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## Evaluation of the Impact of Changes in Commodity Income Support Measures Included in the Agricultural Act of 2014 on Equitable Louisiana Rice Production Rental Arrangements

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EVALUATION OF THE IMPACT OF CHANGES IN COMMODITY INCOME SUPPORT  
MEASURES INCLUDED IN THE AGRICULTURAL ACT OF 2014 ON EQUITABLE  
LOUISIANA RICE PRODUCTION RENTAL ARRANGEMENTS

A Thesis

Submitted to the Graduate Faculty of the  
Louisiana State University and  
Agricultural and Mechanical College  
in partial fulfillment of the  
requirements for the degree of  
Master of Science

in

The Department of Agricultural Economics and Agribusiness

by  
Abdallahi Ould Abderrahmane  
B.A., University of Nouakchott, 2002  
August 2015

To my late parents Dah (Abderrahmane) and Neinne (Mounina),

To Vali, Aicha Lall, Cheikh Mohamed Lemine, Sidi, Anna, and the rest of my brothers, sisters, nieces and nephews,

To my uncle Sid'Ahmed, and my aunts: Mamme and Sultana,

To my daughter Mounina and my son Hamed,

To Deidde, Kerim, Taha, Dr. Ipek Goktepe, Dr. Mohamed Ahmedna, and my wife Jemila,

To my friends and relatives: Dr. Sidina O.Dedah, Dr.Cheikhna O.Dedah, and Dr. Abdallahi O. Beyane.

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## ABSTRACT

This research uses a *Simetar* simulation technique to evaluate the effect of the adoption of the Price Loss Coverage program included in the 2014 Agricultural Act on Louisiana's rice equitable rental arrangement choices. Two scenarios are examined: one in which prices of the last three years are detrended and a second one in which they are not detrended. Each scenario includes six rental arrangements (Cash rent, Fixed Price, Fixed Yield, 60/40, 70/30, 80/20) and each rental arrangement has four adjustments (base, price trigger, yield trigger, and price and yield trigger). Three different risk measure analysis were conducted: Mean-Variance, Value at Risk (VaR), and Stochastic Efficiency with respect to a Function (SERF) to measure and analyze the risk associated with each option. In addition to that, the study reviews some provisions of the newly adopted Farm Bill (PLC and ARC-Parish).

The Mean-Variance results show that for the tenant the 80/20 share with yield-price trigger (6D), the 70/30 share yield-price trigger (5D), and the 60/40 share with yield-price trigger (4D), dominate all the other Louisiana rice rental arrangements. For the landlord, the Fixed Dollar Base (1A), Fixed Price Base (2A), Fixed Yield Base (3A), dominate all the other Louisiana rice rental arrangements.

The VaR results show that for the tenant the 80/20 share with yield-price trigger (6D) dominates all the other Louisiana rice rental arrangements, and for the landlord the Fixed Dollar Base (1A), Fixed Dollar with yield trigger (1B), Fixed Price Base (2A), and Fixed Price with yield trigger (2B) dominate all the other Louisiana rice rental arrangements.

Finally, the SERF results show that the tenant best choices are the 80/20 share with any trigger option (6A, 6B, 6C, 6D), and the landlord best choices are the Fixed Yield or Fixed Price with any trigger option (2A, 2B, 2C, 2D, 3A, 3B, 3C, 3D)

## **CHAPTER 1. INTRODUCTION**

### **1.1 General Introduction**

After more than two years of political gridlock between Republican and Democrat lawmakers, the U.S. Farm Bill, titled the Agricultural Act of 2014, was passed by the U.S. House of Representatives and the Senate on January 29 and February 4, 2014 and was signed into law by the President on February 7, 2014. The U.S. Farm Bill is an omnibus, comprehensive legislative act which authorizes and regulates a variety of programs administered by the U.S. Department of Agriculture. Authorizing specific federal agricultural programs for a four-year period, the 2014 Farm Bill includes legislation related to commodity price and income support programs, as well as programs concerning rural development, foreign agricultural trade, agricultural research, conservation, renewable energy, forestry, and nutrition. One of the most important changes introduced in this new farm bill is that the commodity safety net focus has shifted from sole reliance on traditional price and revenue support programs to new program options which provide supplemental income support and place greater importance on producers having crop insurance as an independent base level of farm income support. Program changes in the 2014 Farm Bill will impact all commodities currently covered by federal farm programs but will have a significant impact on the operating finances of rice farming operations, as rice has historically had significantly higher farm income support payments on a per acre basis in recent farm bills compared to other covered commodities. Under the 2014 farm bill, fixed program payments which existed under previous farm bills will be eliminated and replaced with more price sensitive program payment options.

Among the commodities likely to be affected by the provision of this bill is rice whose production is an important part of the agricultural sector in Louisiana. Louisiana has

traditionally been the third-ranked rice producing state in the U.S., both in terms of acres harvested and quantity of rough rice production. In 2013, there were 2.468 million acres of rice harvested in the U.S. (USDA, 2014). Arkansas harvested 1.07 million acres of rice, primarily long grain rice, followed by California with 561,000 harvested acres, primarily short and medium grain rice. Louisiana was ranked third with 413,000 harvested acres, most of which was long grain rice with minor acreages of medium grain and specialty rice. Total rough rice production in Louisiana in 2013 was 30.135 million hundredweights, representing 16% of total U.S. rough rice production. The estimated total value of the 2013 Louisiana rice crop was calculated to be \$659 million (LSU AgCenter).

In the United States, the portion of the farm bill which is of most interest to agricultural commodity producers and commodity organizations is Title 1. Title 1 has historically contained the provisions for crop price and income support programs for many major row crops produced in this country. Farm bills are usually passed with a period length of four to five years. The first farm bill, The Agricultural Adjustment Act of 1933 (P.L.73-10) was passed during the Great Depression to control the supply of certain agricultural commodities in order to stop the sharp decrease of their prices which was occurring at that time. This farm bill provided for the first implementation of commodity loan rates, which effectively served as price floors in an effort to support and stabilize farm income. Loan rates serve the role as being a minimum price for specified commodities. If the market price of a commodity would decrease below the specified loan rate value, the U.S. government would purchase that commodity at the loan rate value. This type of agricultural income support mechanism has remained as part of succeeding farm bill through the present, although the particular operation of the loan rate program has varied somewhat over time.

Since 1973, many other agricultural programs have been added to the farm bill, including nutrition, conservation, international trade and research, in addition to an expansion of agricultural commodity income support programs above specified loan rate levels. In the 1970s, the target price concept for supporting commodity income was introduced into farm bills and has remains a component of farm income support provisions in farm bills ever since. Target prices for commodities covered in farm bills were established as price support levels which would cover total costs of production. Through the years in an effort to restrict and stabilize farm program expenditures, price income support payments based on farm bill target prices have been paid on established crop base acres, not actual planted acres, and on established crop program yield, not actual yield. The target price program generally works by paying a payment rate based on the difference between the established target price and market price for a program commodity, when the market price is below the target price. This payment rate is paid on established program yield and some percentage of established base acres. Once established initially, crop base acres and program yields have generally not changed over time.

Since the mid-1970s and similar to other program commodities, the target price and loan rate programs have been the primary means of supporting commodity income associated with rice production. Target price provisions for rice were first enacted by the Rice Production Act of 1975 which established target support prices of \$8.25 per cwt. for rice produced in the 1976 and 1977 crop years. The loan rate for rice at that time was set at \$6.19 per cwt. Overtime, succeeding farm bills increased the target price levels for covered commodities. The Food, Agriculture, Conservation and Trade Act of 1990 (P.L. 101-624) established a rice program target price and loan rate of \$10.71 per cwt. and \$6.50 per cwt. for the 1990-1995 crop years.

During the mid-1990s, commodity prices and farm income was at high levels. Given these conditions, there was growing interest in Congress that the federal government should get out of the farm income support business. In response, The Federal Agricultural Improvement and Reform Act of 1996 (P.L.104-127) was enacted. It was commonly called the “Freedom to Farm Bill” or the FAIR Act. The basic foundation of this farm bill was to create a series of fixed declining support payments which would have the effect of gradually reducing the involvement of the federal government in agricultural commodity markets. The law created for the first time a “decoupled” subsidy called the Production Flexibility Contract (PFC) for selected agricultural commodities. “Decoupled” means that the payments are independent of price and revenues. Farmers were also free to plant any crop, with the exception of certain fruits and vegetables, as the intent of the farm bill was to allow producers to respond to market signals. The fixed program payments established under the 1996 Farm Bill have remained in succeeding farm bills, in one form or another, and were the basis for the fixed Direct Payment Program which has been part of the 2002 and 2008 Farms Bills.

In 2002, the Farm Security and Rural Investment Act of 2002 (P.L. 107-171) was passed. This bill contained two commodity income support programs: The Direct Payment Program and the Countercyclical Payment Program. Both of these programs continued to utilize established target prices and loans rates to determine program payments. For rice the target price was set at \$10.50 per cwt. The Direct Payment Program established a fixed payment rate of \$2.35 per cwt. for rice paid established rice program yields and on 85% of rice base acres. In the Countercyclical Payment Program, program payments were a function of market prices. Subtracting the direct payment of \$2.35 per cwt. from the target price of \$10.50 per cwt. yielded a maximum price support level of \$8.15 per cwt. under the Countercyclical Program. If rough

rice market prices fell below \$8.15 per cwt., growers would receive a payment based on that price difference, again paid on program yields and percentage of base acres. The 2008 Farm Bill, the Food, Conservation, and Energy Act of 2008 (P.L. 110-246) essentially continued these two farm income support programs, while also creating another option called the Average Crop Revenue Election (ACRE) program which developed farm income support payments based on whole farm revenues.

With the passage of the Agricultural Act of 2014, both the Direct and Countercyclical Payment Programs have been repealed. This means the elimination of fixed direct program payments which agricultural producers of covered commodities have been receiving since 2002 regardless of the commodity market price levels. More specifically for rice production in Louisiana, the repeal of the Direct Payment Program will mean a loss of approximately \$90 to \$95 per rice base acre in guaranteed income to rice farming operations. This will have a significant impact on several facets of rice production business operations including acquisition of crop operating loans from financial institutions and equitable rental arrangements with land owners.

## **1.2 Problem Statement**

With the passage of the new farm bill in 2014 and the elimination of fixed direct payments to rice farming operations, the expected financial performance of rice production in Louisiana will certainly be altered. Direct payments to rice farms, whose value has been capitalized into land values and rental rates over time, no longer exist. A central question being asked by both rice tenant producers and rice land owners is: How will the loss of direct program payments impact the financial performance of rice production in Louisiana and how should

equitable rice rental arrangements, both cash and share arrangements, adjust to reflect this change in expected farm program income support.

### **1.3 Review of Literature**

This section reviews some of the references that deal with the three tangent issues that make up the topic of this research project. The first section reviews the relevant provisions of Title I of the Agricultural Act of 2014 regarding farm income support programs available to rice producers. The second section reviews previous literature regarding establishment of equitable agricultural rental arrangements. The third section reviews relevant literature concerning stochastic simulation risk analysis of agricultural decision problems.

The first source of information about the 2014 Farm Bill that comes to mind is the House of Representative's Conference Report but it is a very long and cumbersome document. Instead, Schnitkey et al. (2014), Smith (2014), and Johnson and Monke's provide more concise and meaningful accounts of the last Farm Bills. The last authors issued on April 7, 2014 a very brief summary of the bill's twelve titles as well as their cost for the duration of the bill: 2014-18. Salassi (2014) presents a useful comparison between the PLC and ARC-County for Acadia rice growers. Zulauf and Schnitkey compared and contrasted PLC and ARC-County on one hand and DCP and ACRE on the other hand (Farmdoc, March 18, 2014). In a previous article in the same journal, the two authors examined the issue of PLC and ARC-County decision for U.S. corn based on "projected ARC implied price" and PLC's reference price. This corn case focuses on "the price path" estimation as a crucial factor in the program decision process.

The second issue of interest to this research is about rental arrangements and their fairness. In agriculture, there are three major types of rent arrangement: cash rent, share rent and flexible rent. According to Parsell and Hansen the most common share rentals are 1/2-1/2, 2/3-

1/3, or 3/4-1/4, the first fraction being the tenant's share. Salassi and Deliberto 2008 LSU AgCenter Staff Report: Examining Cropland Production in Louisiana's provides among other important things some useful data about Louisiana's rice land tenure statistics. The 2008 study surveyed 158 rice farmers in 487 land tracts. Among these tracts there were 100 cash rents, 350 share rents, and the rest were not identified. Of the share renting respondents 18 were 16% share, 105 were 20% share, 27 were 25% share, 17 were 33% share, 58 were 40% share, and 17 were 50% share. The survey results show that when the share is 30% or more, the landowner paid more than 70% of the irrigation costs. This survey were not concerned with the number of farms owned exclusively, but Aldana in his 2005 thesis reported that in Southwestern Louisiana, 18% rice farms were owned and 82% were leased ( Aldana, 2005). In 2014, Salassi and Deliberto developed a useful Excel spreadsheet that owners and tenants can use to calculate their rice rental arrangement net return. This aid will be used extensively in this study. Finally, a great consensus seem to exist among scholars in the agricultural field that an equitable share rental arrangement requires that the revenue should be shared between the rental contracting parties in the same proportions of their contribution to the production inputs.(Salassi and Deliberto,2014; Bechtel and Corp; Parcell and Hansen).

The third sub-topic of this study is about stochastic simulation and risk management. In 2000, Richardson *et al.* wrote an article in the Journal of Agricultural Economics and Applied Economics about the estimation of the parameters of a multivariate empirical probability distribution that preserves the inter and intra-correlation between its input variables and consequently avoiding the bias that may exist had not such a procedure been applied. The authors also created an Excel spreadsheet that can be used to simulate observations with the property mentioned above. For risk analysis, a method called Stochastic Efficiency with Respect

to a Function (SERF) introduced in 2004 by Hardaker *et al.* will be used in this study. In 2011, Richardson *et al.* developed an Excel add-in called Simulation & Econometrics to Analyze Risk (SIMETAR) that can be used SERF analysis. Details about SERF, SIMETAR, and MVE will be provided in the next sections.

## **1.4 Objectives**

The general objective of this research is to investigate potential changes in equitable rice rental arrangements expected in reaction to the passage of new farm program income support provisions of the Agricultural Act of 2014 and to evaluate the potential impacts on grower net returns and income risk.

The specific objectives are:

- 1) Review the provisions of the 2014 Agricultural Act and identify changes in the commodity program provisions relative to rice income support.
- 2) Review previous literature in the discipline regarding the definition and establishments of equitable rents associated with agricultural crop production.
- 3) Define common rice rental arrangements currently used in rice production in Louisiana and specify alternative rental arrangements to evaluate.
- 4) Develop stochastic models to evaluate the impact of alternative rental arrangements on the expected net income of rice growers.
- 5) Identify preferred rental arrangements for rice producers over a range of risk preferences.

