# Hybrid Rice Production Possibilities in the Southern Rice Producing Region

By Michael A. Deliberto and Michael E. Salassi

## Abstract

Hybrid rice represents a new and increasing popular variety option for rice producers. This study examines the acreage diversification among long grain rice varieties in the southern rice region and presents estimates of the differences in expected costs and returns among the production of conventional, Clearfield®, and hybrid rice varieties. Breakeven yield increases required to cover additional hybrid rice production costs are estimated over a range of rough rice market prices for both owner and tenant rental situations. Rough rice market price adjustments resulting from grade differences from milling yields are also discussed.

## Introduction

Rice producers in the Gulf Coast and Mississippi Delta regions of the United Sates have several rice varieties to choose from when deciding to diversify their farm acreage. Recommended rice varieties can differ in many aspects which ultimately influence returns as well as production costs. Seedling vigor, disease resistance, milling quality, and yield potential are examples of the agronomic and physiological characteristics associated with each variety. The selection of a rice variety, and its placement, are the first of many important steps in establishing a successful rice crop. Producers should consider the economic benefits and costs associated with each variety as applied to their particular situation. Once a new variety is selected, it should be grown initially on a limited amount of acreage to allow for close observation and determine how it fits into the overall farming operation (Miller and Street, 2008). A good farm management practice would be to have a mix of rice varieties planted in a given season to mitigate yield risk across all planted rice acreage. Diversification is a common strategy used to manage production risk. On the farm, this can be achieved by diversifying acreage among competing crops, e.g., crop rotations and/or planting several varieties of crop(s).

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Clearfield® rice was created from a mutation (chemical mutation combined with conventional breeding procedures) that confers tolerance to imidiazolinone herbicides (Newpath® and Beyond®). Before the advent of this technology, there were no effective options to control red rice in conventional white rice (Buehring, 2008). Clearfield® rice allows producers an option to plant rice that is resistant to the imidazolinone family of herbicides. This technology continues to gain acceptance, and producers are moving towards a Clearfield® production system to take advantage of the overall weed control program available (Webster and Levy, 2009). Clearfield® rice varieties have received wide adoption in the mid-south due to the variety's yield potential, ability to control red rice in commercial fields, and overall simpler weed control program (Sha et al., 2007; Buehring, 2008; Webster and Levey, 2009).

Hybrid rice is produced through obtaining crosses between two genetically different inbred parents. Hybrid rice can have as much as a 15 percent or more yield advantage which can promote a producer's productivity and competitiveness, open new seed industries, and help attain food security (Li et al., 2009). Rice breeding programs throughout the southern rice production region are establishing and developing hybrid rice cultivar lines. RiceTec, a private seed company, has been developing hybrid rice since 1988, with the first hybrid seed sold in 1999 (RiceTec). Hybrid rice development and research has contributed to some of the dynamic changes the rice industry has seen in this decade. This coupled with improved field production techniques and farm legislation to remove acreage restrictions has lead to rice remaining a staple crop of the region (Anders et al., 2004).

Hybrid rice represents a relatively new variety option for rice producers. An appealing characteristic associated with hybrid rice is its high yield potential, which can equate to increased farm income. Other appealing characteristics of hybrid varieties include improved grain retention, standard milling yield, disease tolerance/resistant packages, early crop development, excellent grain yield, and excellent ratoon yield potential (RiceTec 2010). The climatic conditions and the earliness of commonly grown rice varieties in the extreme southern portion of the rice producing region create the opportunity for ratoon crop production. Ratooning is the practice of harvesting grain from tillers originating from the stubble of a previously harvested crop (Saichuk 2009).

The purpose of this paper is to provide an economic evaluation on production cost differences associated with leading variety types (conventional, Clearfield®, and hybrid) produced in the southern rice production region through the use of enterprise budgeting. The required breakeven yield increase required to offset additional production inputs are calculated as well as the impact that each variety's milling yield can have on price received by producers. By being aware of the impact that rice variety selection can have on farm profitability, producers can better evaluate a variety's performance and determine the optimal acreage allocation within their operation.

## Rice Production in the Southern Region

For the context of this study, the authors refer to the southern rice producing region of the U.S. to include the states of Arkansas, Louisiana, Mississippi, and Texas. During the 2009 crop year, Arkansas accounted for 99,924,000 cwt. (45%) of total rice production in the United States. Louisiana followed with 29,217,000 cwt. (13%); Mississippi and Texas with 16,281,000 cwt. (7%); and 13,201,000 cwt. (6%), respectively.

