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Hybrid Rice Production Costs and Returns:
Comparisons with Conventional & Clearfield Varieties

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Introduction

Rice producers in Louisiana 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 costs and returns, such as seedling vigor, disease resistance, milling quality and yield potential. 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 on the farm. According to the 2009 Louisiana rice acreage summary, compiled by the LSU AgCenter, of the approximate 456,000 acres of rice in planted in the state in 2009, long grain varieties were produced on roughly 89 percent of the total rice acreage, with the remaining 11 percent of acreage in medium grain varieties. Leading conventional rice varieties in production included the long grain varieties Cocodrie (8.9%) and Cheniere (7.9%) as well as the medium grain variety Jupiter (8.9%). Approximately 47% of the state's total rice acreage was planted in Clearfield varieties, with CL151 accounting for 25.6% of all rice acreage and smaller acreages planted to CL131, CL161 and CL171. Acreage planted in hybrid rice varieties represented about 15% of the total rice acreage planted in the state in 2009. The largest hybrid acreages were in the varieties CLXL729 and CLXL745, each accounting for about 6% of total state rice acreage, with smaller acreages planted in the varieties CLXL730, XP746 and XL723,

Hybrid rice represents a relatively new and growing variety option for rice producers. The purpose of this report is to present estimates of the differences in expected costs and returns between production of conventional, Clearfield and hybrid rice varieties. Rice variety characteristics and variety trial results are presented for selected rice varieties recommended for production in Louisiana. Differences in expected production costs are presented for comparison of conventional versus hybrid varieties and Clearfield versus Clearfield-hybrid varieties. Finally, 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 land tenure situations. Rough rice market price adjustments resulting from grade differences from milling yields are also discussed.

Recommended Long Grain Rice Varieties

Major long grain rice varieties recommended for production in Louisiana include Cocodrie and Cheniere - *conventional varieties*, XL723 - *hybrid variety*, CL 151 and CL 161 - *Clearfield varieties* and CLXL729 and CLXL745 - *Clearfield hybrid varieties*. A brief description of the characteristics of these recommended varieties, along with 2009 variety trial comparative yield results (Tables 1 and 2) is presented below.

Cocodrie - excellent yield potential, good lodging resistance, good milling quality susceptible to sheath blight and straighthead, moderately susceptible to blast

Cheniere - excellent yield potential, good lodging resistance, moderate resistance to straighthead, susceptible to blast and sheath blight

XL723 - very high-yielding, very good seedling vigor, fair milling yields, moderately resistant to sheath blight and blast as well as straighthead

CL 151 - excellent yield potential, very susceptible to sheath blight, susceptible to blast and very susceptible to straighthead

CL 161 - good yield potential, very good milling yield, very susceptible to sheath blight, susceptible to blast

CLXL729 - very high-yielding, fair milling characteristics, moderately resistant to sheath blight and blast as well as straighthead

CLXL745 - very high-yielding, good milling quality when harvested at optimum grain Moisture, moderately resistant to sheath blight and blast as well as straighthead

Table 1 - 2009 Rice Variety Trial Results of Main Crop Yield for Selected Rice Varieties

Variety	Milling Yield[1]	RRS[2]	EVG[3]	JFD[4]	VML[5]	RCH[6]	Mean
Cocodrie	65-72	6,929	5,584	5,598	8,129	8,978	7,044
Cheniere	69-73	7,430	6,850	7,795	8,447	9,630	8,031
XL723	61-72	6,912	9,958	8,575	9,274	12,250	9,393
CL 151	65-72	8,471	7,758	8,390	8,644	10,713	8,795
CL 161	66-72	7,116	7,106	6,408	7,657	8,988	7,455
CLXL729	60-71	7,971	10,503	9,607	9,910	12,267	10,055
CLXL745	64-72	5,600	10,530	10,076	10,787	12,017	9,802

[1]Milling yield is the average from tests at RRS, EVG, JFD and VML. [2]RRS = Rice Research Station, Crowley.
[3]EVG = Evangeline Parish. [4]JFD = Jeff Davis Parish. [5]VML = Vermilion Parish. [6]RCH = Richland Parish.
Data source: Rice Research Station, LSU AgCenter.