## **1.5 Methodology**

Objective 1 of this study will involve a detailed review of the newly passed farm bill to identify provisions which are applicable to rice producers. An overview of the new farm bill is presented here. The Agricultural Act of 2014 was signed into law by President Barack Obama in

February 2014. This new farm bill contains twelve titles which specify the provisions of the various programs included in the farm bill. Provisions related to commodity price and income support measures are included in Title I. The commodities covered included in the programs outlined in Title I are: barley, corn, dry peas, grain sorghum, large chickpeas, small chickpeas, lentils, long grain rice, medium grain rice, oats, other oilseeds, peanuts, soybeans, and wheat. Marketing loan provisions for cotton are included in Title I with cotton crop insurance program provisions included in Title XI. The duration of this farm bill will be for the 2014 to 2018 crop years. Under this new farm bill, the direct payment and counter-cyclical payment programs of the previous farm bill were repealed and replaced with two new income support program options from which producers can choose on a crop by crop basis. Payment of all existing benefits cannot exceed \$125,000 per person or \$250,000 per couple engaged in substantial agricultural activities. (Johnson and Monke, 2014).

The Price Loss Coverage (PLC) Program is a price safety net program and the Agriculture Risk Coverage / county option (ARC-County) Program and Agriculture Risk Coverage / individual farm option (ARC-Individual) Program are revenue based programs. Both the PLC and ARC-County are selected and operate on a crop by crop and farm by farm basis, but the ARC-Individual operates by aggregating income from all commodities produced on a farm. For example, if a grower has two farms and on farm 1 he is planting rice and soybeans and on farm2 he is planting corn and wheat, he can enroll in PLC Program for rice in farm 1 and corn and wheat in farm 2 and enroll in ARC-County Program for only soybeans in farm 1. But if he chooses to enroll in ARC-Individual he has to enroll all the commodities and all the farms in that program. In addition, the Supplemental Coverage Option (SCO) of Title XI provides for coverage of crop insurance deductibles on existing crop insurances policies and is available only to commodities

enrolled in the PLC program exclusively. The ARC Program is considered to be a shallow loss coverage program, similar to SCO. As a result, participation in SCO is not available for crops enrolled in the ARC Program (Smith, 2014; U.S. House of Representatives, 2014)

Each producer must take three major decisions in order for him to be eligible for Title I benefits:

- To keep existing base acres or reallocate them based on previous planting history.
- To keep the 2008 Payment Program yield or update it to 90% of the average yields of the 2008-2012 years (if enrolled in the PLC Program).
- To elect between PLC, ARC-County or ARC-Individual. This decision cannot be changed during the duration of the bill. (Smith, 2014; U.S. House of Representatives, 2014)

Reallocation of the base acres cannot exceed the number of existing base acres minus the cotton base acres. Cotton base acres are now transformed or categorized into “generic base acres” and can be allocated to alternative covered commodities on a year by year basis. The total base acres continue to be “decoupled” in this bill ,which means that the commodities are not required to be planted, while the generic base are required to be planted. Reallocation of the base acres is a landowner decision not a tenant one. (Smith, 2014; U.S. House of Representatives, 2014)

The decision to update yield is also at the discretion of the landowner and it affects the PLC program only. The owner can keep the Direct and Countercyclical Programs payment or update to 90% of his average yield for 2008-2012 years. If in any year the yield drops below 75% of the county yield, the county yield will be used in the calculation of the average. In the case of

multiple owners a unanimous decision is required. (Smith, 2014; U.S. House of Representatives, 2014).

The most crucial decision is the third one: choosing between PLC, ARC-County, or ARC-Individual. The Price Loss Coverage (PLC) is a price support program similar in many aspects to the Countercyclical Payment of the 2002 Farm Bill. The program makes payments whenever the market year average (MYA) of the covered commodity falls below a certain reference price. Examples of reference price are: \$3.70/Bushel for corn, \$535/ton for peanut, \$14.00/cwt. for rice and \$5.50/bushel for wheat. The payment rate is the difference between the reference price and the higher of MYA price or loan rate (LR). The payment is equal to 85% of the payment rate times the payment yield times the base acres. (Smith, 2014; U.S. House of Representatives, 2014. This research will focus on participation in the PLC Program, as the majority of rice base acres, in Louisiana as well as in other rice producing states, is expected to be enrolled in the PLC Program for the price protection afforded by the reference prices specified in that program.

Under objective 2 of this study, previous literature regarding the definition and establishment of equitable crop land rental arrangements will be reviewed. Land is a major factor in the agricultural production. It can be owned or rented. Crop rental arrangements usually take three forms: cash, crop share, or a combination of both. In addition to that, crop share arrangements can be fixed or flexible. The decision to choose between these two kinds of rental leases involves a tradeoff between income and risk. The crop share option shifts some of output price, yield, and production risks from the tenant to the landowner, but it means also more potential income for the landowner.

Under objective 3, common crop land rental arrangements associated with rice production in the state will be specified for evaluation and analysis. More specifically, these rice rental

arrangements will be evaluated under participation in the PLC program to estimate comparable grower and landlord net returns under each rental agreement. These crop leases need to be equitable to the lessor and lessee. This means that each party should receive a portion of the crop that is proportional to its contribution to the production of the output. For that purpose, in 2013 the LSU AgCenter developed a decision tool called the Rice Rental Arrangement Net Return Evaluation Model intended to help Louisiana farmers “in evaluating alternative rice rental arrangements and to estimate the impact on expected net returns above specified rice production expenses for both the tenants rice producer and the land owner.” In 2014, the model was modified to include the newly adopted PLC payment that is likely to be chosen by the farmers of this region. This Excel spreadsheet can be obtained from the LSU Agcenter website at [www.lsuagcenter.com](http://www.lsuagcenter.com). (Salassi and Deliberto, 2014).

Under objective 4, stochastic models will be developed to estimate distributions of grower net returns above variable production with participation in the PLC Program under alternative rental arrangements. The general form of the net return equation utilized in the analysis can be specified as follows:

$$NR = (P*YD*GR) + (GP*PGYD*PLTRatio) - \sum (IPrice*IQty)$$

where  $NR$  = net returns per planted acre,  $P$  = commodity market price,  $YD$  = crop yield per acre,  $GR$  = grower share of crop proceeds,  $GP$  = government farm program payment rate,  $PGYD$  = farm program yield,  $PLTRatio$  = the ration of paid base acres to planted acres,  $IPrice$  = production input price, and  $IQty$  = production input quantity. Monte carlo simulation will be used to develop distributions of net returns under alternative rental arrangements. The *Simetar* simulation softward will be utilized to generate random values of specified random variables. This software package,

based on simulation procedures developed by Richardson et al. (2000), provides the ability to generate random values which are inter- and intra-correlated over time and across variables.

Under objective 5, distributions of grower net returns will be evaluated to identify the impact of the PLC program on preferred rice crop rental arrangements over a range of risk preferences. The theoretical basis of this analysis will be the Subjective Expected Utility hypothesis which states that the utility of a risky alternative is the decision maker's expected utility for the alternative, i.e., a probability-weighted average of outcome utilities (Hardaker, et al., 2004). As a result, the decision maker's utility function for decision alternative outcomes is required.

A negative exponential utility function, commonly used in the field of agricultural economics to represent a decision maker's utility for wealth related to risky choices, will be utilized (Schumann, et al., 2004). Calculation of the certainty equivalents and comparison over alternative risky crop rental arrangement alternatives will be conducted using an Excel based approach developed by (Hardaker, et al., 2004). Distributions of net returns evaluated under this study objective will be those estimated under objective 4.

The certainty equivalent (CE) of a risky choice is an estimated value at which the decision maker would be indifferent between the estimated certainty equivalent and the risky choice. The estimation of certainty equivalents are dependent upon the choice of utility function employed. This study will utilize a negative exponential utility function, commonly used for decision risk analysis choices. A negative exponential utility function may be expressed mathematically as:

$$U(w) = -\exp(-r_a w)$$

where  $U$  represents a measure of utility from a given choice or decision,  $w$  represents the wealth or income associated with that choice and  $r_a$  represents a specific absolute risk aversion coefficient. The absolute risk aversion coefficient is a means of measuring the degree of risk aversion by a

decision maker faced with a risky decision choice. An absolute risk aversion coefficient is defined as the negative ratio of the second and first derivatives of a wealth utility function and basically serves as a measure of the curvature of a utility function (Anderson, et al., 1977).

Stochastic efficiency with respect to a function (SERF) will be utilized in conducting this analysis. Stochastic efficiency with respect to a function was originally proposed by Hardaker and Lien (2003) as a means to evaluate a set of risky alternatives in terms of certainty equivalents for a specified range of risk preferences. The advantage of this procedure lies in its ability to compare the entire set of risky alternatives available to the decision maker, rather than the pairwise comparisons which are made by other risk analysis procedures such as stochastic dominance with respect to a function (SDRF).

Within this type of risk analysis, a problem arises regarding the appropriate values and range of absolute risk aversion coefficients to evaluate for a given risky decision choice. One methodology to address this issue is to evaluate the relationship between absolute and relative risk aversion (Hardaker, et al., 2004). This relationship may be expressed mathematically as follows:

$$r_a(w) = r_r(w)/w$$

where  $r_a$  is the absolute risk aversion coefficient,  $r_r$  is the relative risk aversion coefficient and  $w$  is the wealth from a given risky choice. Anderson and Dillon (1992) have proposed a general classification range of relative risk aversion coefficients in the range of 0.0 for no risk, 0.5 for very little risk, and an upper value of approximately 4.0 for very risky choices. Absolute risk aversion coefficients to be utilized in this analysis will be obtained by dividing a range of relative risk aversion coefficients (0.0 to 4.0) by the estimated net return above variable cost per acre for alternative rental arrangement choices.

The certainty equivalents for alternative rice rental arrangement choices and absolute risk aversion coefficients will then be estimated using the following relationship as outlined by Hardaker, et al., 2004:

$$CE(w, r_a(w)) = \ln \left\{ \left( \frac{1}{n} \sum_i^n \exp(-r_a(w)w_i) \right)^{-\frac{1}{r_a(w)}} \right\}$$

The analysis here will focus on the impact of changes in the rice provisions relative to the PLC Program and its impact on grower net returns. Estimated certainty equivalent values for alternative rental arrangement alternatives will be plotted, with comparisons made regarding which specific rental arrangement choices dominate other choices.

This risk management analysis will be compared and contrasted with two other risk measure analyses: Mean-Variance and Value at Risk. Mean-Variance was developed by Markovitz as portfolio risk management tool early in the fifties of the last century. It is based on the idea that the mean is “good” and variation is “bad”. In this kind of analysis an alternative A is preferred to an alternative B if it has a smaller variance (or equivalently a smaller standard deviation) and its mean is at most equal to the mean of alternative B. A is also preferred to B if it has a larger mean and its variance(or equivalently the standard deviation) is at most equal to the variance of B. If one alternative has a smaller variance (or equivalently a smaller standard deviation), but its mean is less than the other alternative mean the Mean –Variance has no discriminatory power. The inefficient set of alternatives is the set that contains all alternatives that are dominated by at least another alternative. The efficient set is the set of all the alternatives that are dominated by no other alternative.

Another risk management, whose roots can be traced back to Mean –Variance approach, and is widely used by the financial institutions is the value at risk (VaR). It was developed by J. P. Morgan in 1993. Philippe Jorion defined (VaR) as:

...the worst loss over a target horizon with a given level of confidence. More formally, VAR describes the *quantile* of the projected distribution of gains and losses over the target horizon. If  $c$  is the selected confidence level, VAR correspond to  $1-c$  lower tail level. For instance, with a 95 percent confidence level, VAR should be such that it exceeds 5 percent of the total number of observations in the distribution. (Jorion , 2001 p.22)

In Value at Risk analysis, estimated net return values for alternative decision choices are compared at a specific probability of occurrence level. These comparisons are generally evaluated in terms of determining net return values at which the probability of incurring a net return lower than that amount is relatively small.

## **CHAPTER 2. EQUITABLE RICE RENTAL ARRANGEMENT SPECIFICATION**

Land is a predominant factor of production required in any production business and it is even more so in the agricultural sector. To produce an agricultural commodity an operator needs a portion of land that is securely available for the duration of the production cycle. This portion of land has to be either owned or leased from another source. Using the terminology of the U.S. Census of Agriculture, full owner is defined as an operator who owns all the land he uses. A tenant uses a land that is completely leased from another owner. A part owner owns some of the land that is used and rent the rest from another owner. According to Barry et al.(2000), ownership is more common in the fruit and vegetable sector, while leasehold is more prevalent in the grain and cotton sector. Tenant and landowners are usually bound by a lease contract that stipulate their rental arrangement details. In this chapter, rental arrangements are examined and specified to make them equitable to both parties.

### **2.1 Definition of Equitable Crop Rental Arrangements**

Land rental arrangements associated with the production of agricultural crop commodities can be grouped into two basic types: cash rent and share rent. The cash rent situation is where the tenant producer pays a fixed dollar amount per acre to the landlord for the use of the land. In this case, the tenant producer generally pays all crop production expenses, although some production expenses may be shared. The share rent situation is where the tenant producer pays the landlord a share (percentage) of the crop proceeds for the use of the land. In this case, the landlord generally does pay a portion of some production expenses. Both types of crop rental arrangements have advantages and disadvantages which may favor one type of rental arrangement over the other in a given situation. The degree of price and production risk assumed by each party under a cash or share rental arrangement is probably one of the most important

criteria to be considered when negotiating a crop land lease. Under a cash rental arrangement, the tenant producer pays all production costs and assumed all of the income risk associated with production of the crop. Under a share rental arrangement, the tenant producer and the landlord share in the risk of the crop, sharing production expenses as well as crop proceeds.

One important aspect of both cash and share crop land rental arrangements is related to the fairness and equity of the agreement to both parties. For both types of rental arrangements, an equitable rental arrangement is one in which crop proceeds are shared in roughly the same proportion as total production costs are shared. In cash rent situations, the cash rent amount paid per acre is a function of the productivity of the land, but there are some approaches which can be used to determine a fair and equitable cash rent amount. Two approaches which are commonly used to determine a fair cash rent value are based on landowner costs, in which the cash rent paid would cover any land costs by the land owner, or crop share equivalent, in which a fixed dollar amount based on a crop share equivalent less some risk premium amount is used (Kay, Edwards, Duffy, 2004). In addition, cash rental arrangements can also be negotiated as a flexible cash rent, whereby rather than the cash rent being a fixed dollar amount per acre, the rate can be adjusted to a different dollar per acre value based on the level of the market price or crop yield or the cash rent will be paid based on a fixed market price or fixed crop yield (Edwards, 2008; Edwards, 2013).

