

# AN EVALUATION OF COTTON COST OF PRODUCTION IN THE MID-SOUTH

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## Abstract

There are many factors that can affect the costs and net income from growing cotton. Some of these factors include year-to-year variability due to weather differences, producer differences, access and availability to irrigation, and soil and regional variation. Unfortunately, all these variations make it difficult to determine exactly why some cotton producers are profitable and others are not. This paper examines the characteristics of the more profitable cotton producers and compares them to the less profitable producers to determine what factors contribute to the profitability differences. Data from 5 years of producer surveys is used for the analysis and is divided into groups to help isolate some of the variability factors. Results indicate that the most profitable producers have both higher yields and also lower costs of production.

## Introduction

Every year there is a wide range of variability in both net income and cost of production from growing cotton. Much of this variability can be traced to weather differences that affect yields but can also affect expenses. Rainfall variation can affect the amount of chemicals needed to control insects and weeds. Weather variability is not just from year to year but also varies by region within a given year. Other factors affecting net income and production costs include the availability and access to water, producer differences and soil variations. Figure 1 shows how net income per acre of cotton (i.e., returns above fixed and variable costs excluding a land charge) has varied in Mississippi over the last 5 years.

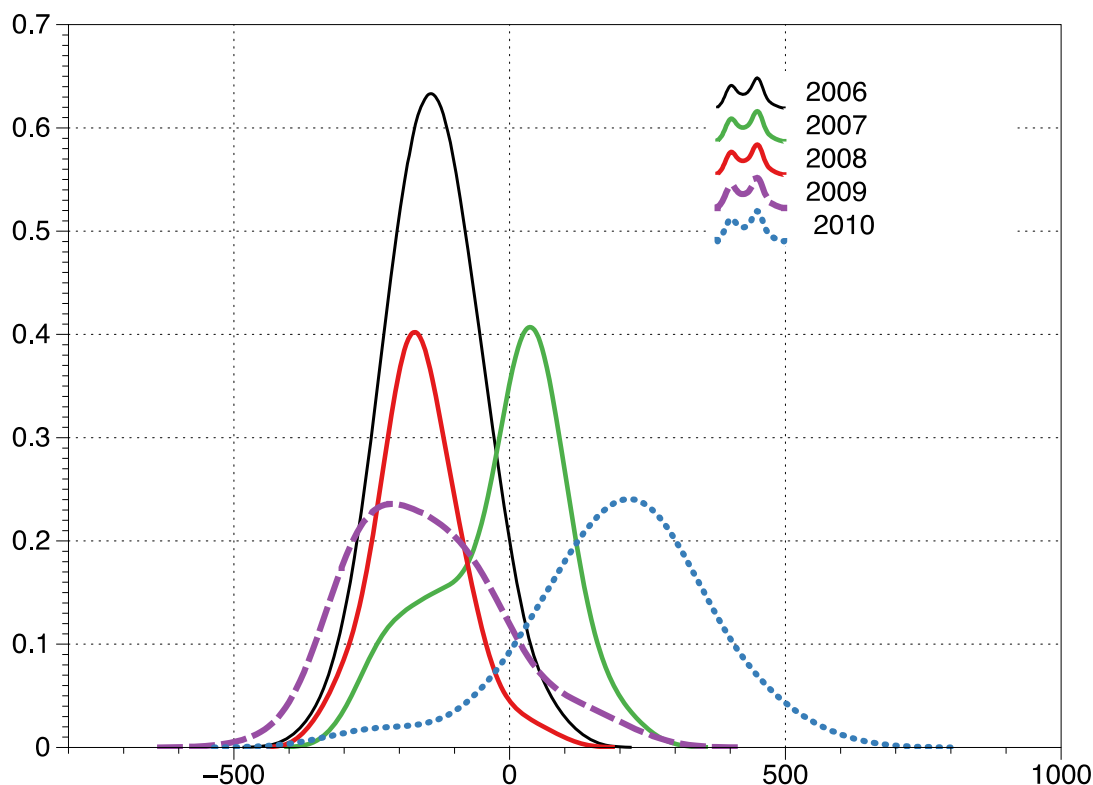


Figure 1. Smoothed Histogram of Returns Above Fixed and Variable Cost per Acre

Notice in Figure 1 that in all 5 years at least some cotton producers were profitable. Unfortunately, all the variations noted above make it difficult to determine exactly why some cotton producers are profitable and others are not.