Rice production in Arkansas and Mississippi has been on the rise since 2000, with production increases of 312,000 and 29,000 cwt per year respectively. This can be partly attributed to yield advancement technologies and producing alternative crop (corn, soybeans, and/or wheat) on fallow/rotational rice aces to increase land productivity. Louisiana and Texas have seen rice production decrease by 148,000 and 371,000 cwt. respectively from 2000-2009. Adverse production conditions from the hurricane season of 2005 can be attributed to the declining trend in Louisiana and Texas. Texas has also seen acreage shift away from rice to more cost-competitive crops, e.g. grains (see Table 1.)

Table 2 represents the average yield level for each state in the region from 2000-2009. During the past decade, there has been an increasing trend in the average yield per acre per year for each state. Arkansas's yield per acre has increased by 78 pounds per year, Louisiana by 103 pounds, Mississippi by 84 pounds, and Texas by 53 pounds. The average yield per acre across all rice producing states (including Missouri and California) was 6,769 pounds per acre, with a yearly increase of 80 pounds. The majority of those yield increases can be attributed to new cultivars released by public rice breeding programs in the southern U.S. They include cultivars such as Cocodrie, Cheniere, Wells, and Francis, all of which are conventional varieties (Sha, Linscombe, and Groth, 2007). These varieties have improved yield potential and milling quality and also mature earlier, which allows savings of water and other inputs, avoids late-season

weather disturbances, and also allows growers in southwestern Louisiana and Texas to harvest a second (ratoon) crop (Sha, Linscombe, and Groth, 2007).

According to Arkansas, Louisiana, Mississippi, and Texas rice acreage summaries for 2009, of the approximate 2,345,914 acres of rice in planted in the region, long grain varieties were produced on approximately 88.2 percent (2,069,898 acres) of the total rice acreage, with the remaining 11.8 percent (276,016 acres) of acreage in medium grain varieties. Leading long grain conventional rice varieties in production within this region include: Cheniere, Cocodrie, Wells, and Francis. Clearfield® (CL) rice varieties include CL 151, 161, 131, and 171. Hybrid varieties grown in the region include CLXL 729 and 745 along with XL 723 and 729, to a less extent (Table 3).

In Arkansas, conventional varieties account for approximately 31.2 percent of long grain rice acres. Clearfield® rice accounts for 18 percent and Clearfield® hybrid varieties account for 23 percent. In Louisiana, 47 percent of the long grain rice acreage is planted in Clearfield® varieties. Conventional varieties represent 20 percent, and Clearfield® hybrids account for 13 percent. Conventional long grain rice acreages Mississippi represents 43 percent of total acreage, with Clearfield® and Clearfield® hybrid varieties accounting for 46 percent and seven percent, respectively. Long grain acres in Texas are mainly concentrated in conventional varieties, at 49 percent. Clearfield® varieties account for 16 percent, with Clearfield® hybrids accounting for six percent and conventional hybrids totaling 11 percent.

## Rice Variety Trials/Characteristics

Rice variety performance trials across the southern rice production region have demonstrated the yield advantage of hybrids over conventional rice varieties. Table 4 depicts comparative variety trial results from evaluations conducted in 2009. General results across the rice belt show that hybrid yield advantage exists in each production region with similar, or slightly lower milling yields. Variety trial results, specifically hybrid yield levels, will vary from the actual farm yields due to the agronomic site characteristics and production practices associated in different production areas. Rough rice value, on either a market price or a loan rate basis, is based on the rough rice milling yield and the milled rice value (price) for whole kernel and broken kernel rice. Milling yield refers to the amount of white "polished" rice that can be obtained from rough rice kernel. These factors are important in correctly evaluating rice crop profitability.

## Estimated Variable Production Costs

In Arkansas, 2010 projected production costs for drill planted conventional rice are $597.30 per acre. Hybrid rice in Arkansas was estimated at $674.54 per acre. In Louisiana, water planted conventional rice was projected to total $576.15 per acre for 2010. Clearfield® rice, drill planted was estimated to total $594.13 for that same year (see Table 5). In Mississippi, Clearfield® rice expenses for 2010 total $545.60 per acre. In Texas, rice production costs are estimated at $523.62 per acre for Jefferson and Liberty Counties, while rice farms west of the Houston area exhibit production costs at $774.79 per acre in 2010.