An equitable crop share rental arrangement is a rental arrangement in which all costs of production are shared in the same or almost the same proportions as the proportions of the sharing of the crop proceeds from production between the landlord and the tenant. Some of the costs are supplied for exclusively by one of the parties and some of them are shared by the parties. The shared costs may include: custom application, drying, seed, fuel, fertilizers,

chemicals, and custom haul. For example, in a 60-40 rental arrangement the tenant pays 60% of the total costs and receives 60% of the crop proceeds, and the landowner pays 40% of these total costs and receives 40% of the crop proceeds.

## **2.2 Typical Rice Rental Arrangements in Louisiana**

Rental arrangements associated with rice production in Louisiana have historically been dominated by crop share arrangements, with a small portion of leases negotiated on a cash rent basis. Being an irrigated crop, land owners, in addition to providing the land for rice production, have also traditionally provided the source of water for rice irrigation. For rice production with irrigation water sources from deep wells, the land owner would generally be responsible for providing the well, pump and power unit required to provide irrigation water to the rice field. In many cases the land owner would also pay the variable fuel costs associated with pumping the water onto the field. As electric irrigation pumping systems have increased in use, rental arrangements have adjusted to reflect the changes in fixed and variable irrigation costs. In addition, the tremendous increase in rice production costs per acre over the past several years has also resulted in adjustments to rental arrangements in an effort to share crop proceeds on a more equitable basis.

According to Salassi and Deliberto (2008), the most common rice rental arrangements in Louisiana are the 80/20 rental arrangements (31.4%), the 60/40 rental arrangements (17.4%), and the 70/30 rental arrangements (9.6%) based on a survey of rice producers in the state. Together these rice rental arrangements represent almost two thirds of the arrangements of the survey respondents. The survey also indicated that the share of irrigation pumping costs paid by landowners varied over the range of crop share alternative arrangements. In the 60/40 rice rental arrangements, 98.3% of the survey respondents indicated that the land owner paid all irrigation

pumping costs. The land owner paid all irrigation pumping costs in 71.9% of the 70/30 crop share rental arrangements. However, for the 80/20 crop share arrangements, only 23.8% of the leases reported land owners paying irrigation pumping costs. In the 60/40 arrangement the survey found that on average 36.1 percent of fertilizer, 36 percent of chemicals, and 39.2 percent of drying were paid by the landlord but only 20.3 percent of the seed costs. This indicates that at least for this rice rental arrangement and for fertilizer, chemicals and drying the landlord is paying on average a share that is close to the 40 percent that he is supposed to pay in an equitable rental arrangement.

### **2.3 Specification of Equitable Base Rice Rental Arrangements**

For purposes of this analysis, six base alternative rice rental arrangements were specified. Three of the base arrangements were forms of cash rent and three of the arrangements were forms of share rent. The three alternative cash rental arrangements were specified as follows:

- Fixed dollar – land rent is a fixed dollar amount of \$80 per acre
- Fixed price – land rent is a fixed price of \$1.20 per cwt. times the actual rice yield
- Fixed yield – land rent is equal to the market price times a fixed yield of 6.8 cwt. per acre

The three crop share rental arrangements evaluated in this study were specified as follows:

- 60/40 – land rent is equal to 40% of the crop proceeds
- 70/30 – land rent is equal to 30% of the crop proceeds
- 80/20 – land rent is equal to 20% of the crop proceeds

For the base cash rental arrangements, rental rate parameters were selected based on observed data for common cash rental agreements for rice production. The fixed dollar cash rental rate of \$80 per planted acre was chosen as a representative cash rental rate for rice land. The fixed price cash rate of \$1.20 per cwt. was chosen to represent 10% of an expected rice

market price of \$12.00 per cwt. The fixed yield cash rate of 6.8 cwt. per acre was chosen to represent 10% of an expected rice yield of 68.4 cwt. per acre. Under these three cash rental arrangement alternatives, the tenant producer would pay 100% of all variable production costs including irrigation pumping costs. The tenant would also pay all fixed costs associated with farm machinery and equipment. The land owner would pay 100% of all fixed costs on irrigation equipment as well as any property taxes on the land itself. Under these cash rental arrangements, the tenant would receive 100% of crop proceeds and the land owner would only receive cash rental payments for providing land as specified above. For all three base cash rental arrangements, a \$40 per acre management charge was included to represent the cost of management, based on an assumed management charge approximately equal to 5% of expected revenue. Production cost shares paid by tenant and land owner for the three base cash rent arrangements are shown in Tables 2.1 – 2.3. This study utilized 2014 estimated rice production costs for drill planted Clearfield rice production (Salassi, Deliberto, and Hilbun, 2014).

For the base share rental arrangements, rental rate parameters were selected to represent three equitable crop share arrangements in which the tenant and land owner are sharing crop proceeds in a manner which closely matches the share of total production input costs provided by each party. All inputs provided to the rice production enterprise were valued including both variable and fixed cost components. Similar to the cash rent specifications, all three base share rental arrangements included a \$40 per acre management charge, based on an assumed value of management approximately equal to 5% of expected revenue.

Table 2.1 – Production Cost Share, Rice First Crop, Fixed Dollar Cash Rental Arrangement

Cost Item	Total First Rice Crop Production Costs					
	<u>Total Costs</u>		<u>Tenant Costs<sup>1</sup></u>		<u>Landlord Costs<sup>2</sup></u>	
	(\$/acre)	(%)	(\$/acre)	(%)	(\$/acre)	(%)
Custom Spray	32.80	3.9	32.80	3.9	--	--
Drying	67.50	8.1	67.50	8.1	--	--
Fertilizer	107.20	12.8	107.20	12.8	--	--
Chemicals	92.96	11.1	92.96	11.1	--	--
Irrigation Supplies	3.65	0.4	3.65	0.4	--	--
Seed	74.25	8.9	74.25	8.9	--	--
Custom fert appl	26.60	3.2	26.60	3.2	--	--
Custom haul	20.40	2.4	20.40	2.4	--	--
Field labor	15.07	1.8	15.07	1.8	--	--
Fuel – field operations	31.16	3.7	31.16	3.7	--	--
Fuel – irrigation	120.00	14.3	120.00	14.3	--	--
Repairs – equip.	20.75	2.5	20.75	2.5	--	--
Repairs – irrg equip.	3.61	0.4	3.61	0.4	--	--
Interest oper. cap.	11.30	1.4	11.30	1.3	--	--
Fixed cost – equip.	48.68	5.8	48.68	5.8	--	--
Fixed cost – irrg. equip.	32.74	3.9	--	--	32.74	3.9
Management	40.00	4.8	40.00	4.8	--	--
Cash rent	80.00	9.9	80.00	9.9	--	--
Property tax	6.00	0.7	--	--	6.00	0.7
	-----	-----	-----	-----	-----	-----
Total	834.67	100.0	795.93	95.4	38.74	4.6

<sup>1</sup> Tenant pays 100% of variable costs of fertilization, chemical (herbicide and insecticide), hauling and drying; seed, irrigation supplies, field labor, field operation fuel and repair, and fixed field equipment cost, as well as 100% of variable irrigation pumping costs. A \$40 per acre management charge is also charged to the tenant. Tenant also pays a fixed \$80 per acre cash rent.

<sup>2</sup> Landlord pays 100% of fixed irrigation costs and property taxes.

Table 2.2 – Production Cost Share, Rice First Crop, Fixed Price Cash Rental Arrangement

Cost Item	Total First Rice Crop Production Costs					
	Total Costs		Tenant Costs <sup>1</sup>		Landlord Costs <sup>2</sup>	
	(\$/acre)	(%)	(\$/acre)	(%)	(\$/acre)	(%)
Custom Spray	32.80	3.9	32.80	3.9	--	--
Drying	67.50	8.1	67.50	8.1	--	--
Fertilizer	107.20	12.8	107.20	12.8	--	--
Chemicals	92.96	11.1	92.96	11.1	--	--
Irrigation Supplies	3.65	0.4	3.65	0.4	--	--
Seed	74.25	8.9	74.25	8.9	--	--
Custom fert appl	26.60	3.2	26.60	3.2	--	--
Custom haul	20.40	2.4	20.40	2.4	--	--
Field labor	15.07	1.8	15.07	1.8	--	--
Fuel – field operations	31.16	3.7	31.16	3.7	--	--
Fuel – irrigation	120.00	14.3	120.00	14.3	--	--
Repairs – equip.	20.75	2.5	20.75	2.5	--	--
Repairs – irr. equip.	3.61	0.4	3.61	0.4	--	--
Interest oper. cap.	11.30	1.4	11.30	1.3	--	--
Fixed cost – equip.	48.68	5.8	48.68	5.8	--	--
Fixed cost – irr. equip.	32.74	3.9	--	--	32.74	3.9
Management	40.00	4.8	40.00	4.8	--	--
Cash rent	82.08	9.9	82.08	9.9	--	--
Property tax	6.00	0.7	--	--	6.00	0.7
Total	836.75	100.0	798.01	95.4	38.74	4.6

<sup>1</sup> Tenant pays 100% of variable costs of fertilization, chemical (herbicide and insecticide), hauling and drying; seed, irrigation supplies, field labor, field operation fuel and repair, and fixed field equipment cost, as well as 100% of variable irrigation pumping costs. A \$40 per acre management charge is also charged to the tenant. Tenant also pays a fixed cash rent price of \$1.20 cwt. per acre on actual production yield.

<sup>2</sup> Landlord pays 100% of fixed irrigation costs and property taxes.

Table 2.3 – Production Cost Share, Rice First Crop, Fixed Yield Cash Rental Arrangement

Cost Item	Total First Rice Crop Production Costs					
	Total Costs		Tenant Costs <sup>1</sup>		Landlord Costs <sup>2</sup>	
	(\$/acre)	(%)	(\$/acre)	(%)	(\$/acre)	(%)
Custom Spray	32.80	3.9	32.80	3.9	--	--
Drying	67.50	8.1	67.50	8.1	--	--
Fertilizer	107.20	12.8	107.20	12.8	--	--
Chemicals	92.96	11.1	92.96	11.1	--	--
Irrigation Supplies	3.65	0.4	3.65	0.4	--	--
Seed	74.25	8.9	74.25	8.9	--	--
Custom fert appl	26.60	3.2	26.60	3.2	--	--
Custom haul	20.40	2.4	20.40	2.4	--	--
Field labor	15.07	1.8	15.07	1.8	--	--
Fuel – field operations	31.16	3.7	31.16	3.7	--	--
Fuel – irrigation	120.00	14.3	120.00	14.3	--	--
Repairs – equip.	20.75	2.5	20.75	2.5	--	--
Repairs – irr. equip.	3.61	0.4	3.61	0.4	--	--
Interest oper. cap.	11.30	1.4	11.30	1.3	--	--
Fixed cost – equip.	48.68	5.8	48.68	5.8	--	--
Fixed cost – irr. equip.	32.74	3.9	--	--	32.74	3.9
Management	40.00	4.8	40.00	4.8	--	--
Cash rent	82.82	9.9	80.00	9.9	--	--
Property tax	6.00	0.7	--	--	6.00	0.7
Total	837.49	100.0	798.75	95.4	38.74	4.6

<sup>1</sup> Tenant pays 100% of variable costs of fertilization, chemical (herbicide and insecticide),

hauling and drying; seed, irrigation supplies, field labor, field operation fuel and repair, and

fixed field equipment cost, as well as 100% of variable irrigation pumping costs. A \$40 per

acre management charge is also charged to the tenant. Tenant also pays a fixed cash rent yield

of 6.80 cwt. per acre on actual market price received.

<sup>2</sup> Landlord pays 100% of fixed irrigation costs and property taxes.

For the 60/40 crop share rental arrangement, the tenant and land owner share crop proceeds on a 60% (tenant) and 40% (land owner) basis. Under this arrangement, the tenant pays 60% of rice first crop variable costs for fertilization, chemical (herbicide and insecticide), hauling and drying, 100% of rice first crop variable costs for seed, irrigation supplies, field labor, field operation fuel and repair, and fixed field equipment cost. The landlord pays 40% of rice first crop variable costs of fertilization, chemical (herbicide and insecticide), hauling and drying and 100% of irrigation pumping costs, fixed irrigation costs and property taxes. Production cost shares paid by tenant and land owner for the base 60/40 share rent arrangement is shown in Table 2.4.

For the 70/30 crop share rental arrangement, the tenant and land owner share crop proceeds on a 70% (tenant) and 30% (land owner) basis. Under this arrangement, the tenant pays 70% of rice first crop variable costs for fertilization, chemical (herbicide and insecticide), hauling and drying, 100% of rice first crop variable costs for seed, irrigation supplies, field labor, field operation fuel and repair, and fixed field equipment cost. The landlord pays 30% of rice first crop variable costs of fertilization, chemical (herbicide and insecticide), hauling and drying and 100% of irrigation pumping costs, fixed irrigation costs and property taxes. Production cost shares paid by tenant and land owner for the base 70/30 share rent arrangement is shown in Table 2.5.

For the 80/20 crop share rental arrangement, the tenant and land owner share crop proceeds on an 80% (tenant) and 20% (land owner) basis. Under this arrangement, the tenant pays 80% of rice first crop variable costs for fertilization, chemical (herbicide and insecticide), hauling and drying, 100% of rice first crop variable costs for seed, irrigation supplies, field labor, field operation fuel and repair, and fixed field equipment cost.

Table 2.4 – Production Cost Share, Rice First Crop, 60/40 Crop Share Rental Arrangement

Cost Item	Total First Rice Crop Production Costs					
	<u>Total Costs</u>		<u>Tenant Costs<sup>1</sup></u>		<u>Landlord Costs<sup>2</sup></u>	
	(\$/acre)	(%)	(\$/acre)	(%)	(\$/acre)	(%)
Custom Spray	32.80	4.3	19.68	2.6	13.12	1.7
Drying	67.50	8.9	40.50	5.4	27.00	3.6
Fertilizer	107.20	14.2	64.32	8.5	42.88	5.7
Chemicals	92.96	12.3	55.78	7.4	37.18	4.9
Irrigation Supplies	3.65	0.5	3.65	0.5	--	--
Seed	74.25	9.8	74.25	9.8	--	--
Custom fert appl	26.60	3.5	15.96	2.1	10.64	1.4
Custom haul	20.40	2.7	12.24	1.6	8.16	1.1
Field labor	15.07	2.0	15.07	2.0	--	--
Fuel – field operations	31.16	4.1	31.16	4.1	--	--
Fuel – irrigation	120.00	15.9	--	--	120.00	15.9
Repairs – equip.	20.75	2.7	20.75	2.7	--	--
Repairs – irrg equip.	3.61	0.5	--	--	3.61	0.5
Interest oper. cap.	11.30	1.5	11.30	1.5	--	--
Fixed cost – equip.	48.68	6.5	48.68	6.5	--	--
Fixed cost – irrg. equip.	32.74	4.3	--	--	32.74	4.3
Management	40.00	5.3	40.00	5.3	--	--
Property tax	6.00	0.8	--	--	6.00	0.8
Total	754.67	100.0	453.34	60.1	301.33	39.9

<sup>1</sup> Tenant pays 60% of variable costs of fertilization, chemical (herbicide and insecticide), hauling and drying; 100% of variable costs for seed, irrigation supplies, field labor, field operation fuel and repair, and fixed field equipment cost. A \$40 per acre management charge is also charged to the tenant.