Also, Figure 1 does not tell us if the same producers are consistently profitable or whether profitability is more of a random occurrence. This paper examines the characteristics of the more profitable cotton producers and compares them to the less profitable producers to determine what factors contribute to the profitability differences. While the results will not provide answers to questions about what a producer should specifically do to increase profits, the results should help direct producers to areas that need examination.

### **Materials and Methods**

The data for this study comes from the last 5 years of cotton surveys used in the estimation of land values for the Mississippi Tax Commission. Every year, between 75 and 125 cotton farmers are surveyed about their general farm characteristics as well as their production practices used to grow cotton. The other major crops are also surveyed as well but a farmer is only surveyed specifically about one crop. The farm is not a panel data set as the mix of farmers' changes every year.

Questions on the survey ask about basic farm operation and size. For the cotton surveys, farmers are asked about the specific field operations they followed on a pre-determined field number. The cotton questions ask them about each machine and tractor and harvester that was used on each trip across the field. Also, the quantities of inputs used on each trip across the field are recorded. The survey does not ask them about labor hours and fuel used as inputs as these two input classes are estimated based on the tractor or harvester used and also the size of the equipment being utilized.

These field trips and inputs used are converted into cost per acre through the use of the Mississippi State Budget Generator (MSBG). The MSBG contains a database of inputs and their costs. This database includes inputs like fertilizer, fuel, insecticides and also fixed inputs like tractors and planters. Converting variable input items like fertilizer and chemicals into a cost is straightforward as the quantity used (from the survey) is multiplied by the cost per unit (from the database). Converting fixed inputs into a cost is not as simple as assumptions have to be made about the machinery cost, the average use of the machinery per year, and the lifespan of the machine. Fuel use is estimated based on agricultural engineering formulas about how much fuel a given horsepower tractor or harvester will use per hour.

One limitation of using the MSBG is the assumption that all farmers pay the same price per unit for their inputs. The MSBG also does not assume any volume discounts. A related limitation is that all farmers are assumed to follow the same machinery use schedule. That is, farmers all trade their machinery after the same number of years and that the machinery is fully utilized the same number of hours on the farm during the year. This is probably a bigger weakness than the assumption about input prices for the direct expenses. However, anyone estimating fixed expenses is going to have trouble coming up with completely accurate values. The method used by the MSBG is probably as good as anything else outside of a detailed farm analysis of each specific farm.

For each farm survey, the costs are computed and stored in the database with the other general farm questions. To eliminate some of the variability, the surveys are divided into irrigated and non-irrigated farms. Results are also shown on a year-by-year basis. Once the surveys are broken into irrigated and non-irrigated for each year, the median net income is calculated for each group. In this paper, net income is really the returns above variable and fixed costs excluding a charge for land. The farms are then further divided by whether the net cotton income per acre is above the median or below the median. A smaller division was considered (upper-thirds vs. lower-thirds) but was not used due to the small data size in each year.

At this point, specific farm characteristics were examined to determine whether there were differences between the higher net cotton income and the lower net cotton income farmers in each year. For some characteristics, the irrigated vs. non-irrigated farms were compared to each other.

### **Results and Discussion**

Figure 2 shows the basic idea behind the analysis. Here, irrigated cotton land and dry land acres are analyzed separately. For each land type, the median net cotton income is calculated and farms are divided into an upper group and a lower group respective to the median net income. The lines in the figure represent the mean of each net income group. Because the data was already divided by net income, this graph should, by definition, show a

difference between the upper and lower income groups. As shown in the figure, there is a \$100 to \$200 difference between the mean of the upper income and the lower groups. This difference holds for both irrigated and dry land production.