Variation in production costs within the region can be attributed to soil, climate, tillage, rotational systems, and disease pressure. Inputs such as chemicals, fertilizer, and fuel, have the potential to vary by locale, along with land tenure and "custom" farming activities. Noticeable production cost increases result from: the price of Clearfield® and hybrid rice seed as compared to conventional rice seed, additional recommended fertilizer (N) application rates per variety type, fungicide application(s), drying, and hauling charges. Drying and hauling are functions of the yield per acre; therefore these rates will vary by the rice output. Information on rice production costs were obtained from each state's university agricultural extension service.

## Comparison of Clearfield® and Hybrid Rice Enterprise Budgets for Louisiana

A hybrid variety rice enterprise budget for Louisiana is being developed due to the fact that many producers are expanding their acreage allocation to include these high yielding varieties. Obtaining detailed production cost estimates for hybrid variety rice is limited. The premium that hybrid rice seed demands can act as a major deterrent for producers in investing acres to this variety. Information from Louisiana rice producers and area extension agents has aided in obtaining an overall estimate of production costs associated with hybrid rice production. Irrigation cost estimates were held constant between varieties at an application of 25 acre-inches of water from a deep well water source. Herbicide and insecticide costs were also held constant based on industry as well as university recommendations.

Through the comparison of seed costs for conventional, Clearfield®, and Clearfield® hybrid rice varieties, noticeable differences exist in the seeding rates and price per acre. Hybrid rice is planted at a lower density as compared to the conventional and Clearfield® rice and as a result, the recommended seeding rate is 30 pounds per acre. Seed

costs for drill planting Clearfield® rice (e.g., CL 151) at a recommended rate of 75 pounds per acre at a unit price of $0.88 per pounds amounts to a $66.00 per acre cost. The seed cost for Clearfield® hybrid varieties, specifically CLXL 729, were obtained through dealer price quotes on a dollars per acre basis. In January 2010, Clearfield® hybrid rice seed was quoted at $146.00 per acre, representing an $80.00 per acre increase in seed cost for hybrids over Clearfield® varieties.

Nitrogen (N) fertilizer recommendations for the majority of rice varieties produced in Louisiana for Clearfield® rice is between 120-160 pounds per acre. The price per pound of N was projected in early 2010 at $0.42. Assuming an application rate of 130 pounds per acre, the total N cost per acre is $54.60. The recommended N application rate for hybrid rice is 150 pounds per acre. Holding the N fertilizer unit price per pound constant at $0.42, the total N cost for the hybrid crop is $63.00. Although, the N cost is slightly higher ($8.40 per acre) with the election of hybrid varieties, this expenditure may become significant if the price of fertilizer were to increase to 2008 levels in excess of $0.54 per pound.

Disease pressure in south Louisiana is a critical issue confronting rice producers. Diseases such as blast, sheath blight, and straighthead can significantly reduce the yield potential of the rice plant, regardless of the variety. Fungicide applications are common to Clearfield® varieties planted in Louisiana. *Quadris*® (Syngenta Crop Protection) is a typical rice fungicide treatment with a recommended application rate of 10.0 fluid ounce per acre. At a material price of $2.56 per ounce, the fungicide application would equate to $25.60 per acre. Hybrid rice varieties, as described by RiceTec, do not normally require fungicides due to their disease resistance packages. However, producers and farm managers should take note that rice fields need to be scouted regularly and treated if necessary. A common fungicide application for hybrid varieties may include a treatment on roughly 60 percent of all hybrid rice acreage, based on the assumption that probably more than half of hybrid rice acreage would be treated by producers with a fungicide as a precaution. The *Quadris*® price is held constant with the fluid ounce application reduced to represent 60 percent of its original amount. This is intended to represent a weighted average of the acreage receiving a fungicide application and not a reduction in the rate of the chemical. The cost estimate for a fungicide treatment on hybrid rice would therefore be $15.36, representing a $10.24 cost savings in application compared to Clearfield® varieties.

