yields or there has been no yield response came when we had a tremendous amount of rainfall and a tremendous amount of boll rot," he explained. "The cotton following corn, which is generally taller and more lush, is a better growing crop. It is more deeply rooted. That crop suffered more because of the excess rainfall, we had a lot more boll rot. So we actually reduced yields there. Yet, if you looked at the crop on July 1, you would have been convinced that it was going to be a bumper crop."

What is difficult is not knowing what a year will be like. Some years there are really good yields with a significant increase in cotton following corn compared to cotton following cotton. Then there are years when yields have been bad, maybe 600 pounds with cotton following cotton, and cotton following corn, maybe 900 pounds.

"Obviously rotation is a key," Ebelhar said. "We are very much interested in rotation. In Mississippi last year we had planted 980,000 acres of corn planted. The last time we had a million acres of corn in Mississippi was in 1960, and that crop averaged 27 bushels to the acre."

Mississippi in the 1930's had 3.5 million acres of corn so it is not that Mississippians haven't grown corn before. Still there are rotation benefits.

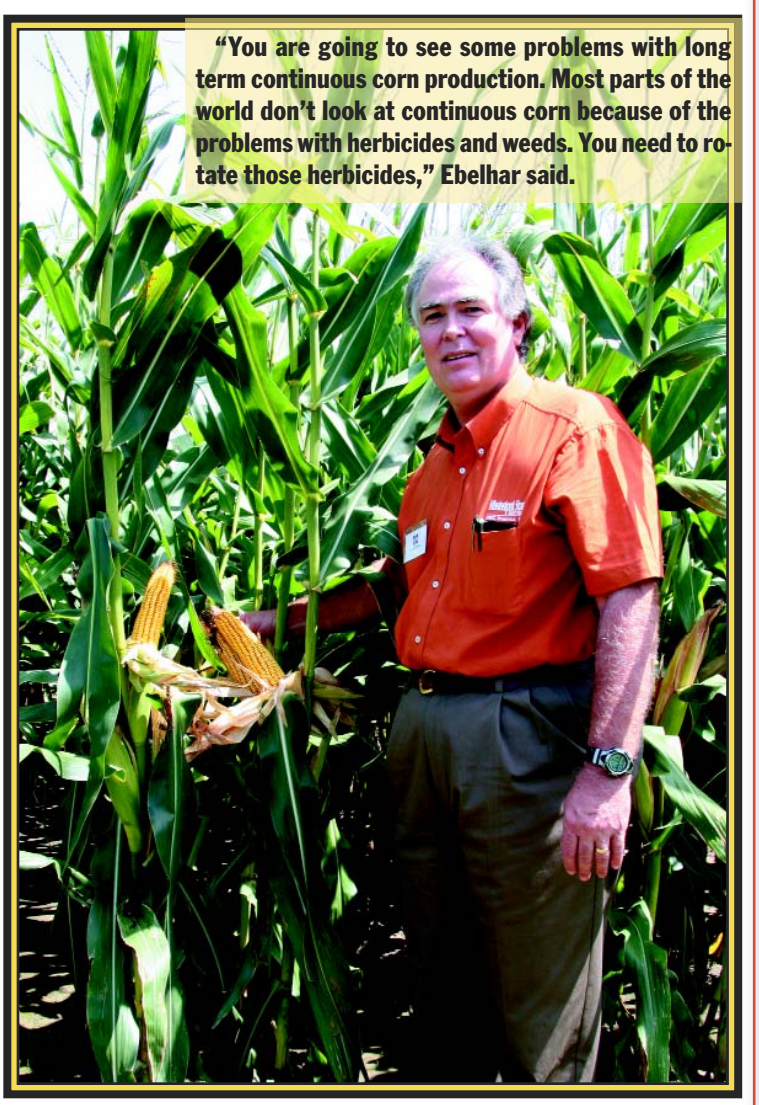
"Also, rotating the chemistries of herbicides helps in the long run for both corn and cotton," Ebelhar said. "You are going to see some problems with long term continuous corn production. Most parts of the world don't look at continuous corn because of the problems with herbicides and weeds. You need to rotate those herbicides."

Ebelhar said that over the long haul farmers definitely need to be in some kind of rotation system.

"Our emphasis has shifted on this study and we are now looking at the nematode dynamics," he said. "We are still growing the same crop sequence, we are still looking at its relationship to soil applied, but now our emphasis has shifted to the nematodes and the effects of potassium and nitrogen on nematode numbers. We know that rotations have a direct effect on nematode numbers and want to study the effects of N and K nutrition with respect to the nematodes."

Rotation is a long term project. If weeds in corn, particularly johnsongrass and bermudagrass, are not controlled, they can carry over as problems in the cotton crop.

"At the time we ran into problems with grasses we were using a conventional cotton variety," Ebelhar recalled. "We shifted to a Roundup Ready variety to be able to get in and control some of the Johnsongrass and bermudagrass problems that we had. With Roundup Ready corn, we can address those problems, so there are management decisions that we had to make, based on our rotations. Some things we had to shift to be able to grow it successfully, but here on the station we have seen 240-250 bushel yields with corn in some years. We have seen it nearly that high at Tribbett if you plant it early on the heavier ground. We definitely see some responses to nitrogen down there. In fact we see more responses to nitrogen on cotton there than we do here on the station in this sandy loam soil. Sometimes we get by with 60-90 pounds of N."



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Ebelhar also is looking at real high N rates on corn in another field, and attempting to gauge the effects on residual nitrogen on the following cotton crop. He is studying whether there is carryover nitrogen in the following growing season. In the first two years of that project there has been no evidence of increased cotton yields from the possible residuals from the high N levels in the corn from the previous season.

"However, in our situation where we have warm winter months and plenty of rainfall, we end up with very little nitrogen carryover due to the nitrogen transformations that take place in the soil," he noted. "You get a lot of denitrification especially in wet winters which are common here. We see a lot of wetness related nitrification-denitrification occurring in the winter time. We don't see a lot of nitrogen in the surface in the spring of the year except in the organic residues, so as far as being able to measure it with a crop we haven't been seeing that.

"As to whether we are going to continue to see that as we shift to higher and higher N levels on corn, I don't know," he said. "With corn, you are looking at least at twice to two-and-a-half times the nitrogen requirements as on cotton, so with corn, nitrogen use is going to be up also."

He reported a significant response to nitrogen in corn in 2006 on an on-farm study, but that response to nitrogen was only three to four bushel.

"Even though statistically significant, if you take four bushel of corn at $3 a bushel that is $12," he reasoned. "If you take 40 pounds of N, which is the increment that we applied, at $0.40 a pound that is $16, so for $16 worth of fertilizer you get $12 worth of corn. That wasn't economical. So even though statistically we saw a response, when you put it in the form of dollars, it does not pay.

"So we are shooting at somewhere in the middle. Mississippi recommends 1.3 pounds of N per bushel of expected yield, so if your goal is a 200 bushel corn crop we would recommend 260 pounds of nitrogen per acre. In 2006 it didn't take near that much. So it depends on the efficiency, I think, along with the amount of N available from the organic residues."

He said water is the key, getting enough water on there to get good kernel set.

"That plant takes up most of its nitrogen before it ever starts maturing that seed, so it is going to take the nitrogen out the plant once it gets it there to fill out that seed," he summed. Δ