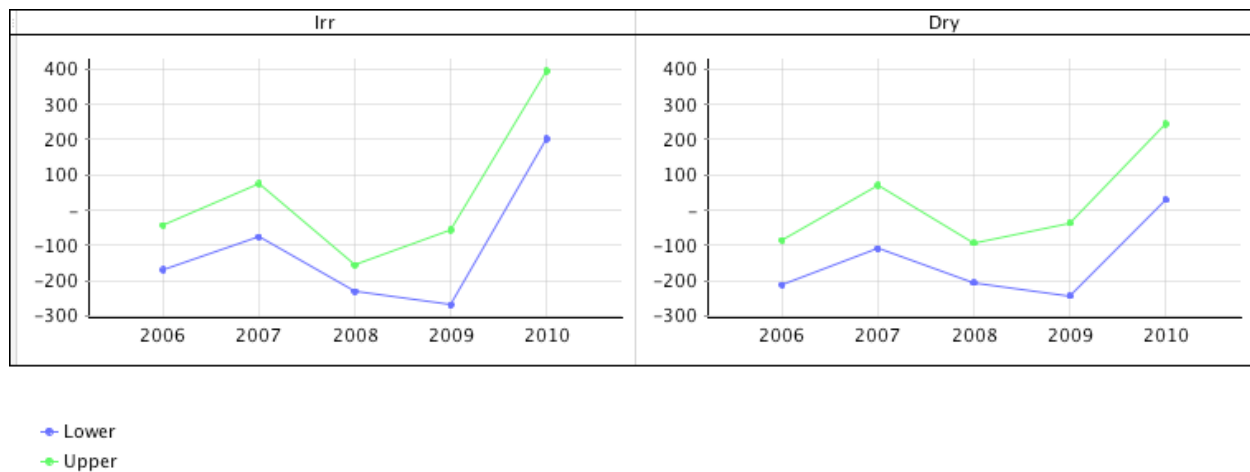


Figure 2. Net Income per Acre of Irrigated and Dry Land Cotton for Lower and Upper Income Groups

Figure 3 shows basically the same data that was used in Figure 2 but arranged differently. Now the comparison is between irrigated and dry land cotton for the lower and upper income groups. This figure was included because it indicates that irrigated cotton is not much more profitable than dry land cotton. Although irrigated cotton has higher yields, the extra expenses negate the extra income. This holds true for both groups of farmers.

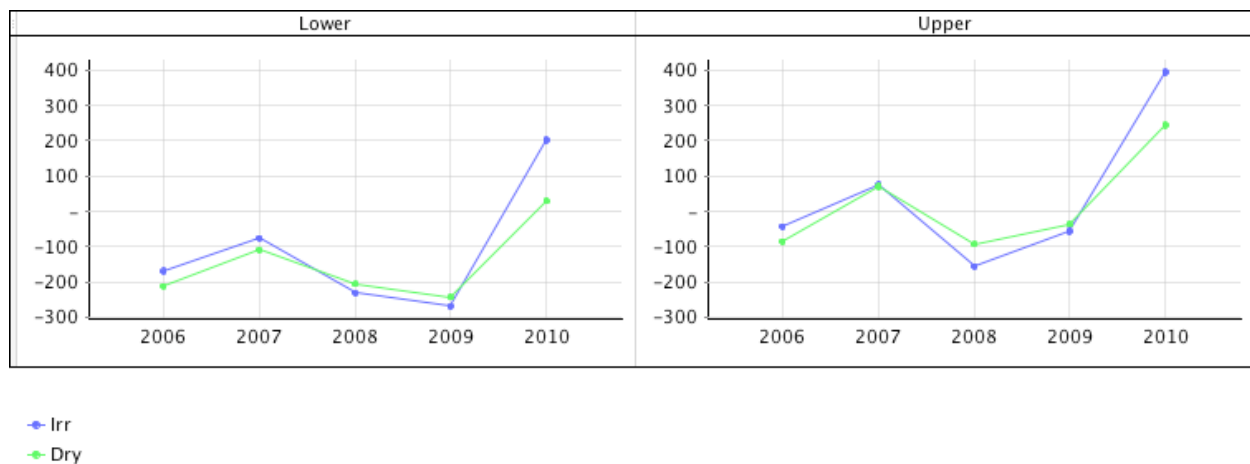


Figure 3. Net Income per Acre of Lower and Upper Income Groups for Irrigated and Dry Land Cotton

Figure 4 shows one of the reasons that higher net income farmers are more profitable than lower net income farmers. As can be seen, yields are consistently higher. This holds in each year and for both dry land and irrigated cotton. One thing that cannot be determined from this graph is the makeup of the soils for the two income groups. It may be that the upper net income farms have a higher percentage of farms in the Delta. Further analysis will be needed to examine this yield difference.