Based on the input rate assumptions for seed, N fertilizer, and fungicide categories utilized in this analysis, production of a hybrid variety, such as CLXL 729 compared to a Clearfield® 151 in Louisiana would be expected to have production costs, which are $74.70 per acre higher.

## Required Breakeven Yield Increases

The breakeven rice yield increases required for hybrid rice produced on cropland which is either owned or cash rented, representing situations in which the producer would pay all of the increased hybrid rice production costs and receive 100 percent of the crop proceeds after sale, was estimated using the following formula:

$$(1) \quad BEYI = \Delta PC / (MP - HD)$$

where *BEYI* is the required breakeven rice yield increase (cwt/ac), *ΔPC* is the change in production costs per acre paid by the grower ($/ac), *MP* is the rough rice market price (cwt/ac), and *HD* is the hauling and drying charge per yield unit ($/cwt). To reflect representative hauling and drying charges, $0.30 per cwt was assigned to the hauling expense category. Commercial rice drying facilities were contacted in southwestern Louisiana in order to accurately estimate drying costs. Assuming that the rice is harvested at a moisture content of 22 percent, the applicable drying cost per cwt of $1.54 was assigned. Drying and hauling are calculated as a function of yield, meaning higher yielding varieties will incur greater costs in these two production categories. For rice produced on land that is share-rented where the grower receives an agreed upon predetermined percentage of the crop, proceeds at sale and would most likely pay for most or all of the increase in production costs, the required breakeven yield would be estimated via the revised formula:

$$(2) \quad BEYI = \Delta PC / (MP - HD) \times GS\%$$

where *ΔPC* is the change in production costs per acre paid by the grower ($/ac) and *GS%* is the grower's share of the crop proceeds under a crop share land tenure arrangement. It should be noted that the change in production costs per acre may be different in Equation 2 than in Equation 1 due to the contractual obligations of each party to share in certain expense categories.

Breakeven yield increases are highly dependent on the current relevant rough rice market price level. Increases (decreases) in rough rice market price reduce (raise) required breakeven yields. For example,

the increased production costs associated with CL 151 and CLXL 729 in Louisiana is calculated. The estimated increased production cost of producing the Clearfield® hybrid variety CLXL 729 (compared to the CL 151 variety) on owned or cash rented land would require an increase in yield of 735 pounds per acre to cover the increased production costs at a rough rice price of $12.00 per cwt. (Table 6). As the rough rice market price increases to $15.00 per cwt., the required breakeven yield increase declines to 567 pounds per acre. For the 70/30 crop share rental arrangement, the grower is assumed to finance the increased production expenses while receiving 70 percent of the crop proceeds. The required breakeven yield increases in this scenario are approximately 244 to 315 per acre higher than for owner-operator or cash rented tracts, depending upon relevant rough rice market price level and decision on ratoon crop production. Therefore, gross returns and cost of production estimates must be taken into account when deciding to diversify farm acreage amongst multiple rice varieties.

## Impact of Milling Yield on Market Price

An important consideration is the impact of rice quality (i.e., milling yield) on the market price received for the rough rice produced. In observing the variety trial data from each state in the region presented in Table 4, the hybrid variety (CLXL 729) has the greatest yield per acre but exhibits lower milling yields as compared to the conventional and Clearfield® varieties in Arkansas and Louisiana. However, hybrid milling yields were more competitive in Mississippi and Texas, with hybrid yield levels in Mississippi far surpassing conventional and Clearfield ® varieties. Therefore, milling quality must be taken into account when evaluating a variety's economic benefit as more production is needed to offset returns generated from lower milling characteristics in order to make the variety financially competitive.

In order to estimate the impacts of milling yield on rough rice market price, milled price values for whole kernel (WK) and broken kernel (BK) rice would have to be adjusted to the relevant current rough rice market price level. Mid-month *National Weekly Rice Summary* reports were obtained from August to December 2010 to calculate the BK:WK price ratio for each state relative to the market price received by local producers. Government payments are not considered, as current rice price per cwt exceeds the loan rate.

The BK:WK ratio for Arkansas was 67.6 percent; 70.2 percent for Louisiana; 67.6 percent for Mississippi; and 62.4 percent for Texas. The estimated impacts of alternative milling yields are presented in Table 7 and estimated for base rough rice market prices ranging from $12.00 to $15.00 per cwt. Milling characteristics were obtained from each state's 2009 variety trials. A base 55/70 milling yield is applied to this analysis in order to calculate the adjusted rough rice price for each variety's milling characteristics relative to the base market price level presented in Table 7. As illustrated, milling yield can have a significant impact on the final market price received for rough rice sold and should be considered when making comparisons between the relative profitability of any rice varieties.