<sup>2</sup> Landlord pays 40% of variable costs of fertilization, chemical (herbicide and insecticide), hauling and drying; 100% of irrigation pumping costs, fixed irrigation costs and property taxes.

Table 2.5 – Production Cost Share, Rice First Crop, 70/30 Crop Share Rental Arrangement

Cost Item	Total First Rice Crop Production Costs					
	<u>Total Costs</u>		<u>Tenant Costs<sup>1</sup></u>		<u>Landlord Costs<sup>2</sup></u>	
	(\$/acre)	(%)	(\$/acre)	(%)	(\$/acre)	(%)
Custom Spray	32.80	4.3	32.80	4.3	--	--
Drying	67.50	8.9	47.25	6.3	20.25	2.7
Fertilizer	107.20	14.2	75.04	9.9	32.16	4.3
Chemicals	92.96	12.3	92.96	12.3	--	--
Irrigation Supplies	3.65	0.5	3.65	0.5	--	--
Seed	74.25	9.8	74.25	9.8	--	--
Custom fert appl	26.60	3.5	18.62	2.5	7.98	1.1
Custom haul	20.40	2.7	14.28	1.9	6.12	0.8
Field labor	15.07	2.0	15.07	2.0	--	--
Fuel – field operations	31.16	4.1	31.16	4.1	--	--
Fuel – irrigation	120.00	15.9	--	--	120.00	15.9
Repairs – equip.	20.75	2.7	20.75	2.7	--	--
Repairs – irrg equip.	3.61	0.5	--	--	3.61	0.5
Interest oper. cap.	11.30	1.5	11.30	1.5	--	--
Fixed cost – equip.	48.68	6.5	48.68	6.5	--	--
Fixed cost – irrg. equip.	32.74	4.3	--	--	32.74	4.3
Management	40.00	5.3	40.00	5.3	--	--
Property tax	6.00	0.8	--	--	6.00	1.8
Total	754.67	100.0	525.81	69.7	228.86	30.3

<sup>1</sup> Tenant pays 70% of variable costs of fertilization, hauling and dryings; 100% of variable costs of seed, chemical (herbicide and insecticide), irrigation supplies, field labor, field operation fuel and repairs, and fixed field equipment cost. A \$40 per acre management charge is also charged to the tenant.

<sup>2</sup> Landlord pays 30% of variable costs of fertilization, hauling and drying; 100% of irrigation pumping costs, fixed irrigation costs and property taxes.

The landlord pays 20% of rice first crop variable costs of fertilization, chemical (herbicide and insecticide), hauling and drying and 100% of irrigation pumping co Production cost shares paid by tenant and land owner for the base 80/20 share rent arrangement is shown in Table 2.6.

sts, fixed irrigation costs and property taxes.

Over the past few years, approximately 38% of the rice acreage in Acadia Parish, Louisiana has been kept in production for a ratoon or second crop. Accordingly, ratoon crop production was included in the analysis on prorated share of 38% for both yield and production cost. For cash rental arrangements, the tenant was specified to pay 100% of all ratoon crop variable production cost. For crop share rental arrangements, variable costs associated with ratoon crop production were split as specified above for the first crop, with the exception of variable irrigation pumping costs. In order to maintain equitability in the specified share rental arrangements, it was required for the tenant to pay a portion of the ratoon crop variable irrigation cost. As a result, the portion of variable irrigation pumping cost paid by the tenant for the 60/40, 70/30 and 80/20 crop share arrangements was specified as 10%, 35%, and 55%, respectively. Production cost shares paid by the tenant and land owner for ratoon crop production for the six base rental arrangements are shown in Tables 2.7 - 2.12.

## **2.4 Specification of Flexible Adjustments to Base Rice Rental Arrangements**

Flexible cash or share crop rental arrangements represent a commonly utilized approach to reduce the probability of negative net returns to the tenant producer in years of low crop yields and/or low market prices. It is more commonly used in association with cash rents, as cash rents are fixed by definition. For this study, flexible adjustments to the base specified rental rates for rice production were evaluated for each of the six base cash and share rental arrangements.

Table 2.6 – Production Cost Share, Rice First Crop, 80/20 Crop Share Rental Arrangement

Cost Item	Total First Rice Crop Production Costs					
	<u>Total Costs</u>		<u>Tenant Costs<sup>1</sup></u>		<u>Landlord Costs<sup>2</sup></u>	
	(\$/acre)	(%)	(\$/acre)	(%)	(\$/acre)	(%)
Custom Spray	32.80	4.3	32.80	4.3	--	--
Drying	67.50	8.9	67.50	8.9	--	--
Fertilizer	107.20	14.2	107.20	14.2	--	--
Chemicals	92.96	12.3	92.96	12.3	--	--
Irrigation Supplies	3.65	0.5	3.65	0.5	--	--
Seed	74.25	9.8	74.25	9.8	--	--
Custom fert appl	26.60	3.5	26.60	3.5	--	--
Custom haul	20.40	2.7	20.40	2.7	--	--
Field labor	15.07	2.0	15.07	2.0	--	--
Fuel – field operations	31.16	4.1	31.16	4.1	--	--
Fuel – irrigation	120.00	15.9	--	--	120.00	15.9
Repairs – equip.	20.75	2.7	20.75	2.7	--	--
Repairs – irr. equip.	3.61	0.5	3.61	0.5	--	--
Interest oper. cap.	11.30	1.5	11.30	1.5	--	--
Fixed cost – equip.	48.68	6.5	48.68	6.5	--	--
Fixed cost – irr. equip.	32.74	4.3	--	--	32.74	4.3
Management	40.00	5.3	40.00	5.3	--	--
Property tax	6.00	0.8	--	--	6.00	0.8
	-----	-----	-----	-----	-----	-----
Total	754.67	100.0	595.93	79.0	158.74	21.0

<sup>1</sup> Tenant pays 100% of variable costs of fertilization, chemical (herbicide and insecticide),

hauling, drying, seed, irrigation supplies, field labor, field operation fuel and repairs, and fixed field equipment cost. A \$40 per acre management charge is also charged to the tenant.

<sup>2</sup> Landlord pays 30% of variable costs of fertilization, hauling and drying; 100% of irrigation pumping costs, fixed irrigation costs and property taxes.

Table 2.7 – Production Cost Share, Rice Ratoon Crop, Fixed Dollar Cash Rental Arrangement

Cost Item	Total Rice Ratoon Crop Production Costs <sup>1</sup>					
	<u>Total Costs</u>		<u>Tenant Costs</u> <sup>2</sup>		<u>Landlord Costs</u> <sup>3</sup>	
	(\$/acre)	(%)	(\$/acre)	(%)	(\$/acre)	(%)
Custom Spray	0.13	0.2	0.13	0.2	--	--
Drying	8.21	13.2	8.21	13.2	--	--
Fertilizer	10.45	16.8	10.45	16.8	--	--
Chemicals	--	--	--	--	--	--
Irrigation Supplies	--	--	--	--	--	--
Seed	--	--	--	--	--	--
Custom fert appl	3.19	5.1	3.19	5.1	--	--
Custom haul	2.51	4.0	2.51	4.0	--	--
Field labor	2.66	4.3	2.66	4.3	--	--
Fuel – field operations	4.03	6.5	4.03	6.5	--	--
Fuel – irrigation	16.72	26.9	16.72	26.9	--	--
Repairs – equip.	5.22	8.4	5.22	8.4	--	--
Repairs – irrg equip.	--	--	--	--	--	--
Interest oper. cap.	0.71	1.1	0.71	1.1	--	--
Fixed cost – equip.	8.27	13.3	8.27	13.3	--	--
Fixed cost – irrg. equip.	--	--	--	--	--	--
Management	--	--	--	--	--	--
Property tax	--	--	--	--	--	--
Total	62.11	100.0	62.11	100.0	0.00	0.0

<sup>1</sup> Prorated costs per acre for a 38% ratoon crop acreage production.

<sup>2</sup> Tenant pays 100% of variable costs of fertilization, hauling and drying; 100% of variable costs for irrigation supplies, field labor, field operation fuel and repairs. Tenant also pays 100% of irrigation pumping cost.

<sup>3</sup> Landlord pays no variable costs charged to the ratoon crop.

Table 2.8 – Production Cost Share, Rice Ratoon Crop, Fixed Price Cash Rental Arrangement

Cost Item	Total Rice Ratoon Crop Production Costs <sup>1</sup>					
	<u>Total Costs</u>		<u>Tenant Costs</u> <sup>2</sup>		<u>Landlord Costs</u> <sup>3</sup>	
	(\$/acre)	(%)	(\$/acre)	(%)	(\$/acre)	(%)
Custom Spray	0.13	0.2	0.13	0.2	--	--
Drying	8.21	13.2	8.21	13.2	--	--
Fertilizer	10.45	16.8	10.45	16.8	--	--
Chemicals	--	--	--	--	--	--
Irrigation Supplies	--	--	--	--	--	--
Seed	--	--	--	--	--	--
Custom fert appl	3.19	5.1	3.19	5.1	--	--
Custom haul	2.51	4.0	2.51	4.0	--	--
Field labor	2.66	4.3	2.66	4.3	--	--
Fuel – field operations	4.03	6.5	4.03	6.5	--	--
Fuel – irrigation	16.72	26.9	16.72	26.9	--	--
Repairs – equip.	5.22	8.4	5.22	8.4	--	--
Repairs – irrg equip.	--	--	--	--	--	--
Interest oper. cap.	0.71	1.1	0.71	1.1	--	--
Fixed cost – equip.	8.27	13.3	8.27	13.3	--	--
Fixed cost – irrg. equip.	--	--	--	--	--	--
Management	--	--	--	--	--	--
Property tax	--	--	--	--	--	--
Total	62.11	100.0	62.11	100.0	0.00	0.0

<sup>1</sup> Prorated costs per acre for a 38% ratoon crop acreage production.

<sup>2</sup> Tenant pays 100% of variable costs of fertilization, hauling and drying; 100% of variable costs for irrigation supplies, field labor, field operation fuel and repairs. Tenant also pays 100% of irrigation pumping cost.

<sup>3</sup> Landlord pays no variable costs charged to the ratoon crop.

Table 2.9 – Production Cost Share, Rice Ratoon Crop, Fixed Yield Cash Rental Arrangement

Cost Item	Total Rice Ratoon Crop Production Costs <sup>1</sup>					
	<u>Total Costs</u>		<u>Tenant Costs</u> <sup>2</sup>		<u>Landlord Costs</u> <sup>3</sup>	
	(\$/acre)	(%)	(\$/acre)	(%)	(\$/acre)	(%)
Custom Spray	0.13	0.2	0.13	0.2	--	--
Drying	8.21	13.2	8.21	13.2	--	--
Fertilizer	10.45	16.8	10.45	16.8	--	--
Chemicals	--	--	--	--	--	--
Irrigation Supplies	--	--	--	--	--	--
Seed	--	--	--	--	--	--
Custom fert appl	3.19	5.1	3.19	5.1	--	--
Custom haul	2.51	4.0	2.51	4.0	--	--
Field labor	2.66	4.3	2.66	4.3	--	--
Fuel – field operations	4.03	6.5	4.03	6.5	--	--
Fuel – irrigation	16.72	26.9	16.72	26.9	--	--
Repairs – equip.	5.22	8.4	5.22	8.4	--	--
Repairs – irrg equip.	--	--	--	--	--	--
Interest oper. cap.	0.71	1.1	0.71	1.1	--	--
Fixed cost – equip.	8.27	13.3	8.27	13.3	--	--
Fixed cost – irrg. equip.	--	--	--	--	--	--
Management	--	--	--	--	--	--
Property tax	--	--	--	--	--	--
Total	62.11	100.0	62.11	100.0	0.00	0.0

<sup>1</sup> Prorated costs per acre for a 38% ratoon crop acreage production.

<sup>2</sup> Tenant pays 100% of variable costs of fertilization, hauling and drying; 100% of variable costs for irrigation supplies, field labor, field operation fuel and repairs. Tenant also pays 100% of irrigation pumping cost.

<sup>3</sup> Landlord pays no variable costs charged to the ratoon crop.

Table 2.10 – Production Cost Share, Rice Crop, 60/40 Crop Share Rental Arrangement

Cost Item	Total Rice Ratoon Crop Production Costs <sup>1</sup>					
	Total Costs		Tenant Costs <sup>2</sup>		Landlord Costs <sup>3</sup>	
	(\$/acre)	(%)	(\$/acre)	(%)	(\$/acre)	(%)
Custom Spray	0.13	0.2	0.08	0.1	0.05	0.1
Drying	8.21	13.2	4.92	7.9	3.28	5.3
Fertilizer	10.45	16.8	6.27	10.1	4.18	6.7
Chemicals	--	--	--	--	--	--
Irrigation Supplies	--	--	--	--	--	--
Seed	--	--	--	--	--	--
Custom fert appl	3.19	5.1	1.92	3.1	1.28	2.1
Custom haul	2.51	4.0	1.50	2.4	1.00	1.6
Field labor	2.66	4.3	2.66	4.3	--	--
Fuel – field operations	4.03	6.5	4.03	6.5	--	--
Fuel – irrigation	16.72	26.9	1.67	2.7	15.05	24.2
Repairs – equip.	5.22	8.4	5.22	8.4	--	--
Repairs – irrg equip.	--	--	--	--	--	--
Interest oper. cap.	0.71	1.1	0.71	1.1	--	--
Fixed cost – equip.	8.27	13.3	8.27	13.3	--	--
Fixed cost – irrg. equip.	--	--	--	--	--	--
Management	--	--	--	--	--	--
Property tax	--	--	--	--	--	--
Total	62.11	100.0	37.26	60.0	24.84	40.0

<sup>1</sup> Prorated costs per acre for a 38% ratoon crop acreage production.

<sup>2</sup> Tenant pays 60% of variable costs of fertilization, hauling and drying; 100% of variable costs for irrigation supplies, field labor, field operation fuel and repairs. Tenant also pays 10% of irrigation pumping cost.

<sup>3</sup> Landlord pays 40% of variable costs of fertilization, hauling and drying; 90% of irrigation pumping costs.