Table 2 - 2009 Rice Variety Trial Results of Total Yield Over Three Locations for Selected Rice Varieties

Variety	Milling Yield[1]	Main Crop	Ratoon Crop	Total Yield
Cocodrie	66.6 – 72.5	6,885	1,391	8,276
Cheniere	69.1 – 72.5	7,891	1,498	9,389
XL723	62.3 – 72.1	8,253	1,565	9,638
CL 151	66.5 – 72.2	8,501	1,617	10,118
CL 161	66.2 – 71.7	7,060	1,613	8,673
CLXL729	60.9 – 71.1	9,162	1,822	10,984
CLXL745	64.2 – 72.2	8,821	1,256	10,077

Data source: Rice Research Station, LSU AgCenter.

Differences in Production Costs

In comparing the relative economics of hybrid rice production in Louisiana, expected differences in both gross market returns and crop production costs must be taken into account. Although hybrid rice varieties are generally expected to have higher yield levels than conventional varieties, the impact of milling yield on market price should also be considered in addition to the change in gross market revenue based solely on rough rice yield level. At rough rice market prices above the loan rate, government farm program payments would not be affected by type of rice produced, whether conventional, Clearfield or hybrid. Production of hybrid rice, compared to conventional and Clearfield varieties, would be expected to result in some changes in production costs. The more significant of these production cost changes are related to the cost of hybrid rice seed, nitrogen fertilization recommendations, and whether or not a fungicide is applied. Yield per acre levels would also impact rough rice hauling and drying charges per acre.

Recommended rice seeding rates are determined with the goal of achieving the desired plant stand. The optimal plant stand for conventional rice varieties is 10-15 plants per square foot. Although this desired plant stand is the same for all varieties of rice produced in Louisiana, the actual seeding rate, in pounds of seed per acre, will vary by rice variety and planting method. The recommended rice seeding rate for water-seeded rice is 90 to 125 pounds per acre. When drill seeding, the recommended rate is 60 to 90

pounds per acre. Due to a higher yield potential, the desired plant stand for hybrid rice is 8 to 10 plants per square foot. As a result, the recommended seeding rate for hybrid rice is lower than for other rice varieties, in the general range of approximately 30 pounds of seed per acre.

A comparison of seed costs for conventional, hybrid, Clearfield and Clearfield-hybrid rice varieties is shown in Table 3. Water-seeding a conventional rice variety, such as Cheniere, would require a seeding rate of approximately 100 pounds of seed per acre. With a seed price of $0.29 per pound, seed cost for a conventional rice variety like Cheniere would be $29.00 per acre. For a hybrid variety, such as XL723, seed prices are quoted by seed dealers in dollars per acre. In January of 2010, seed prices for hybrid varieties like XL723 were approximately $98.00 per acre, representing a $69.00 per acre increase in seed cost for hybrids over conventional varieties. Quoted seed prices for Clearfield hybrids, such as CLXL729 or CLXL745, were approximately $146.00 per acre. Seed costs for a Clearfield variety such as CL 151 were $56.00 per acre, at a 70 pound per acre seeding rate and a $0.80 per pound seed price. At these seed prices, seed cost per acre for Clearfield hybrids were about $90.00 per acre higher than for non-hybrid Clearfield varieties.

Table 3 - Differences in Expected Rice Seed Cost

Rice Variety	Seed Rate *(lbs/acre)*	Seed Price *($/lb)*	Seed Cost *($/acre)*
Conventional varieties:			
Cheniere	100	$0.29	$29.00
XL723	--	--	$98.00
Change in seed cost with hybrids			*+$69.00*
Clearfield varieties:			
CL 151	70	$0.80	$56.00
CLXL729/745	--	--	$146.00
Change in seed cost with hybrids			*+$90.00*

[1]Seed prices based on quotes in January 2010 for the 2010 crop year.