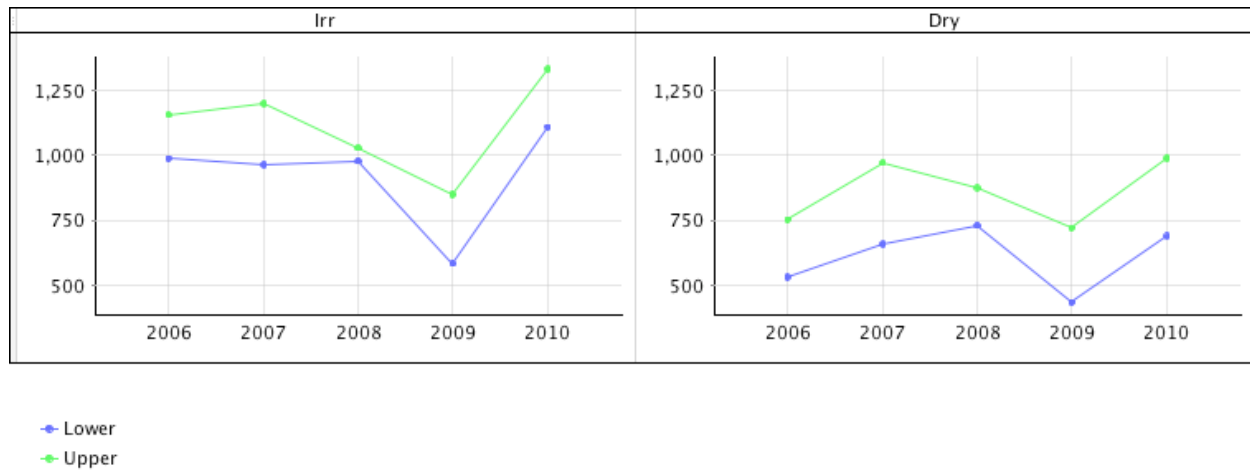


Figure 4. Yield per Acre of Irrigated and Dry Land Cotton for Lower and Upper Income Groups

Figure 5 shows the second main reason that higher net income farmers are more profitable than lower net income farmers. The upper net income farms usually have lower total costs. The differences seem to show up more in irrigated cotton but even with dry land cotton, the upper net income farms usually have less total costs.

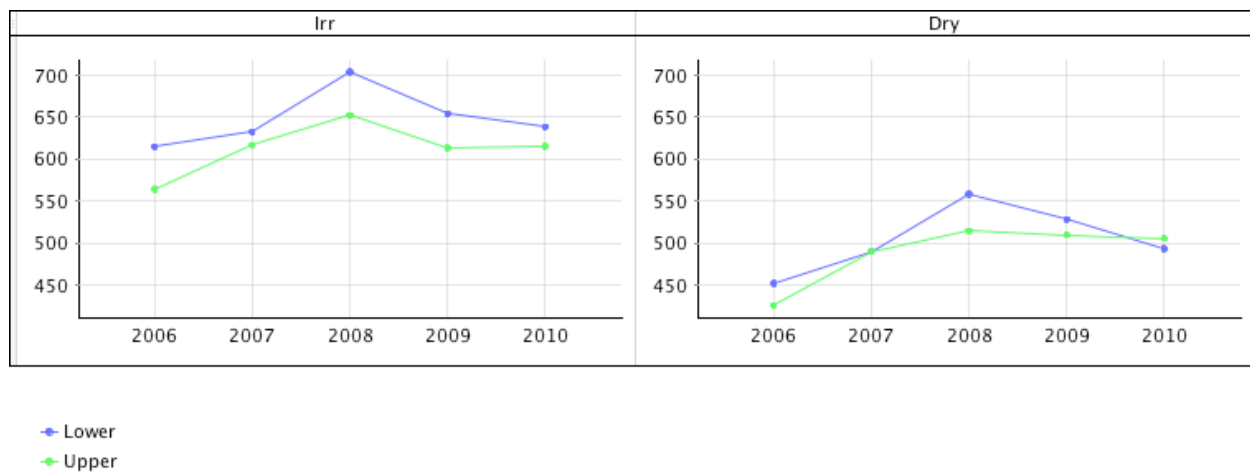


Figure 5. Total Costs per Acre of Irrigated and Dry Land Cotton for Lower and Upper Income Groups

Figures 6 through 11 show how specific costs affect the difference between upper and lower net income farmers. For fixed costs, diesel, fertilizer, and insecticides there seems to be a clear pattern of upper net income farmers having lower expenses than lower net income farmers. However, herbicide costs do not exhibit this clear trend. Figure 9 was included because the result was somewhat surprising. As shown, irrigated cotton has consistently lower fertilizer costs than dry land cotton. This trend held for both upper and lower net income farms.