Table 2.11 – Production Cost Share, Rice Ratoon Crop, 70/30 Crop Share Rental Arrangement  
Total Rice Ratoon Crop Production Costs <sup>1</sup>

Cost Item	Total Costs		Tenant Costs <sup>2</sup>		Landlord Costs <sup>3</sup>	
	(\$/acre)	(%)	(\$/acre)	(%)	(\$/acre)	(%)
Custom Spray	0.13	0.2	0.09	0.1	0.04	0.1
Drying	8.21	13.2	5.75	9.3	2.46	4.0
Fertilizer	10.45	16.8	7.32	11.8	3.14	5.0
Chemicals	--	--	--	--	--	--
Irrigation Supplies	--	--	--	--	--	--
Seed	--	--	--	--	--	--
Custom fert appl	3.19	5.1	2.23	3.6	0.96	1.5
Custom haul	2.51	4.0	1.76	2.8	0.75	1.2
Field labor	2.66	4.3	2.66	4.3	--	--
Fuel – field operations	4.03	6.5	4.03	6.5	--	--
Fuel – irrigation	16.72	26.9	5.85	9.4	10.87	17.5
Repairs – equip.	5.22	8.4	5.22	8.4	--	--
Repairs – irrg equip.	--	--	--	--	--	--
Interest oper. cap.	0.71	1.1	0.71	1.1	--	--
Fixed cost – equip.	8.27	13.3	8.27	13.3	--	--
Fixed cost – irrg. equip.	--	--	--	--	--	--
Management	--	--	--	--	--	--
Property tax	--	--	--	--	--	--
Total	62.11	100.0	43.89	70.7	18.22	29.3

<sup>1</sup> Prorated costs per acre for a 38% ratoon crop acreage production.

<sup>2</sup> Tenant pays 70% of variable costs of fertilization, hauling and drying; 100% of variable costs for irrigation supplies, field labor, field operation fuel and repairs. Tenant also pays 35% of irrigation pumping cost.

<sup>3</sup> Landlord pays 30% of variable costs of fertilization, hauling and drying; 65% of irrigation pumping costs.

Table 2.12 – Production Cost Share, Rice Ratoon Crop, 80/20 Crop Share Rental Arrangement

Cost Item	Total Rice Ratoon Crop Production Costs <sup>1</sup>					
	<u>Total Costs</u>		<u>Tenant Costs</u> <sup>2</sup>		<u>Landlord Costs</u> <sup>3</sup>	
	(\$/acre)	(%)	(\$/acre)	(%)	(\$/acre)	(%)
Custom Spray	0.13	0.2	0.11	0.2	0.03	0.0
Drying	8.21	13.2	6.57	10.6	1.64	2.6
Fertilizer	10.45	16.8	8.36	13.5	2.09	3.4
Chemicals	--	--	--	--	--	--
Irrigation Supplies	--	--	--	--	--	--
Seed	--	--	--	--	--	--
Custom fert appl	3.19	5.1	2.55	4.1	0.64	1.0
Custom haul	2.51	4.0	2.01	3.2	0.50	0.8
Field labor	2.66	4.3	2.66	4.3	--	--
Fuel – field operations	4.03	6.5	4.03	6.5	--	--
Fuel – irrigation	16.72	26.9	9.20	14.8	7.52	12.1
Repairs – equip.	5.22	8.4	5.22	8.4	--	--
Repairs – irr g equip.	--	--	--	--	--	--
Interest oper. cap.	0.71	1.1	0.71	1.1	--	--
Fixed cost – equip.	8.27	13.3	8.27	13.3	--	--
Fixed cost – irr g. equip.	--	--	--	--	--	--
Management	--	--	--	--	--	--
Property tax	--	--	--	--	--	--
Total	62.11	100.0	49.69	80.0	12.42	20.0

<sup>1</sup> Prorated costs per acre for a 38% ratoon crop acreage production.

<sup>2</sup> Tenant pays 80% of variable costs of fertilization, hauling and drying; 100% of variable costs for irrigation supplies, field labor, field operation fuel and repairs. Tenant also pays 55% of irrigation pumping cost.

<sup>3</sup> Landlord pays 20% of variable costs of fertilization, hauling and drying; 45% of irrigation pumping costs.

Flexible crop land rental rates utilize some specified yield and/or market price trigger which, if enacted, allow the rental rate to adjust to a lower specified value. For each base rice rental arrangement evaluated in this study, three flexible rental rate triggers were specified: (a.) a price trigger, (b.) a yield trigger, and (c.) a price and yield trigger. These lower price and yield triggers were set at a value equal to the expected mean price or yield minus one standard deviation. For the yield trigger, a simulated expected mean of 68.30 cwt. /acre with a standard deviation of 1.95 cwt. /acre resulted in a yield trigger of 66.35 cwt. /acre. If the actual simulated yield in a given year was less than 66.35 cwt. /acre, the flexible rent would adjust to a lower specified rate. For the price trigger, a simulated expected U.S. long grain market price of \$11.94/cwt. with a standard deviation of \$1.51/cwt. resulted in a market price trigger of \$10.42/cwt for the trended price data scenario (Scenario A).

For the untrended price data scenario (Scenario B), a simulated mean price of \$11.69/cwt. with a standard deviation of \$2.45/cwt. resulted in a market price trigger of \$9.24/cwt. If the market price of U.S. long grain rice fell below these trigger levels, the flexible rent would adjust to a lower specified rate. These lower specified rental rates were assumed to be 10% below the base rate.

Base rental rates, yield and price triggers, and flexible adjusted rental rates are shown in Tables 2.13 and 2.14 for the two market price scenarios evaluated in this study. It is important to notice that the two scenarios have the same base land rental rate per acre, the same flexible rent after the triggered adjustment, the same yield trigger values, but they have different price trigger values: \$10.42 for scenario A and \$9.24 for scenario B.

Table 2.13 – Flexible Rice Rental Rate Adjustments, Scenario A

Rice Rental Arrangement	Base Land Rental Rate per Acre	Yield Trigger and/or Price Trigger <sup>1,2</sup>	Flexible Rent after Triggered Adjustment <sup>3</sup>
Fixed dollar cash rent	\$80/acre	< 66.35 cwt./acre and/or < \$10.42/cwt.	\$60/acre
Fixed price cash rent	\$1.20/cwt.	< 66.35 cwt./acre and/or < \$10.42/cwt.	\$0.90/cwt.
Fixed yield cash rent	6.80 cwt./acre	< 66.35 cwt./acre and/or < \$10.42/cwt.	5.10 cwt./acre
Fixed dollar cash rent	40%	< 66.35 cwt./acre and/or < \$10.42/cwt.	30%
Fixed dollar cash rent	30%	< 66.35 cwt./acre and/or < \$10.42/cwt.	23%
Fixed dollar cash rent	20%	< 66.35 cwt./acre and/or < \$10.42/cwt.	15%

<sup>1</sup> Yield and price trigger is specified as equal to one standard deviation below the simulated mean of parish rice yield and U.S. long grain rice price.

<sup>2</sup> Three alternative flexible rental arrangements were evaluated for each base rental arrangement: (a.) price trigger, (b.) yield trigger and (c.) price and yield trigger.

<sup>3</sup> Rent adjustment is equal to a 10% reduction in base rental rate.

Table 2.14 – Flexible Rice Rental Rate Adjustments, Scenario B

Rice Rental Arrangement	Base Land Rental Rate per Acre	Yield Trigger and/or Price Trigger <sup>1,2</sup>	Flexible Rent after Triggered Adjustment <sup>3</sup>
Fixed dollar cash rent	\$80/acre	< 66.35 cwt./acre and/or < \$9.24/cwt.	\$60/acre
Fixed price cash rent	\$1.20/cwt.	< 66.35 cwt./acre and/or < \$9.24/cwt.	\$0.90/cwt.
Fixed yield cash rent	6.80 cwt./acre	< 66.35 cwt./acre and/or < \$9.24/cwt.	5.10 cwt./acre
Fixed dollar cash rent	40%	< 66.35 cwt./acre and/or < \$9.24/cwt.	30%
Fixed dollar cash rent	30%	< 66.35 cwt./acre and/or < \$9.24/cwt.	23%
Fixed dollar cash rent	20%	< 66.35 cwt./acre and/or < \$9.24/cwt.	15%

<sup>1</sup> Yield and price trigger is specified as equal to one standard deviation below the simulated means of parish rice yield and U.S. long grain rice price.

<sup>2</sup> Three alternative flexible rental arrangements were evaluated for each base rental arrangement: (a.) price trigger, (b.) yield trigger and (c.) price and yield trigger.

<sup>3</sup> Rent adjustment is equal to a 10% reduction in base rental rate.

## **CHAPTER 3. RICE RENTAL ARRANGMENT EVALUATION MODEL**

Chapter 2 dealt with the issue of defining and specifying an equitable rice crop rental arrangement between a landlord and a tenant in the sense that the production costs need to be divided in the same proportions as the proportions of the rental arrangement. This chapter presents the Rice Rental Arrangement Evaluation model, which is a model that evaluates net returns from rice production for alternative cash and share rental arrangements above total rice production costs over a range of simulated rice market prices, crop yields, and input prices, with participation in the Price Loss Coverage (PLC) Program option of the 2014 farm bill.

### **3.1 Farm Program Participation**

One of the major changes introduced in the 2014 Agricultural Act of 2014 is the repeal of Direct and Countercyclical Payments (DCP) and the Average Crop Revenue Election (ACRE) and their replacement by the Price Loss Coverage (PLC) and the Agricultural Risk Coverage County or Individual.

The PLC, as its name indicates, is a price support program that is paid to farmers whenever the reference price for certain commodities covered by the program is greater than the effective price. The effective price refers to the higher of the market year average (MYA) and the loan rate (LR).

$$Payment = .85 * base\ acre * payment\ yield * payment\ rate$$

The payment yield can be the same under the previous bill or updated to 90% the farm yield from 2008 to 2012.

The Agricultural Risk Coverage is a revenue support program. Eligible farmers receive payments whenever the actual payment is less than the guarantee revenue. The guarantee revenue is equal to 86% of the five year Olympic average of the parish yield times the five year

Olympic average of the market year average (MYA). The difference between the actual revenue and the guarantee is the payment rate.

$$ARC-Parish = 85\% \times \text{Payment rate} \times \text{Base acres}$$

Since rice in this region relies heavily on irrigation, there is little variation expected in yield from year to year. Therefore, decision maker are likely to choose the PLC program over the ARC- Parish program.

### 3.2 Tenant and Landlord Net Return Specification

The tenant net return above specified costs in dollar per acre is equal to his/her share of the revenue and the PLC payment less the cost in dollar per acre of the first crop and ratoon crop costs.

$$\begin{aligned} GRWNR = & [ (P_R * YD * GR_R) + (PLC * PGYD * PLTRatio * GR_{PG}) ] \\ & - [ (P_n * N * GR_n) + (P_p * P * GR_p) + (P_k * K * GR_k) \\ & + (P_f * F_{fld} * GR_f) + (P_f * F_{irg} * GR_i) + (P_d * YD * GR_d) \\ & + (OVC * GR_o) + (MFC * GR_{mfc}) + (IFC * GR_{ifc}) + CR + MGT ] \\ & - PRC * [ (P_n * N_R * GR_n) + (P_f * F_{Rfld} * GR_f) + (P_f * F_{Rirg} * GR_i) \\ & + (OVC_R * GR_o) ] \end{aligned} \quad (3.1)$$

where  $GRWNR$  = grower net returns above specified costs in dollars per acre,  $P_R$  = market price of rough rice in dollars per cwt.,  $YD$  = rough rice yield in cwt. per acre,  $GR_R$  = grower's share of market revenue,  $PLC$  = government farm program (Price Loss Coverage Program) payment in dollars per program yield,  $PGYD$  = rough rice program yield in cwt. per acre,  $PLTRatio$  = planting ratio of paid program acres to planted acres,  $GR_{PG}$  = grower's share of program payments,  $P_n$  = price of nitrogen fertilizer in dollars per pound of active ingredient,  $N$  = quantity of nitrogen fertilizer applied in pounds of active ingredient per acre,  $GR_n$  = grower's share of

nitrogen fertilizer cost,  $P_p$  = price of phosphorus fertilizer in dollars per pound of active ingredient,  $P$  = quantity of phosphorus fertilizer applied in pounds of active ingredient per acre,  $GR_p$  = grower's share of phosphorus fertilizer cost,  $P_k$  = price of potassium fertilizer in dollars per pound of active ingredient,  $K$  = quantity of potassium fertilizer applied in pounds of active ingredient per acre,  $GR$  = grower's share of potassium fertilizer cost,  $P_f$  = price of diesel fuel in dollars per gallon,  $F_{fld}$  = quantity of diesel fuel used for field operations in gallons per acre,  $GR_f$  = grower's share of field operation fuel cost,  $F_{irg}$  = quantity of diesel fuel used for irrigation in gallons per acre,  $GR_i$  = grower's share of irrigation cost,  $P_d$  = cost of drying in dollars per cwt.,  $GR_d$  = grower's share of drying cost,  $OVC$  = other variable costs in dollars per acre,  $GR_o$  = grower's share of other variable costs,  $MFC$  = machinery fixed costs in dollars per acre,  $GR_{mfc}$  = grower's share of machinery fixed costs,  $IFC$  = irrigation fixed costs in dollars per acre,  $GR_{ifc}$  = grower's share of irrigation fixed costs,  $CR$  = cash rent in dollars per acre,  $MGT$  = management charge in dollars per acre,  $PRC$  = percent of rice crop ratooned,  $N_R$  = quantity of nitrogen fertilizer applied to ratoon crop in pounds of active ingredient per acre,  $F_{Rfld}$  = quantity of diesel fuel used for field operations on ratoon crop in gallons per acre,  $F_{Rirg}$  = quantity of diesel fuel used for irrigation of ratoon crop in gallons per acre,  $OVC_R$  = other variable costs for ratoon crop.

The landlord net return above specified costs in dollar per acre is equal to his/her share of the revenue and the PLC payment less the cost in dollar per acre of the first crop and ratoon crop.

$$\begin{aligned}
 LLDNR = & \quad [ (P_R * YD * LR_R) + (PLC * PGYD * PLTRatio * LR_{PG}) + CR ] \\
 & - [ (P_n * N * LR_n) + (P_p * P * LR_p) + (P_k * K * LR_k) \\
 & + (P_f * F_{fld} * LR_f) + (P_f * F_{irg} * LR_i) + (P_d * YD * LR_d) \\
 & + (OVC * LR_o) + (MFC * LR_{mfc}) + (IFC * LR_{ifc}) + PTX ]
 \end{aligned}$$

$$\begin{aligned}
& - PRC * [ (P_n * N_R * LR_n) + (P_f * F_{Rfld} * LR_f) + (P_f * F_{Rirg} * LR_i) \\
& + (OVC_R * LR_o) ] \tag{3.2}
\end{aligned}$$

where  $LLDNR$  = landlord net returns above specified costs in dollars per acre,  $LR_R$  = landlord's share of market revenue,  $LR_{PG}$  = landlord's share of farm program payments,  $LR_n$  = landlord's share of nitrogen fertilizer cost,  $LR_p$  = landlord's share of phosphorus fertilizer cost,  $LR_k$  = landlord's share of potassium fertilizer cost,  $LR_f$  = landlord's share of field operation fuel cost,  $R_i$  = landlord's share of irrigation fuel cost,  $LR_d$  = landlord's share of drying cost,  $LR_o$  = landlord's share of other variable costs,  $LR_{mfc}$  = landlord's share of machinery fixed costs,  $LR_{ifc}$  = landlord's share of irrigation fixed costs,  $PTX$  = property taxes in dollars per acre, and all other variables are as defined in equation 31.

$$PLC = \quad \text{if } (P_R < RP) \text{ then } PLC = RP - P_R, \text{ else } PLC = 0 \tag{3.3}$$

where  $RP$  = rough rice reference price under the Price Loss Coverage Program of \$14/cwt.