## Conclusions

From a price and yield risk management perspective, it is recommended for rice farms to plant a mix of varieties rather than devoting the majority of planted rice acreage to a single variety. When producers are in the process of selecting rice varieties to plant, several factors such as soil type and yield potential need to be considered. Certain varieties may be more expensive to produce and may require additional chemical treatments, field cultivation, and management. Increases in seed cost, fertilizer, drying, and hauling make hybrid rice more expensive to produce. Fungicide treatment cost is lower, but this category does not account for a large share of the operating budget that would result in a significant savings to the producer. Income from hybrid varieties are largely influenced by the higher yield potential when compared to the non-hybrid varieties (conventional and CL), making them appealing to produce. However, considering the milling characteristics of each variety can provide an accurate estimation of the economic return that is generated. Hybrid rice production offers rice producers a decision alternative to further diversify rice varieties produced on the farm and to aid in better managing production and price risk and increase net returns, as well as reduce net return variability from year to year.

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*Table 1. Rice production (1,000 cwt) by locale in the southern region (2000-2009)*

| Year | Arkansas | Louisiana | Mississippi | Texas | U.S.[1/] |
|---|---|---|---|---|---|
| 2000 | 86,112 | 24,402 | 12,862 | 14,342 | 190,872 |
| 2001 | 102,858 | 30,014 | 16,698 | 14,790 | 215,270 |
| 2002 | 96,752 | 29,400 | 16,192 | 14,616 | 210,960 |
| 2003 | 96,188 | 26,397 | 15,912 | 11,880 | 199,897 |
| 2004 | 108,560 | 28,730 | 16,146 | 14,906 | 232,362 |
| 2005 | 108,792 | 30,983 | 16,832 | 13,266 | 222,833 |
| 2006 | 96,565 | 20,294 | 13,230 | 10,760 | 194,585 |
| 2007 | 95,814 | 23,222 | 13,892 | 9,497 | 198,388 |
| 2008 | 92,938 | 27,037 | 15,687 | 11,868 | 203,733 |
| 2009 | 99,924 | 29,217 | 16,281 | 13,201 | 219,850 |
| Average (1,000 cwt) | 98,450 | 26,969 | 15,373 | 12,912 | 208,875 |
| Prod. Increase[2/] (1,000 cwt) | 312.4 | -148.2 | 29.3 | -371.6 | 555.9 |

[1] U.S. serves as a representative for all rice producing states including Missouri and California

[2] Slope function used to calculate the production increase in 1,000 cwt for each state based on historical production data available from NASS

*Table 2. Rice yield level (lbs/ac) by locale in the southern region (2000-2009)*

| Year | Arkansas | Louisiana | Mississippi | Texas | U.S.[1/] |
|---|---|---|---|---|---|
| 2000 | 6,011 | 5,080 | 5,900 | 6,700 | 6,281 |
| 2001 | 6,350 | 5,500 | 6,660 | 6,850 | 6,496 |
| 2002 | 6,440 | 5,500 | 6,400 | 7,100 | 6,578 |
| 2003 | 6,610 | 5,870 | 6,800 | 6,600 | 6,670 |
| 2004 | 6,980 | 5,390 | 6,900 | 6,840 | 6,988 |
| 2005 | 6,650 | 5,900 | 6,400 | 6,600 | 6,624 |
| 2006 | 6,900 | 5,880 | 7,000 | 7,170 | 6,898 |
| 2007 | 7,230 | 6,140 | 7,350 | 6,550 | 7,219 |
| 2008 | 6,660 | 5,830 | 6,850 | 6,900 | 6,846 |
| 2009 | 6,800 | 6,300 | 6,700 | 7,770 | 7,085 |
| Average (lbs) | 6,673 | 5,739 | 6,690 | 6,908 | 6,768 |
| Yearly Increase[2/] (lbs) | 78.0 | 103.2 | 83.6 | 52.7 | 80.1 |

[1] U.S. serves as a representative for all rice producing states including Missouri and California