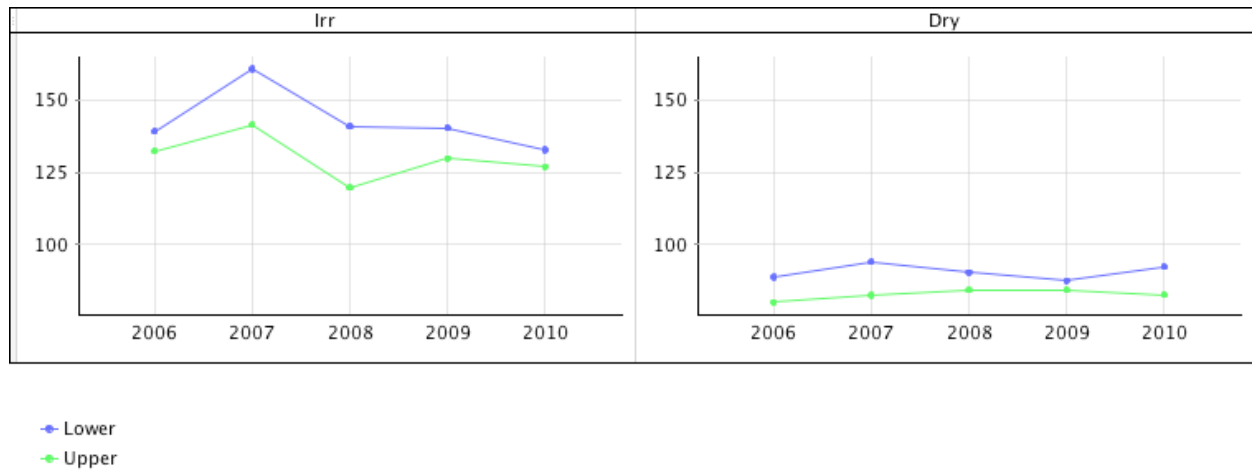


Figure 6. Fixed Costs per Acre of Irrigated and Dry Land Cotton for Lower and Upper Income Groups

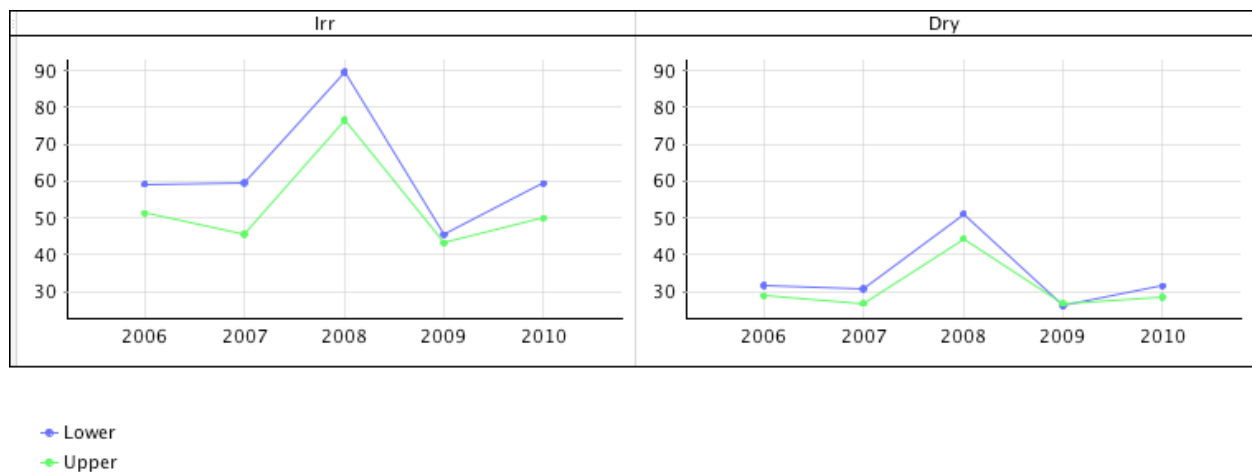


Figure 7. Diesel Costs per Acre of Irrigated and Dry Land Cotton for Lower and Upper Income Groups