### 3.3 Net Return Simulation

Net returns to the tenant and landlord were simulated over a range of random rice yields, market prices and input prices. Random values for four input prices were simulated in this analysis. These random input price values included diesel fuel ( $P_f$ ), nitrogen fertilizer ( $P_n$ ), phosphorus fertilizer ( $P_p$ ) and potassium fertilizer ( $P_k$ ). Published prices for these input price values for the years 2004-2013 were taken from crop enterprise budgets published by the Department of Agricultural Economics and Agribusiness at the Louisiana State University Agricultural Center and were used as the historical data on which the simulation of random input prices were performed. No significant trend was present in the data, therefore the historical values were not detrended prior to the simulation process. The simulation computer package Simetar (Richardson, et al., 2008) was utilized to simulate the four random input prices.

Simulation means for the randomly generated input prices were set at their previous five-year averages of \$3.48/gallon for diesel fuel, \$0.56/pound for nitrogen, \$0.65/pound for phosphorus and \$0.47/pound for potassium.

Random yields were simulated using historical yield data for Acadia Parish, Louisiana. The previous ten years of rough rice yield history from 2004-2013 were utilized in generating random rice yields used in the analysis. Yields were detrended and the simulation mean was specified as equal to the previous three-year average yield of 6,840 pounds of rough rice per acre. This yield does include a proportion of production from ratoon crop acreage. As a result, the production costs simulated in the analysis included a proportional share of ratoon crop production costs equal to the average percent of rice acres ratoon cropped in Acadia Parish over the past few years.

Two different simulations of rough rice market prices were included in the analysis. Over the previous ten-year period (2004-2013), there was a significant trend factor in the U.S. long grain market price history. This significant trend factor occurred as a result of the particular period of time chosen. Rough rice market prices were relatively low in the early years of the period and were relatively high during the later years of the period, thereby resulting in a significant trend. As a result, one rough rice market price simulation utilized detrended price data, to represent a period of relatively lower market price variation. A second rough rice market price simulation utilized untrended price data, to represent a period of relatively greater market price variation. In both cases, the mean of the U.S. long grain rice market price simulation was set equal to the previous ten-year average price of \$11.85 per cwt.

The U.S. long grain rice price was used to simulate the Price Loss Coverage farm program, as any program payments are triggered based on the U.S. market price. Market sales of

rough rice in this analysis were based on simulated values of Louisiana average rice market prices. Louisiana market prices were simulated by first estimating the price deviations between the U.S. long grain and Louisiana average rice market prices. These price deviations were then randomly simulated and the simulated price deviation added to the simulated U.S. long grain price to yield a simulated Louisiana rough rice market price.

## **CHAPTER 4. RICE RENTAL ARRANGEMENT EVALUATION RESULTS**

This chapter presents and analyses the results of the two scenarios presented in the previous chapter (prices detrended and prices not detrended) for six rental arrangements (each with four options) using three different risk management measures: the Mean Variance, the Value at Risk (VaR), and the Stochastic Efficiency with Respect to a Function (SERF).

### **4.1 Mean Variance Analysis**

The Mean- Variance analysis focuses on two parameters of the distribution: the mean and the variance of the variable at stake. The mean is preferably large and the variance is preferably small. It is particularly suitable for outcomes with normal distribution, but it can be used in other parametric or nonparametric distributions. In the Mean-Variance risk analysis, an alternative A is preferred to an alternative B if it has a smaller variance and its mean is at least equal to the mean of B. If an alternative has a smaller variance but the other alternative has a larger mean, the risk measure has no discriminatory power.

The results of table 4.1 and figure 4.1 indicates that, for the most part, arrangements based on sharing a certain proportion of the revenue (80/20, 70/30, 60/40) in scenario A are preferred to those that are based on fixed dollar, price, or yield. Every single option in the first category dominates every single option in the second category except of two options 4A and 4B. The same observation applies to scenario B.

Applying the Mean-Value rule to the tenant's scenario A shows that every option is dominated by at least another except of the following options: 60/40 Price trigger (4C), 60/40 Price-Yield trigger (4D), 70/30 Yield – Price trigger, and 80/20 Yield –Price trigger. For the tenant's scenario B (table 4.5 and figure4.2) the efficient set is the same as that of scenario A.

Table 4.1 – Tenant Net Returns Above Total Production Costs – Scenario A

Rice Rental Arrangement	Tenant Net Returns Above Total Rice Production Costs			
	Mean (\$/acre)	Std. Dev. (\$/acre)	Coefficient of Variation (%)	Probability of Neg. Returns (%)
(1-A) Fixed dollar – base <sup>1</sup>	60	53	88.2	11.3
(1-B) Fixed dollar – yld trigger <sup>1</sup>	61	52	86.0	10.0
(1-C) Fixed dollar – prc trigger <sup>1</sup>	64	50	78.5	7.6
(1-D) Fixed dollar – yld/prc trigger <sup>1</sup>	64	50	77.0	6.7
(2-A) Fixed price – base <sup>2</sup>	58	52	89.4	11.6
(2-B) Fixed price – yld trigger <sup>2</sup>	59	51	87.2	10.4
(2-C) Fixed price – prc trigger <sup>2</sup>	62	49	79.1	8.0
(2-D) Fixed price – yld/prc trigger <sup>2</sup>	63	49	77.6	7.1
(3-A) Fixed yield – base <sup>3</sup>	56	45	80.6	8.8
(3-B) Fixed yield – yld trigger <sup>3</sup>	57	45	78.4	7.6
(3-C) Fixed yield – prc trigger <sup>3</sup>	60	44	73.1	6.6
(3-D) Fixed yield – yld/prc trigger <sup>3</sup>	61	43	71.5	5.6
(4-A) 60/40 – base <sup>4</sup>	59	30	50.4	0.8
(4-B) 60/40 – yld trigger <sup>4</sup>	63	32	51.5	0.7
(4-C) 60/40 – prc trigger <sup>4</sup>	72	30	42.2	0.0
(4-D) 60/40 – yld/prc trigger <sup>4</sup>	75	32	42.2	0.0
(5-A) 70/30 – base <sup>5</sup>	73	35	47.6	0.5
(5-B) 70/30 – yld trigger <sup>5</sup>	76	35	46.9	0.4
(5-C) 70/30 – prc trigger <sup>5</sup>	82	32	38.7	0.0
(5-D) 70/30 – yld/prc trigger <sup>5</sup>	84	32	38.2	0.0
(6-A) 80/20 – base <sup>6</sup>	86	40	46.5	0.7
(6-B) 80/20 – yld trigger <sup>6</sup>	89	40	45.6	0.6
(6-C) 80/20 – prc trigger <sup>6</sup>	95	36	38.3	0.0
(6-D) 80/20 – yld/prc trigger <sup>6</sup>	97	36	37.7	0.0

<sup>1</sup> Base cash rent = \$80 per acre, or \$60 per acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>2</sup> Base cash rent = \$1.20 per cwt, or \$0.90 per cwt if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>3</sup> Base cash rent = value of 6.8 cwt/acre, or 5.1 cwt/acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>4</sup> Base share rent = 40% of crop proceeds, or 30% per acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre.

<sup>5</sup> Base share rent = 30% of crop proceeds, or 23% if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>6</sup> Base share rent = 20% of crop proceeds, or 15% if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre.

Table 4.2 – Tenant Net Returns Above Total Production Costs – Scenario B

Rice Rental Arrangement	Tenant Net Returns Above Total Rice Production Costs			
	Mean (\$/acre)	Std. Dev. (\$/acre)	Coefficient of Variation (%)	Probability of Neg. Returns (%)
(1-A) Fixed dollar – base <sup>1</sup>	62	76	123.1	21.9
(1-B) Fixed dollar – yld trigger <sup>1</sup>	63	76	120.3	21.0
(1-C) Fixed dollar – prc trigger <sup>1</sup>	66	72	110.6	17.3
(1-D) Fixed dollar – yld/prc trigger <sup>1</sup>	66	72	108.9	16.5
(2-A) Fixed price – base <sup>2</sup>	60	75	125.9	23.2
(2-B) Fixed price – yld trigger <sup>2</sup>	61	75	123.1	22.3
(2-C) Fixed price – prc trigger <sup>2</sup>	64	72	112.6	18.1
(2-D) Fixed price – yld/prc trigger <sup>2</sup>	64	71	110.8	17.3
(3-A) Fixed yield – base <sup>3</sup>	60	62	103.4	14.6
(3-B) Fixed yield – yld trigger <sup>3</sup>	61	62	101.0	13.7
(3-C) Fixed yield – prc trigger <sup>3</sup>	63	60	95.6	11.5
(3-D) Fixed yield – yld/prc trigger <sup>3</sup>	64	60	93.9	10.7
(4-A) 60/40 – base <sup>4</sup>	61	45	73.7	5.0
(4-B) 60/40 – yld trigger <sup>4</sup>	64	46	71.3	4.4
(4-C) 60/40 – prc trigger <sup>4</sup>	72	38	52.8	0.3
(4-D) 60/40 – yld/prc trigger <sup>4</sup>	75	39	52.1	0.2
(5-A) 70/30 – base <sup>5</sup>	75	52	69.7	3.7
(5-B) 70/30 – yld trigger <sup>5</sup>	77	52	67.5	3.1
(5-C) 70/30 – prc trigger <sup>5</sup>	83	45	55.0	0.2
(5-D) 70/30 – yld/prc trigger <sup>5</sup>	85	46	54.0	0.1
(6-A) 80/20 – base <sup>6</sup>	88	60	67.8	3.3
(6-B) 80/20 – yld trigger <sup>6</sup>	90	59	65.8	2.9
(6-C) 80/20 – prc trigger <sup>6</sup>	96	53	55.3	0.2
(6-D) 80/20 – yld/prc trigger <sup>6</sup>	97	53	54.3	0.1

<sup>1</sup> Base cash rent = \$80 per acre, or \$60 per acre if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>2</sup> Base cash rent = \$1.20 per cwt, or \$0.90 per cwt if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>3</sup> Base cash rent = value of 6.8 cwt/acre, or 5.1 cwt/acre if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>4</sup> Base share rent = 40% of crop proceeds, or 30% per acre if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre.

<sup>5</sup> Base share rent = 30% of crop proceeds, or 23% if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>6</sup> Base share rent = 20% of crop proceeds, or 15% if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre.



Figure 4.1- Mean Variance Analysis Results, Grower Net returns, Scenario A – Prev. 3-yr yield, Price Detrended.



Figure 4.2- Mean Variance Analysis Results, Grower Net returns, Scenario B – Prev. 3-yr yield, Price Not Detrended

For the landlord's scenario A, Table 4.4 and Figure 4.3 show that the efficient set is composed of the following arrangements: Fixed Dollar- Base (1A), Fixed Price-Base (2A), and Fixed Yield-Base (3A) and for scenario B it is made up of the following arrangements: Fixed Price-Base (1A), and Fixed Yield-Base (2A). (Table 4.5 and Figure 4.4 ). Tables 4.5- 4.8 presents the mean and standard deviation distribution between the two parties.

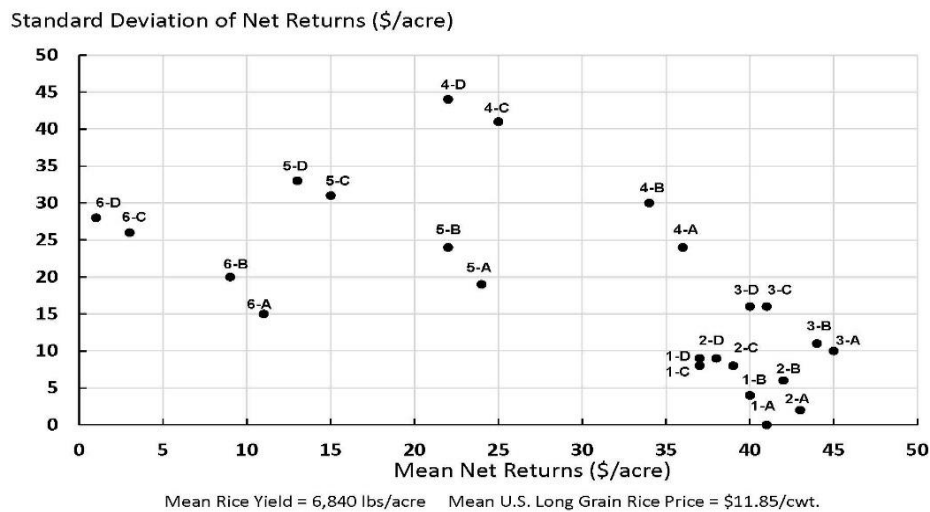


Figure 4.3- Mean Variance Analysis Results, Landlord Net returns, Scenario A – Prev. 3-yr yield, Price Detrended.

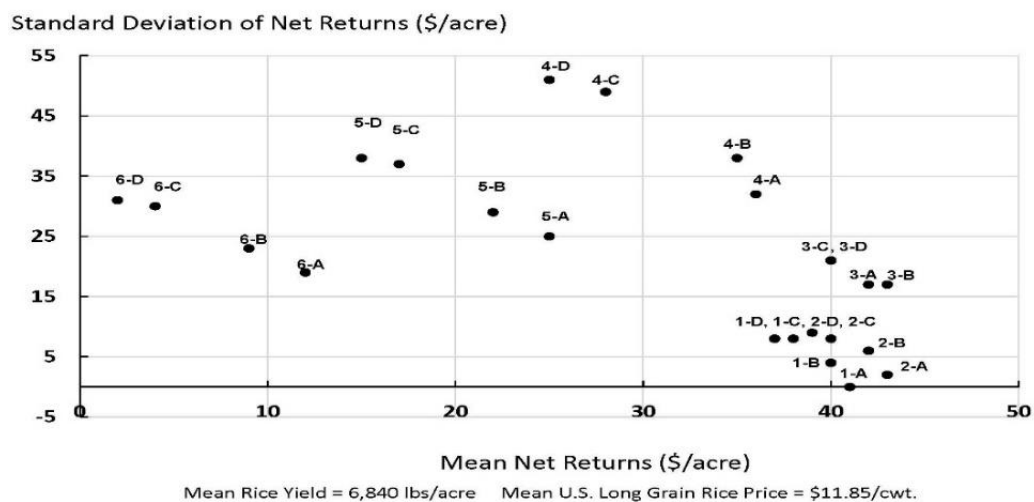


Figure 4.4- Mean Variance Analysis Results, Landl Net returns, Scenario A – Prev. 3-yr yield, Price Not Detrended.