[2] Slope function used to calculate the production increase in pounds for each state based on historical production data available from NASS

*Table 3. Long grain rice acreage summary for southern rice producing states, 2009 crop year*

| State | | Major Long Grain Rice Varieties | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Rice Varieties Planted in Arkansas | | | | | | | |
| | | Wells | CLXL 729 | CL 151 | Francis | CLXL 745 | CL 171 | Cheniere | Other[1/] |
| Arkansas | Total Rice Acres | 240,778 | 220,733 | 172,488 | 140,345 | 118,461 | 93,751 | 78,455 | 169,923 |
| | Percent of Total | 16.51 | 15.14 | 11.83 | 9.63 | 8.12 | 6.43 | 5.38 | 11.65 |
| | | Rice Varieties Planted in Louisiana | | | | | | | |
| | | CL 151 | CL 161 | Cocodrie | CL 131 | Cheniere | CLXL 729 | CLXL 745 | Other[2/] |
| Louisiana | Total Rice Acres | 116,864 | 43,609 | 40,630 | 39,992 | 36,236 | 30,163 | 27,298 | 70,156 |
| | Percent of Total | 25.61 | 9.56 | 8.90 | 8.76 | 7.94 | 6.61 | 5.98 | 15.38 |
| | | Rice Varieties Planted in Mississippi | | | | | | | |
| | | Cocodrie | CL 151 | CL 131 | CLXL 729 | CLXL 745 | Cheniere | Bowman | Other[3/] |
| Mississippi | Total Rice Acres | 94,097 | 65,879 | 48,729 | 10,442 | 7,256 | 7,162 | 5,952 | 10,130 |
| | Percent of Total | 37.69 | 26.39 | 19.52 | 4.18 | 2.91 | 2.87 | 2.38 | 4.0 |
| | | Rice Varieties Planted in Texas | | | | | | | |
| | | Cocodrie | CL 151 | Presidio | XL 723 | Cheniere | Milagro | CLXL 745 | Other[4/] |
| Texas | Total Rice Acres | 36,772 | 27,239 | 20,858 | 17,017 | 13,642 | 11,748 | 11,025 | 6,053 |
| | Percent of Total | 21.63 | 16.02 | 12.27 | 10.01 | 8.03 | 6.91 | 6.49 | 3.56 |

1 Arkansas other long grain varieties include: Catahoula, CL 131, CL 161, Cypress, CLXL 730, CLXL 746, CLXL 751, and XL 723.

2 Louisiana other long grain varieties include: Catahoula, CL 171, CLXL 730, Cypress, XP 746, Sabine, Wells, and XL 723.

3 Mississippi other long grain varieties include: Sabine, Wells, XP 723, CLXL 745, CLXL 744, CL 161, CL 171, and Cheniere.

4 Texas other long grain varieties include: XP 723, XL 729, Catahoula, CL 171, XL 746, CL 161, Sierra, and CLXL 730.

Source: Variety trial results were obtained from the University of Arkansas Division of Agriculture, Louisiana State University Ag Center Rice Research Station, Mississippi State University Delta Research Center, and Texas A&M University Extension Agricultural Economics Department.

*Table 4. 2009 southern rice variety performance trial results*

| | Variety | Seed Type | Percent of state acreage | Grain Yield (lbs/ac) | Milling Yield |
|---|---|---|---|---|---|
| Arkansas | Wells | Conventional | 16.51 | 8,235 | 62-74 |
| | CL 151 | Clearfield® | 11.83 | 6,975 | 64-71 |
| | CLXL 729 | CL Hybrid | 15.14 | 8,730 | 59-73 |
| Louisiana | Cocodrie | Conventional | 8.90 | 6,885 | 67-73 |
| | CL 151 | Clearfield® | 25.61 | 8,501 | 67-72 |
| | CLXL 729 | CL Hybrid | 6.61 | 9,162 | 61-71 |
| Mississippi | Cocodrie | Conventional | 37.69 | 8,910 | 55-67 |
| | CL 151 | Clearfield® | 26.39 | 9,900 | 62-69 |
| | CLXL 729 | CL Hybrid | 4.18 | 12,465 | 63-72 |
| Texas | Cocodrie | Conventional | 21.63 | 6,476 | 59-71 |
| | CL 151 | Clearfield® | 16.02 | 7,312 | 57-70 |
| | CLXL 729 | CL Hybrid | 1.00 | 7,073 | 58-70 |

Source: Variety trial results were obtained from the University of Arkansas Division of Agriculture, Louisiana State University Ag Center Rice Research Station, Mississippi State University Delta Research Center, and Texas A&M University Extension Agricultural Economics Department.