Nitrogen (N) recommendations for the majority of rice varieties produced in Louisiana, both conventional and Clearfield, are in the 120 to 160 pounds of N per acre range. Taking the midpoint of this range, an application of 140 pounds of N per acre at a $0.42 per pound of N price would result in a nitrogen cost of $58.80 per acre for both conventional and Clearfield rice varieties (Table 4). All or most of the nitrogen can be applied in a water-seeded pinpoint flood system. In a drill-seeded system, all or most of the nitrogen can be applied immediately before the permanent flood. Recommended fertilization on hybrid rice involves a different timing than for conventional rice varieties. Nitrogen recommendations for hybrid rice production, on both silt and clay soils in south Louisiana, call for an application rate of 150 pounds of N per acre, with 120 pounds applied at preflood and 30 pounds applied in late season. At a nitrogen price of $0.42 per pound of N, the 10 extra pounds of nitrogen applied on hybrid rice would result in an increase in fertilizer cost per of $4.20. This additional fertilizer cost, although relatively small, is dependent largely on the price of nitrogen which can be highly variable from year to year.

LSU AgCenter nitrogen recommendations for rice ratoon crops call for 75 to 90 of N applied when the first crop harvest is before August 15 and 30 to 45 pounds of N when the first crop harvest is after August 15. When conditions appear favorable for a ratoon crop, the higher nitrogen rates should be applied. These rates are applicable to both conventional and Clearfield rice varieties. Nitrogen recommendations on hybrid rice call for an application of 100 pounds of N on ratoon crops. Table 5 presents a comparison of these nitrogen rates on ratoon nitrogen costs. In this example, an N rate of 80 pounds per acre is applied to both conventional and Clearfield varieties. Using a nitrogen price of $0.42 per pound, this application rate results in a nitrogen material cost of $33.60 per acre of ratoon crop. The higher N rate on hybrid rice is 20 pounds greater, resulting in an increase of $8.40 per acre for hybrid rice ratoon crop production.

Table 4 - Differences in Expected Rice Nitrogen Fertilization Cost on Main Crop

Rice Variety	Nitrogen Rate *(lbs/acre)*	Nitrogen Price *($/lb)*	Nitrogen Cost *($/acre)*
Conventional varieties:			
Cheniere	140	$0.42	$58.80
XL723	150	$0.42	$63.00
Change in main crop nitrogen cost with hybrids			*+$4.20*
Clearfield varieties:			
CL 151	140	$0.42	$58.80
CLXL729/745	150	$0.42	$63.00
Change in main crop nitrogen cost with hybrids			*+$4.20*

[1]Nitrogen prices based on quotes in January 2010 for the 2010 crop year.

Table 5 - Differences in Expected Rice Nitrogen Fertilization Cost on Ratoon Crop

Rice Variety	Nitrogen Rate *(lbs/acre)*	Nitrogen Price *($/lb)*	Nitrogen Cost *($/acre)*
Conventional varieties:			
Cheniere	80	$0.42	$33.60
XL723	100	$0.42	$42.00
Change in ratoon crop nitrogen cost with hybrids			*+$8.40*
Clearfield varieties:			
CL 151	80	$0.42	$33.60
CLXL729/745	100	$0.42	$42.00
Change in ratoon crop nitrogen cost with hybrids			*+$8.40*

[1]Nitrogen prices based on quotes in January 2010 for the 2010 crop year.

Plant diseases are a critical issue confronting rice production in Louisiana. The yield potential of any rice variety can be severely reduced by high levels of diseases such as blast, sheath blight, straighthead and others. Fungicide applications on both conventional and Clearfield varieties are quite common on rice fields in Louisiana. A typical rice fungicide treatment could include an application of the fungicide *Stratego*® (Bayer CropScience) at a rate of 19.0 fluid ounces per acre. At a material price of $1.25 per fluid ounce, this rice fungicide application would cost $23.75 per acre.