Table 4.3 – Landlord Net Returns Above Total Production Costs – Scenario A

Rice Rental Arrangement	Landlord Net Returns Above Total Rice Production Costs			
	Mean (\$/acre)	Std. Dev. (\$/acre)	Coefficient of Variation (%)	Probability of Neg. Returns (%)
(1-A) Fixed dollar – base <sup>1</sup>	41	0	0.0	0.0
(1-B) Fixed dollar – yld trigger <sup>1</sup>	40	4	11.2	0.0
(1-C) Fixed dollar – prc trigger <sup>1</sup>	37	8	21.1	0.0
(1-D) Fixed dollar – yld/prc trigger <sup>1</sup>	37	9	23.3	0.0
(2-A) Fixed price – base <sup>2</sup>	43	2	5.4	0.0
(2-B) Fixed price – yld trigger <sup>2</sup>	42	6	13.3	0.0
(2-C) Fixed price – prc trigger <sup>2</sup>	39	8	21.4	0.0
(2-D) Fixed price – yld/prc trigger <sup>2</sup>	38	9	24.1	0.0
(3-A) Fixed yield – base <sup>3</sup>	45	10	23.3	0.0
(3-B) Fixed yield – yld trigger <sup>3</sup>	44	11	25.8	0.0
(3-C) Fixed yield – prc trigger <sup>3</sup>	41	16	38.0	0.0
(3-D) Fixed yield – yld/prc trigger <sup>3</sup>	40	16	39.4	0.0
(4-A) 60/40 – base <sup>4</sup>	36	24	67.1	6.3
(4-B) 60/40 – yld trigger <sup>4</sup>	34	30	87.5	8.7
(4-C) 60/40 – prc trigger <sup>4</sup>	25	41	164.3	21.2
(4-D) 60/40 – yld/prc trigger <sup>4</sup>	22	44	197.7	24.8
(5-A) 70/30 – base <sup>5</sup>	24	19	79.8	11.0
(5-B) 70/30 – yld trigger <sup>5</sup>	22	24	108.7	14.4
(5-C) 70/30 – prc trigger <sup>5</sup>	15	31	202.9	26.1
(5-D) 70/30 – yld/prc trigger <sup>5</sup>	13	33	249.1	29.0
(6-A) 80/20 – base <sup>6</sup>	11	15	135.5	21.1
(6-B) 80/20 – yld trigger <sup>6</sup>	9	20	223.3	23.9
(6-C) 80/20 – prc trigger <sup>6</sup>	3	26	978.7	33.7
(6-D) 80/20 – yld/prc trigger <sup>6</sup>	1	28	4181.4	36.2

<sup>1</sup> Base cash rent = \$80 per acre, or \$60 per acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>2</sup> Base cash rent = \$1.20 per cwt, or \$0.90 per cwt if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>3</sup> Base cash rent = value of 6.8 cwt/acre, or 5.1 cwt/acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>4</sup> Base share rent = 40% of crop proceeds, or 30% per acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>5</sup> Base share rent = 30% of crop proceeds, or 23% if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre.

<sup>6</sup> Base share rent = 20% of crop proceeds, or 15% if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre.

Table 4.4 – Landlord Net Returns Above Total Production Costs – Scenario B

Rice Rental Arrangement	Landlord Net Returns Above Total Rice Production Costs			
	Mean (\$/acre)	Std. Dev. (\$/acre)	Coefficient of Variation (%)	Probability of Neg. Returns (%)
(1-A) Fixed dollar – base <sup>1</sup>	41	0	0	0
(1-B) Fixed dollar – yld trigger <sup>1</sup>	40	4	11.2	0
(1-C) Fixed dollar – prc trigger <sup>1</sup>	38	8	20.5	0
(1-D) Fixed dollar – yld/prc trigger <sup>1</sup>	37	8	22.6	0
(2-A) Fixed price – base <sup>2</sup>	43	2	5.4	0
(2-B) Fixed price – yld trigger <sup>2</sup>	42	6	13.3	0
(2-C) Fixed price – prc trigger <sup>2</sup>	40	8	20.7	0
(2-D) Fixed price – yld/prc trigger <sup>2</sup>	39	9	23.4	0
(3-A) Fixed yield – base <sup>3</sup>	43	17	39.2	0
(3-B) Fixed yield – yld trigger <sup>3</sup>	42	17	41.4	0.2
(3-C) Fixed yield – prc trigger <sup>3</sup>	40	21	51.9	2.5
(3-D) Fixed yield – yld/prc trigger <sup>3</sup>	40	21	53.3	2.5
(4-A) 60/40 – base <sup>4</sup>	36	32	89.0	11.5
(4-B) 60/40 – yld trigger <sup>4</sup>	35	38	106.3	12.9
(4-C) 60/40 – prc trigger <sup>4</sup>	28	49	178.2	20.9
(4-D) 60/40 – yld/prc trigger <sup>4</sup>	25	51	207.5	24.5
(5-A) 70/30 – base <sup>5</sup>	25	25	101.8	15.5
(5-B) 70/30 – yld trigger <sup>5</sup>	22	29	129.2	18.6
(5-C) 70/30 – prc trigger <sup>5</sup>	17	37	216.3	25.0
(5-D) 70/30 – yld/prc trigger <sup>5</sup>	15	38	255.8	27.8
(6-A) 80/20 – base <sup>6</sup>	12	19	160.9	26.7
(6-B) 80/20 – yld trigger <sup>6</sup>	9	23	244.9	29.3
(6-C) 80/20 – prc trigger <sup>6</sup>	4	30	743.7	33.5
(6-D) 80/20 – yld/prc trigger <sup>6</sup>	2	31	1502.7	35.9

<sup>1</sup> Base cash rent = \$80 per acre, or \$60 per acre if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>2</sup> Base cash rent = \$1.20 per cwt, or \$0.90 per cwt if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>3</sup> Base cash rent = value of 6.8 cwt/acre, or 5.1 cwt/acre if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>4</sup> Base share rent = 40% of crop proceeds, or 30% per acre if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>5</sup> Base share rent = 30% of crop proceeds, or 23% if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>6</sup> Base share rent = 20% of crop proceeds, or 15% if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre.

Table 4.5 – Mean Net Returns Above Total Production Costs – Scenario A

Rice Rental Arrangement	Distribution of Mean Net Returns			
	<u>Tenant</u>		<u>Landlord</u>	
	(\$/acre)	(%)	(\$/acre)	(%)
(1-A) Fixed dollar – base <sup>1</sup>	60	59.1	41	40.9
(1-B) Fixed dollar – yld trigger <sup>1</sup>	61	60.2	40	39.8
(1-C) Fixed dollar – prc trigger <sup>1</sup>	64	63.0	37	37.0
(1-D) Fixed dollar – yld/prc trigger <sup>1</sup>	64	63.8	37	36.2
(2-A) Fixed price – base <sup>2</sup>	58	57.2	43	42.8
(2-B) Fixed price – yld trigger <sup>2</sup>	59	58.2	42	41.8
(2-C) Fixed price – prc trigger <sup>2</sup>	62	61.1	39	38.9
(2-D) Fixed price – yld/prc trigger <sup>2</sup>	63	62.0	38	38.0
(3-A) Fixed yield – base <sup>3</sup>	56	55.8	45	44.2
(3-B) Fixed yield – yld trigger <sup>3</sup>	57	56.9	44	43.1
(3-C) Fixed yield – prc trigger <sup>3</sup>	60	59.1	41	40.9
(3-D) Fixed yield – yld/prc trigger <sup>3</sup>	61	60.0	40	40.0
(4-A) 60/40 – base <sup>4</sup>	59	62.5	36	37.5
(4-B) 60/40 – yld trigger <sup>4</sup>	63	64.6	34	35.4
(4-C) 60/40 – prc trigger <sup>4</sup>	72	74.1	25	25.9
(4-D) 60/40 – yld/prc trigger <sup>4</sup>	75	77.3	22	22.7
(5-A) 70/30 – base <sup>5</sup>	73	75.0	24	25.0
(5-B) 70/30 – yld trigger <sup>5</sup>	76	77.7	22	22.3
(5-C) 70/30 – prc trigger <sup>5</sup>	82	84.3	15	15.7
(5-D) 70/30 – yld/prc trigger <sup>5</sup>	84	86.6	13	13.4
(6-A) 80/20 – base <sup>6</sup>	86	88.5	11	11.5
(6-B) 80/20 – yld trigger <sup>6</sup>	89	90.9	9	9.1
(6-C) 80/20 – prc trigger <sup>6</sup>	95	97.2	3	2.8
(6-D) 80/20 – yld/prc trigger <sup>6</sup>	97	99.3	1	0.7

<sup>1</sup> Base cash rent = \$80 per acre, or \$60 per acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>2</sup> Base cash rent = \$1.20 per cwt, or \$0.90 per cwt if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>3</sup> Base cash rent = value of 6.8 cwt/acre, or 5.1 cwt/acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>4</sup> Base share rent = 40% of crop proceeds, or 30% per acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre.

<sup>5</sup> Base share rent = 30% of crop proceeds, or 23% if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>6</sup> Base share rent = 20% of crop proceeds, or 15% if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre.

Table 4.6 – Standard Deviation of Net Returns Above Total Production Costs – Scenario A

Rice Rental Arrangement	Distribution of Stand Deviation of Net Returns			
	<u>Tenant</u>		<u>Landlord</u>	
	(\$/acre)	(%)	(\$/acre)	(%)
(1-A) Fixed dollar – base <sup>1</sup>	53	100.0	0	0.0
(1-B) Fixed dollar – yld trigger <sup>1</sup>	52	99.3	4	8.5
(1-C) Fixed dollar – prc trigger <sup>1</sup>	50	94.8	8	15.0
(1-D) Fixed dollar – yld/prc trigger <sup>1</sup>	50	94.3	9	16.2
(2-A) Fixed price – base <sup>2</sup>	52	98.0	2	4.4
(2-B) Fixed price – yld trigger <sup>2</sup>	51	97.4	6	10.6
(2-C) Fixed price – prc trigger <sup>2</sup>	49	92.8	8	16.0
(2-D) Fixed price – yld/prc trigger <sup>2</sup>	49	92.3	9	17.5
(3-A) Fixed yield – base <sup>3</sup>	45	86.2	10	19.7
(3-B) Fixed yield – yld trigger <sup>3</sup>	45	85.5	11	21.4
(3-C) Fixed yield – prc trigger <sup>3</sup>	44	82.9	16	29.8
(3-D) Fixed yield – yld/prc trigger <sup>3</sup>	43	82.3	16	30.2
(4-A) 60/40 – base <sup>4</sup>	30	56.6	24	45.2
(4-B) 60/40 – yld trigger <sup>4</sup>	32	61.5	30	57.3
(4-C) 60/40 – prc trigger <sup>4</sup>	30	57.9	41	78.6
(4-D) 60/40 – yld/prc trigger <sup>4</sup>	32	60.4	44	83.0
(5-A) 70/30 – base <sup>5</sup>	35	66.0	19	36.8
(5-B) 70/30 – yld trigger <sup>5</sup>	35	67.4	24	44.8
(5-C) 70/30 – prc trigger <sup>5</sup>	32	60.4	31	58.7
(5-D) 70/30 – yld/prc trigger <sup>5</sup>	32	61.1	33	61.9
(6-A) 80/20 – base <sup>6</sup>	40	76.0	15	28.9
(6-B) 80/20 – yld trigger <sup>6</sup>	40	76.7	20	37.4
(6-C) 80/20 – prc trigger <sup>6</sup>	36	68.9	26	49.8
(6-D) 80/20 – yld/prc trigger <sup>6</sup>	36	69.2	28	53.0

<sup>1</sup> Base cash rent = \$80 per acre, or \$60 per acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>2</sup> Base cash rent = \$1.20 per cwt, or \$0.90 per cwt if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>3</sup> Base cash rent = value of 6.8 cwt/acre, or 5.1 cwt/acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>4</sup> Base share rent = 40% of crop proceeds, or 30% per acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre.

<sup>5</sup> Base share rent = 30% of crop proceeds, or 23% if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>6</sup> Base share rent = 20% of crop proceeds, or 15% if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre.

Table 4.7 – Mean Net Returns Above Total Production Costs – Scenario B

Rice Rental Arrangement	Distribution of Mean Net Returns			
	<u>Tenant</u>		<u>Landlord</u>	
	(\$/acre)	(%)	(\$/acre)	(%)
(1-A) Fixed dollar – base <sup>1</sup>	62	60.0	41	40.0
(1-B) Fixed dollar – yld trigger <sup>1</sup>	63	61.0	40	39.0
(1-C) Fixed dollar – prc trigger <sup>1</sup>	66	63.5	38	36.5
(1-D) Fixed dollar – yld/prc trigger <sup>1</sup>	66	64.3	37	35.7
(2-A) Fixed price – base <sup>2</sup>	60	58.1	43	41.9
(2-B) Fixed price – yld trigger <sup>2</sup>	61	59.1	42	40.9
(2-C) Fixed price – prc trigger <sup>2</sup>	64	61.7	40	38.3
(2-D) Fixed price – yld/prc trigger <sup>2</sup>	64	62.5	39	37.5
(3-A) Fixed yield – base <sup>3</sup>	60	58.3	43	41.7
(3-B) Fixed yield – yld trigger <sup>3</sup>	61	59.3	42	40.7
(3-C) Fixed yield – prc trigger <sup>3</sup>	63	60.8	40	39.2
(3-D) Fixed yield – yld/prc trigger <sup>3</sup>	64	61.7	40	38.3
(4-A) 60/40 – base <sup>4</sup>	61	62.5	36	37.5
(4-B) 60/40 – yld trigger <sup>4</sup>	64	64.5	35	35.5
(4-C) 60/40 – prc trigger <sup>4</sup>	72	72.3	28	27.7
(4-D) 60/40 – yld/prc trigger <sup>4</sup>	75	75.3	25	24.7
(5-A) 70/30 – base <sup>5</sup>	75	74.9	25	25.1
(5-B) 70/30 – yld trigger <sup>5</sup>	77	77.5	22	22.5
(5-C) 70/30 – prc trigger <sup>5</sup>	83	83.0	17	17.0
(5-D) 70/30 – yld/prc trigger <sup>5</sup>	85	85.1	15	14.9
(6-A) 80/20 – base <sup>6</sup>	88	88.3	12	11.7
(6-B) 80/20 – yld trigger <sup>6</sup>	90	90.7	9	9.3
(6-C) 80/20 – prc trigger <sup>6</sup>	96	96.0	4	4.0
(6-D) 80/20 – yld/prc trigger <sup>6</sup>	97	97.9	2	2.1

<sup>1</sup> Base cash rent = \$80 per acre, or \$60 per acre if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>2</sup> Base cash rent = \$1.20 per cwt, or \$0.90 per cwt if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>3</sup> Base cash rent = value of 6.8 cwt/acre, or 5.1 cwt/acre if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>4</sup> Base share rent = 40% of crop proceeds, or 30% per acre if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre.