*Table 5. Estimates variable costs per acre among common rice varieties for southern rice region, 2010*

| | Variable (Direct) Cost per Acre | | | | | |
|---|---|---|---|---|---|---|
| Expense Category | Arkansas (C) | Arkansas (H) | Louisiana (CL) | Louisiana (H) | Mississippi (CL) | Texas (C) |
| Fertilizers | $131.26 | $141.96 | $99.00 | $107.40 | $73.74 | $118.20 |
| Chemicals[1/] | $102.63 | $83.11 | $80.78 | $70.54 | $85.09 | $65.00 |
| Diesel Fuel | $88.58 | $88.58 | $134.02 | $134.02 | $67.28 | $45.00 |
| Seed | $34.04 | $141.96 | $66.00 | $146.00 | $82.72 | $31.50 |
| Total Direct Costs[2/] | $597.30 | $674.54 | $594.13 | $764.25 | $545.60 | $523.62 |

1 Farm chemicals include herbicides, fungicides, and insecticides recommended for use by each state's extension service.

2 Drying and hauling charges are per unit and therefore are function of the projected yield level. They are not included in this table. [C = conventional variety, CL = Clearfield® variety, H = hybrid variety].

Source: Variety trial results were obtained from the University of Arkansas Division of Agriculture, Louisiana State University Ag Center Rice Research Station, Mississippi State University Delta Research Center, and Texas A&M University Extension Agricultural Economics Department.

*Table 6. Main crop breakeven yield increases required to cover increased production costs from Clearfield® to hybrid rice production in Louisiana*

| Rough Rice Price ($/cwt) | Owner-Operator or Cash Rent | Tenant-Operator 70/30 Crop Share |
|---|---|---|
| $12.00 | 735 lbs/ac | 1,050 lbs/ac |
| $13.00 | 669 lbs/ac | 956 lbs/ac |
| $14.00 | 614 lbs/ac | 878 lbs/ac |
| $15.00 | 567 lbs/ac | 811 lbs/ac |

*Table 7. Estimated milling yield impacts on rough rice market prices for 2009 variety trial yield results*

| | | | Base Rough Rice Market Price Level | | | |
|---|---|---|---|---|---|---|
| | Variety | Milling Yield | $12.00 | $13.00 | $14.00 | $15.00 |
| Arkansas | Wells[1/] | 62-74 | $12.91 | $13.99 | $15.06 | $16.14 |
| | CL 151[2/] | 64-71 | $12.66 | $13.71 | $14.77 | $15.82 |
| | CLXL 729[3/] | 59-73 | $12.61 | $13.66 | $14.71 | $15.76 |
| Louisiana | Cocodrie[1/] | 67-73 | $13.04 | $14.12 | $15.21 | $16.30 |
| | CL 151[2/] | 67-72 | $12.91 | $13.98 | $15.06 | $16.13 |
| | CLXL 729[2/] | 61-71 | $12.45 | $13.49 | $14.53 | $15.56 |
| Mississippi | Cocodrie[1/] | 55-67 | $11.62 | $12.59 | $13.56 | $14.53 |
| | CL 151[2/] | 62-69 | $12.29 | $13.31 | $14.34 | $15.36 |
| | CLXL 729[3/] | 63-72 | $12.72 | $13.78 | $14.84 | $15.90 |
| Texas | Cocodrie[1/] | 59-71 | $12.39 | $13.42 | $14.46 | $15.49 |
| | CL 151[2/] | 57-70 | $12.14 | $13.15 | $14.16 | $15.17 |
| | CLXL 729[3/] | 58-70 | $12.21 | $13.22 | $14.24 | $15.26 |

[1] Conventional variety

[2] Clearfield® variety

3 Hybrid variety

Source: Variety trial results were obtained from the University of Arkansas Division of Agriculture, Louisiana State University Ag Center Rice Research Station, Mississippi State University Delta Research Center, and Texas A&M University Extension Agricultural Economics Department.