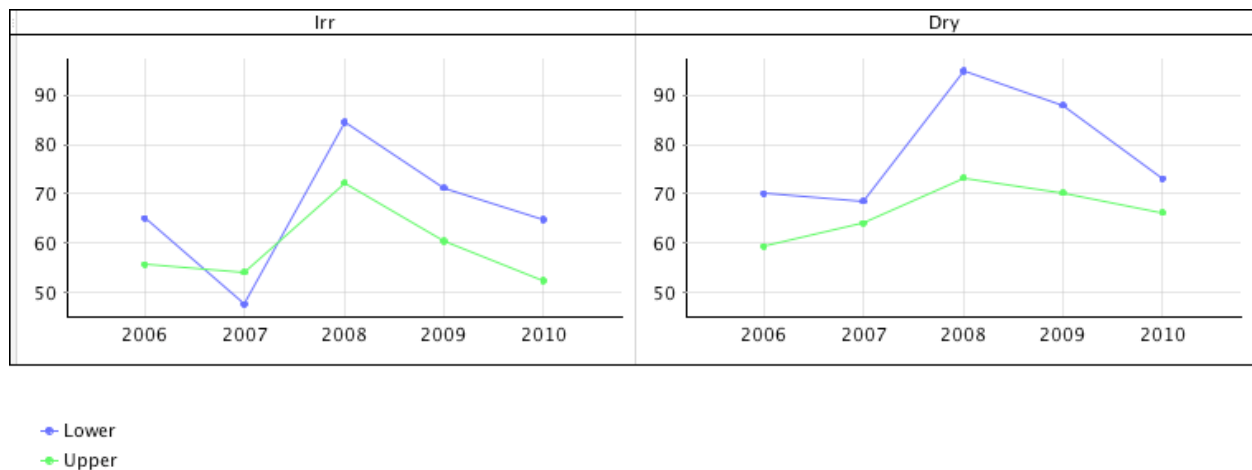
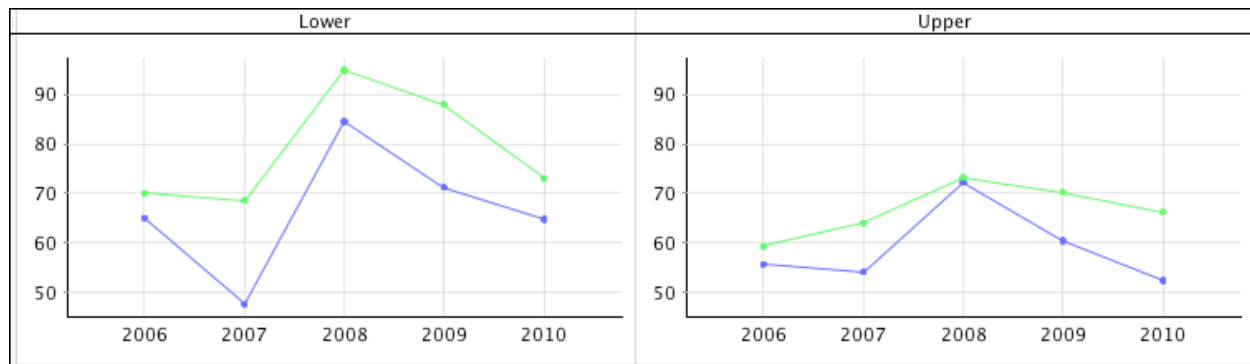


Figure 8. Fertilizer Costs per Acre of Irrigated and Dry Land Cotton for Lower and Upper Income Groups



◆ Irr  
◆ Dry

Figure 9. Fertilizer Costs per Acre of Lower and Upper Income Groups for Irrigated and Dry Land Cotton



◆ Lower  
◆ Upper

Figure 10. Herbicide Costs per Acre of Irrigated and Dry Land Cotton for Lower and Upper Income Groups



◆ Lower  
◆ Upper

Figure 11. Insecticide Costs per Acre of Irrigated and Dry Land Cotton for Lower and Upper Income Groups

### **Conclusions**

The \$100 to \$200 difference between upper and lower net income farms can be attributed to two main factors – higher yields and selected lower costs. Fixed costs were lower along with certain variable costs. As all machinery costs were calculated the same way on each farm, the lower fixed costs results from less machinery use on the upper income farms. The selected variable costs that were lower on the upper net income farms include diesel, fertilizer, and insecticides. Given that the budget generator assumes equal prices for all inputs across farms, these lower costs can be attributed to less use of those inputs.

There were some other surprises that came out of this study as well. First, fertilizer costs were lower on irrigated cotton than on dry land cotton. Second irrigated cotton was not any more profitable than dry land cotton.

This study was just an initial look into some of the data being collected during the estimation of land values in Mississippi. Further research is needed to determine why the most profitable farms have greater yields and lower expenses.

### **Acknowledgement**

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