Although hybrid rice varieties are described as not normally requiring fungicides, it is recommended that fields be scouted regularly and treated if necessary. Both the hybrid variety XL723 as well as the Clearfield hybrids CLXL729 and CLXL745 are rated as moderately resistant to blast and straighthead, moderately susceptible to sheath blight and smut, and susceptible to stem rot. The fungicide cost estimates presented in Table 6 compares a standard fungicide treatment on conventional and Clearfield rice varieties to a standard fungicide treatment on 60 percent of 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. Using the 60% of hybrid acres treated, the 11.4 ounce fungicide rate on hybrids, in the table below, represents a weighted average application rate over all hybrid acreage and not a reduced rate on acres actually treated. This cost estimate is based on an assumption that a fair amount of hybrid rice acreage in Louisiana would be treated with a fungicide as a precaution. Under this assumption, the average fungicide cost savings with hybrid rice would be $9.50 per acre. This cost savings would be larger or smaller, depending upon the actual percent of hybrid acreage treated with a fungicide.

Table 6 - Differences in Expected Rice Fungicide Cost

Rice Variety	Fungicide Rate (*fl oz/acre*)	Fungicide Price (*$/fl oz*)	Fungicide Cost ($/acre)
Conventional varieties:			
Cheniere	19.0	$1.25	$23.75
XL723	11.4	$1.25	$14.25
Change in fungicide cost with hybrids			*($9.50)*
Clearfield varieties:			
CL 151	19.0	$1.25	$23.75
CLXL729/745	11.4	$1.25	$14.25
Change in fungicide cost with hybrids			*($9.50)*

[1]The rice fungicide *Stratego*® is used in this example; fungicide price is for the 2010 crop year. [2]Fungicide cost on hybrid rice is based on the assumption that approximately 60% of total hybrid rice acreage would probably be treated with a fungicide as a precaution.

A comparison of total production cost changes in seed, nitrogen and fungicide costs for production of hybrid rice varieties compared with conventional and Clearfield varieties are presented in Table 7. Based on the input rate assumptions utilized in this analysis, production of a hybrid variety such as XL723, compared to production of a conventional variety such as Cheniere, would be expected to have production costs which are $63.70 per acre higher for the main crop and $72.10 per acre higher for the main crop plus the ratoon crop. Production of Clearfield hybrids, such as CLXL729 and CLXL745, would be expected to have production costs which are $84.70 per acre higher for the main crop, compared to standard Clearfield varieties, and $93.10 per acre higher for the main crop plus the ratoon crop. The primary difference in production cost changes between standard hybrids and Clearfield hybrids is the price of the seed. Cost values in Table 7 exclude any additional expenses associated with hauling and drying the potential additional yield per acre with hybrids.

Table 7 – Estimated Changes in Production Cost for Hybrid Rice over Conventional and Clearfield Rice Varieties

Change in Rice Production Cost with Hybrid Production	XL723 Main Crop Only (*$/acre*)	XL723 Main Crop plus Ratoon (*$/acre*)	CLXL729/745 Main Crop Only (*$/acre*)	CLXL729/745 Main Crop plus Ratoon (*$/acre*)
Seed	$69.00	$69.00	$90.00	$90.00
Nitrogen – Main Crop	$4.20	$4.20	$4.20	$4.20
Nitrogen – Ratoon Crop	--	$8.40	--	$8.40
Fungicide	($9.50)	($9.50)	($9.50)	($9.50)
Total Change	$63.70	$72.10	$84.70	$93.10

[1]Changes in total rice production costs exclude changes in yield-based hauling and drying costs.

Breakeven Yield Increases Required to Cover Increased Costs

Using the production cost increases estimated in Table 7, breakeven rice yield increases required to cover increased costs associated with hybrid rice production were estimated for a range of rough rice market prices and are shown in Table 8. The specific level of rice yield increase is influenced by (a.) the dollar per acre value of increased production cost, (b.) the current rough rice market price level, and (c.) the land tenure arrangement. Breakeven yield increases required for hybrid rice produced on cropland which is either owned or cash rented, representing situations in which the rice producer would pay all of the increased hybrid rice production costs and receive 100% of the crop proceeds after sale, was estimated using the following formula:

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

where BEYI = the required breakeven rice yield increase *(cwt/acre)*, Δ PC = the change in production costs per acre paid by the grower *($/acre)*, MP = the rough rice market price *($/cwt)*, and HD = the hauling and drying charge per yield unit *($/cwt)*. A representative value of $1.84 per cwt. was used for this illustration to reflect typical hauling and drying charges in this calculation. For hybrid rice produced on share-rented land, where the grower receives a share of the crop proceeds at sale and would pay most or all of the increase in production costs, the required breakeven yield to cover increased hybrid rice production costs would be estimated using the following revised formula:

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

where Δ PC = the change in production costs per acre paid by the grower *($/acre)* (which may be different than in the equation above depending upon the specific crop share arrangement) and GS% = the grower's share of the crop proceeds under a crop share land tenure arrangement. Depending upon the particular crop share arrangement being utilized, the landlord may or may not pay some of the increased seed, fertilizer or fungicide costs associated with the production of hybrid rice. The crop share arrangement presented in Table 8, as an illustration, assumes that the landlord receives 30% of the crop proceeds in exchange for providing land and irrigation water. For this particular crop share arrangement, the grower would pay all of the increased production costs related to hybrid rice production.

Breakeven yield increases are highly dependent on the current relevant rough rice market price level. Increases in rough rice market price reduce required breakeven yields and decreases in rough rice market price increase breakeven yields. For example, the estimated increased production cost of producing the hybrid variety XL723 on owned or cash-rented land would require an increase in yield of 627 pounds per acre to cover increased production costs at a rough rice price of $12.00 per cwt. If the rough rice price was $15.00 per cwt., the required breakeven yield increase would decline to 484 pounds per acre. For the 70/30 crop share arrangement illustrated here, the grower is paying all of the increased production costs and is receiving only 70 percent crop proceeds. Required breakeven yield increases in this instance are approximately 200 to 400 pounds per acre higher than for owner-operator or cash-rented production situations, depending upon relevant rough rice market price level and decision on ratoon crop production.

Table 8 – Required Breakeven Yield Increases Necessary to Cover Increased Production Costs with Hybrid Rice Production

	XL723		CLXL729/745	
Rough Rice Market Price Level *($/cwt)*	Main Crop Only *(lbs/acre)*	Main Crop plus Ratoon *(lbs/acre)*	Main Crop Only *(lbs/acre)*	Main Crop plus Ratoon *(lbs/acre)*
	Owner-Operator or Cash Rented Land			
$12.00	627	710	834	917
$13.00	571	646	759	834
$14.00	524	593	697	766
$15.00	484	548	644	708
	Tenant-Operator under 70/30 Crop Share[1]			
$12.00	896	1,014	1,191	1,309
$13.00	815	923	1,084	1,192
$14.00	748	847	995	1,094
$15.00	691	782	919	1,010

[1]70/30 crop share arrangement assuming landlord only pays for irrigation pumping costs and does not share in any seed, fertilizer or chemical costs.

Differences in Rough Rice Market Price Based on Rice Quality

The costs and returns differences related to hybrid rice production presented above illustrate the expected production cost differences associated with hybrid rice production and the required breakeven yield increases necessary to cover those increased production costs. Another important consideration is the impact of rice quality (i.e., milling yield) on the market price received for the rough rice produced. Rice quality impacts on market price are important for comparisons between any rice varieties, conventional, Clearfield or hybrids, and the market price estimates presented here for hybrid rice are included for illustrative purposes.

Rough rice value, on either a market price or loan rate basis, is based on the rough rice milling yield and the milled rice value (price) for whole kernel rice (long grain or medium grain) and broken kernels. For example, each year the Farm Service Agency of USDA announces the loan rate values for whole kernel and broken kernel rice in establishing the rough rice loan rate. For the 2009 crop year, the whole kernel milled loan rate for long grain rice was $9.94 per cwt. and the broken kernel loan rate was $6.84 per cwt. The relationship between the broken kernel rate and the whole kernel rate (68.8%) is based on the milled rice market price relationships for the two rice classes over the previous two years. Using this milled loan rate values, the rough rice loan rate value in 2009 for long grain rice with a milling yield of 55/70 (55% head rice and 15% brokens) would be calculated as follows:

(55% head rice x $9.94/cwt.) + (15% brokens x $6.84/cwt.) = $6.49/cwt. rough rice loan rate value

This example milling yield and loan rate pricing can be interpreted as follows: A one hundredweight sample of rough rice resulting in a milling yield of 55 pounds of whole kernel milled rice, valued at $9.94/cwt., and 15 pounds of broken kernel milled rice, valued at $6.84/cwt., and would have a rough rice loan rate value of $6.49/cwt. For the 2010 rice crop year, the loan rate values are $9.91/cwt. for long grain whole kernel rice, $9.65/cwt. for medium grain whole kernel rice, and $7.01/cwt. for broken kernel rice.

A similar methodology can be used to estimate the impacts of milling yield on rough rice market prices. The milled price values for whole kernel and broken kernel rice would have to be adjusted to the relevant current rough rice market price level. In April 2010, milled long grain whole kernel prices in Louisiana were $23.50-$23.75 per cwt. and prices for brokens were $17.50-$18.50 per cwt. Using this price relationship (approximately 75%) and a base level rough rice market price of $13.00/cwt. for a 55/70 milling yield, the rough rice market value of whole kernel or head rice (WK) and broken kernel rice (BK) could be determined by the following formula, similar to the loan rate calculation:

$$55\% \text{ (WK)} + 15\% \text{ (BK)} = \$13.00/\text{cwt.}$$

$$0.55 \text{ (WK)} + 0.15 \text{ (0.75 x WK)} = \$13.00/\text{cwt.}$$

$$\text{WK} = \$13.00/\text{cwt.} / (0.55 + (0.15 \times 0.75))$$

$$\text{WK} = \$13.00/\text{cwt.} / 0.6625 = \$19.62$$

$$\text{BK} = 0.75 \text{ (WK)} = \$14.71$$

Using this price estimation methodology. The estimated impacts of alternative milling yields, from the 2009 variety trials presented in Table 2, are estimated for four levels of base rough rice market prices, $12.00/cwt through $15.00/cwt. in Table 9 below. As can be seen in the Table 9, milling yield can have a significant impact on the final market price received for rough rice sold and should always be considered when making comparisons between the relative profitability of any rice varieties.

Table 9 – Estimated Rough Rice Market Price for 2009 Rice Variety Trial Results of Selected Rice Varieties for Alternative Rough Rice Base Market Price Levels

Variety	Milling Yield[1]	$12.00/cwt.[2]	$13.00/cwt.[2]	$14.00/cwt.[2]	$15.00/cwt.[2]
Cocodrie	65-72	$12.72	$13.78	$14.85	$15.91
Cheniere	69-73	$13.04	$14.13	$15.22	$16.30
XL723	61-72	$12.54	$13.59	$14.63	$15.68
CL 151	65-72	$12.72	$13.78	$14.85	$15.91
CL 161	66-72	$12.77	$13.83	$14.90	$15.96
CLXL729	60-71	$12.36	$13.39	$14.42	$15.45
CLXL745	64-72	$12.68	$13.74	$14.79	$15.85

[1]Milling yield is percent whole kernel – percent broken kernel. [2]Base level rough rice market price for a 55/70 milling yield.

Summary

Hybrid rice production represents a relatively new alternative for Louisiana rice producers to consider in selecting rice varieties to be planted on their farming operations. 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 acreage to a single variety. In 2009, about 15% of Louisiana's rice acreage was planted in hybrid varieties. Because of differences in production costs and expected yields with hybrid rice varieties, it is important to consider the relative differences in expected costs and returns compared to conventional varieties. This report has highlighted some of the expected differences in production cost related to hybrid rice production, based on hybrid rice variety management guidelines. Major differences in hybrid rice production cost are related to higher seed prices, slightly higher nitrogen fertilization costs and potentially lower fungicide costs. The major attraction of hybrid rice production is related to the higher yield potential of hybrid rice varieties. Some comparative yield data from field trials at the LSU AgCenter Rice Research Station were included in this report for comparison. It is also important to consider the impact of milling yield on the market price of rough rice received in addition to the change in rough rice yield per acre. Hybrid rice production offers Louisiana rice producers an excellent decision choice alternative to further diversity rice varieties produced on the farm to aid in better managing production and price risk and increase net returns, as well as reduce net return variability from year to year, to the farming operation.

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