<sup>5</sup> Base share rent = 30% of crop proceeds, or 23% if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>6</sup> Base share rent = 20% of crop proceeds, or 15% if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre.

Table 4.8 – Standard Deviation of Net Returns Above Total Production Costs – Scenario B

Rice Rental Arrangement	Distribution of Stand Deviation of Net Returns			
	<u>Tenant</u>		<u>Landlord</u>	
	(\$/acre)	(%)	(\$/acre)	(%)
(1-A) Fixed dollar – base <sup>1</sup>	76	100.0	0	0.0
(1-B) Fixed dollar – yld trigger <sup>1</sup>	76	99.4	4	5.9
(1-C) Fixed dollar – prc trigger <sup>1</sup>	72	95.1	8	10.1
(1-D) Fixed dollar – yld/prc trigger <sup>1</sup>	72	94.8	8	10.9
(2-A) Fixed price – base <sup>2</sup>	75	99.0	2	3.1
(2-B) Fixed price – yld trigger <sup>2</sup>	75	98.5	6	7.3
(2-C) Fixed price – prc trigger <sup>2</sup>	72	94.0	8	10.8
(2-D) Fixed price – yld/prc trigger <sup>2</sup>	71	93.8	9	11.9
(3-A) Fixed yield – base <sup>3</sup>	62	81.6	17	22.1
(3-B) Fixed yield – yld trigger <sup>3</sup>	62	81.1	17	22.8
(3-C) Fixed yield – prc trigger <sup>3</sup>	60	78.7	21	27.5
(3-D) Fixed yield – yld/prc trigger <sup>3</sup>	60	78.4	21	27.7
(4-A) 60/40 – base <sup>4</sup>	45	58.5	32	42.5
(4-B) 60/40 – yld trigger <sup>4</sup>	46	60.1	38	49.4
(4-C) 60/40 – prc trigger <sup>4</sup>	38	49.9	49	64.4
(4-D) 60/40 – yld/prc trigger <sup>4</sup>	39	51.2	51	67.0
(5-A) 70/30 – base <sup>5</sup>	52	68.3	25	33.3
(5-B) 70/30 – yld trigger <sup>5</sup>	52	68.4	29	38.0
(5-C) 70/30 – prc trigger <sup>5</sup>	45	59.6	37	48.1
(5-D) 70/30 – yld/prc trigger <sup>5</sup>	46	60.0	38	49.9
(6-A) 80/20 – base <sup>6</sup>	60	78.2	19	24.6
(6-B) 80/20 – yld trigger <sup>6</sup>	59	78.0	23	29.9
(6-C) 80/20 – prc trigger <sup>6</sup>	53	69.4	30	39.0
(6-D) 80/20 – yld/prc trigger <sup>6</sup>	53	69.5	31	41.0

<sup>1</sup> Base cash rent = \$80 per acre, or \$60 per acre if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>2</sup> Base cash rent = \$1.20 per cwt, or \$0.90 per cwt if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>3</sup> Base cash rent = value of 6.8 cwt/acre, or 5.1 cwt/acre if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>4</sup> Base share rent = 40% of crop proceeds, or 30% per acre if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre.

<sup>5</sup> Base share rent = 30% of crop proceeds, or 23% if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>6</sup> Base share rent = 20% of crop proceeds, or 15% if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre.

Unlike the Mean-Value approach, which considers the mean and standard deviation jointly, here the parameters are considered separately. It may be a useful tool if the Mean-Value fails to discriminate between different alternatives.

#### **4.2 Value at Risk Analysis**

Another way of ranking alternative rental arrangements is to compare their Value-at Risk (VaR) at a certain percentile: ten percent, twenty five percent, fifty percent or any other percentage. In this context, the value at risk is simply the value at which the net return above specific costs is expected to be below ten percent of the time and above it ninety percent of the time. The higher the value at risk of the alternative the less risky it is. The results of this risk measure are exposed in table 4.9 and table 4.10 for scenario A and B respectively. In general, for the tenant the rental arrangement based on fixed dollar, price or yield are riskier than the 80/20, 70/30, and 60/40 arrangement, and for the landlord the 80/20, 70/30, and 60/40 arrangements are riskier than the arrangement based on fixed dollar, price or yield.

For the tenant's scenario A, the best option is the 80/20 Yield /Price trigger (6D) with a value that is equal to \$57/acre, and the worst is Fixed Price –Base (2A) with a value equal to \$-4/acre. For the landlord's scenario A, the best options are Fixed Dollar- Base (1A) and Fixed Dollar-Yield trigger (1B) with a value equal to \$41/acre , and the worst is the 60/40 Yield /Price trigger (4D) with a value equal to -\$48/acre. For the tenant' scenario B, the best and worst arrangement are the same as those of the tenant's scenario A, but the values are different: \$41/acre and -\$25/acre respectively.

Table 4.9 – Value at Risk Measures for 10% Level - Scenario A

Rice Rental Arrangement	Value at Risk 10%	
	<u>Tenant</u> (\$/acre)	<u>Landlord</u> (\$/acre)
(1-A) Fixed dollar – base <sup>1</sup>	-3	41
(1-B) Fixed dollar – yld trigger <sup>1</sup>	0	41
(1-C) Fixed dollar – prc trigger <sup>1</sup>	5	21
(1-D) Fixed dollar – yld/prc trigger <sup>1</sup>	9	21
(2-A) Fixed price – base <sup>2</sup>	-4	41
(2-B) Fixed price – yld trigger <sup>2</sup>	-1	41
(2-C) Fixed price – prc trigger <sup>2</sup>	5	22
(2-D) Fixed price – yld/prc trigger <sup>2</sup>	9	21
(3-A) Fixed yield – base <sup>3</sup>	3	31
(3-B) Fixed yield – yld trigger <sup>3</sup>	5	30
(3-C) Fixed yield – prc trigger <sup>3</sup>	8	14
(3-D) Fixed yield – yld/prc trigger <sup>3</sup>	10	14
(4-A) 60/40 – base <sup>4</sup>	25	5
(4-B) 60/40 – yld trigger <sup>4</sup>	27	2
(4-C) 60/40 – prc trigger <sup>4</sup>	37	-45
(4-D) 60/40 – yld/prc trigger <sup>4</sup>	39	-48
(5-A) 70/30 – base <sup>5</sup>	33	-2
(5-B) 70/30 – yld trigger <sup>5</sup>	36	-6
(5-C) 70/30 – prc trigger <sup>5</sup>	46	-33
(5-D) 70/30 – yld/prc trigger <sup>5</sup>	48	-37
(6-A) 80/20 – base <sup>6</sup>	40	-11
(6-B) 80/20 – yld trigger <sup>6</sup>	43	-15
(6-C) 80/20 – prc trigger <sup>6</sup>	54	-39
(6-D) 80/20 – yld/prc trigger <sup>6</sup>	57	-42

<sup>1</sup> Base cash rent = \$80 per acre, or \$60 per acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>2</sup> Base cash rent = \$1.20 per cwt, or \$0.90 per cwt if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>3</sup> Base cash rent = value of 6.8 cwt/acre, or 5.1 cwt/acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>4</sup> Base share rent = 40% of crop proceeds, or 30% per acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre.

<sup>5</sup> Base share rent = 30% of crop proceeds, or 23% if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>6</sup> Base share rent = 20% of crop proceeds, or 15% if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre.

Table 4.10 – Value at Risk Measures for 10% Level - Scenario B

Rice Rental Arrangement	Value at Risk 10%	
	<u>Tenant</u> (\$/acre)	<u>Landlord</u> (\$/acre)
(1-A) Fixed dollar – base <sup>1</sup>	-24	41
(1-B) Fixed dollar – yld trigger <sup>1</sup>	-23	41
(1-C) Fixed dollar – prc trigger <sup>1</sup>	-14	21
(1-D) Fixed dollar – yld/prc trigger <sup>1</sup>	-13	21
(2-A) Fixed price – base <sup>2</sup>	-25	41
(2-B) Fixed price – yld trigger <sup>2</sup>	-24	41
(2-C) Fixed price – prc trigger <sup>2</sup>	-15	22
(2-D) Fixed price – yld/prc trigger <sup>2</sup>	-14	22
(3-A) Fixed yield – base <sup>3</sup>	-9	19
(3-B) Fixed yield – yld trigger <sup>3</sup>	-8	17
(3-C) Fixed yield – prc trigger <sup>3</sup>	-5	5
(3-D) Fixed yield – yld/prc trigger <sup>3</sup>	-3	5
(4-A) 60/40 – base <sup>4</sup>	9	-1
(4-B) 60/40 – yld trigger <sup>4</sup>	11	-6
(4-C) 60/40 – prc trigger <sup>4</sup>	28	-54
(4-D) 60/40 – yld/prc trigger <sup>4</sup>	30	-58
(5-A) 70/30 – base <sup>5</sup>	15	-6
(5-B) 70/30 – yld trigger <sup>5</sup>	16	-11
(5-C) 70/30 – prc trigger <sup>5</sup>	34	-41
(5-D) 70/30 – yld/prc trigger <sup>5</sup>	36	-44
(6-A) 80/20 – base <sup>6</sup>	19	-12
(6-B) 80/20 – yld trigger <sup>6</sup>	22	-17
(6-C) 80/20 – prc trigger <sup>6</sup>	38	-44
(6-D) 80/20 – yld/prc trigger <sup>6</sup>	41	-47

<sup>1</sup> Base cash rent = \$80 per acre, or \$60 per acre if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>2</sup> Base cash rent = \$1.20 per cwt, or \$0.90 per cwt if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>3</sup> Base cash rent = value of 6.8 cwt/acre, or 5.1 cwt/acre if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>4</sup> Base share rent = 40% of crop proceeds, or 30% per acre if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre.

<sup>5</sup> Base share rent = 30% of crop proceeds, or 23% if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre. <sup>6</sup> Base share rent = 20% of crop proceeds, or 15% if market price < \$9.24/cwt and/or yield < 66.35 cwt/acre.

Also, the landlord scenario B's best and worst arrangements are the same as those of the landlord's scenario A, but the value of the worst is different: -\$58/acre.

### **4.3 SERF Analysis**

The last risk management measure used in this study is the Stochastic Efficiency with Respect to a Function (SERF). It is a type of stochastic dominance that uses certainty equivalence to rank risky alternatives. Here, the alternatives are twenty four rental arrangements in each of the two scenarios: A and B. The absolute risk aversion coefficient range is from zero to 0.06. The mean of the means of all the alternatives is \$50.1. The tenant's largest mean is \$97 (6-D scenario A and B), its smallest mean is \$56 (3-A scenario A), the landlord highest mean is \$45/acre (3-A scenario A), and its lowest mean is \$1/acre (6-D scenario A).

The first observation related to SERF is that the price, yield trigger, and the base option curves are identical for the six types of rental arrangements reducing the alternatives to six instead of twenty four, in each scenario, in the other risk management approaches. The second observation is about the graphs of the two scenarios. The curves of scenario A are flatter than those of scenario B. This is due to the fact that in scenario A the output prices are detrended and in scenario B they are not. Tables 4.1, 4.2, 4.3, and 4.4 show that the detrending of these price decreases the standard deviation of every rental arrangement in scenario B except of one (4- D scenario B), which makes every alternative in scenario B riskier than its counterpart in scenario A. Consequently, a decision maker, with a certain absolute risk aversion, confronted with the same alternative in both scenarios will assign a lower certainty equivalent to the riskier rental arrangement in scenario B.

Figure 4.5 and 4.6 show that tenants with absolute risk aversion between zero and 0.06 would prefer the 80/20 share over the other alternatives in both scenarios. The 70/30 share is preferred to the 60/40 share. The 60/40 share is preferred to the rest of the alternatives. For the

tenant, scenario A and B are almost the same but the curves steepness in scenario B decline more rapidly than those of scenario A as absolute risk aversion increases.

Figure 4.7 show that landlords with absolute risk aversion between zero and 0.025 prefer the Fixed Yield to the other alternatives. The landlords whose absolute risk aversion is between 0.025 and 0.06 prefer the Fixed Price arrangement to the other alternatives. These two arrangement are preferred to the Fixed Dollar which is preferred to the 60/40 share, the 60/40 is preferred to the 70/30 which is preferred to the 80/20 share.

Figure 4.8 indicate that any rational landlord would prefer the Fixed Dollar arrangement to the Fixed Price, Fixed Price to the Fixed Yield, the Fixed Yield to the 60/40 share, the 60/40 share to the 70/30share, and the 70/30 share to the 80/20 share.

These SERF results, like the results of the previous risk measures, demonstrate that share rental arrangements shift part of the risk from the tenant to the landlord and the more the share proportion in the arrangement is the greater the risk transferred.

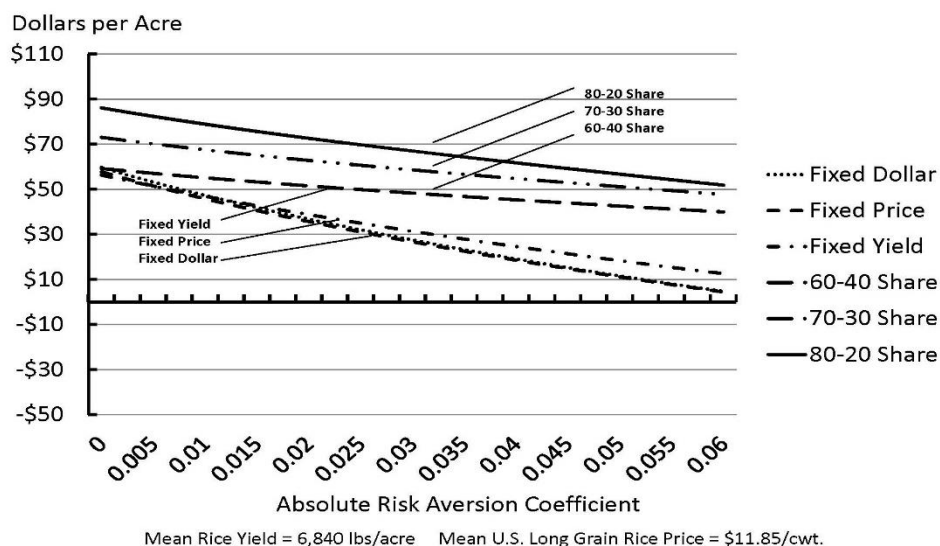


Figure 4.5 – SERF Analysis Results, Grower Net Returns,  
Scenario A – Prev. 3-yr Yield, Price Detrended

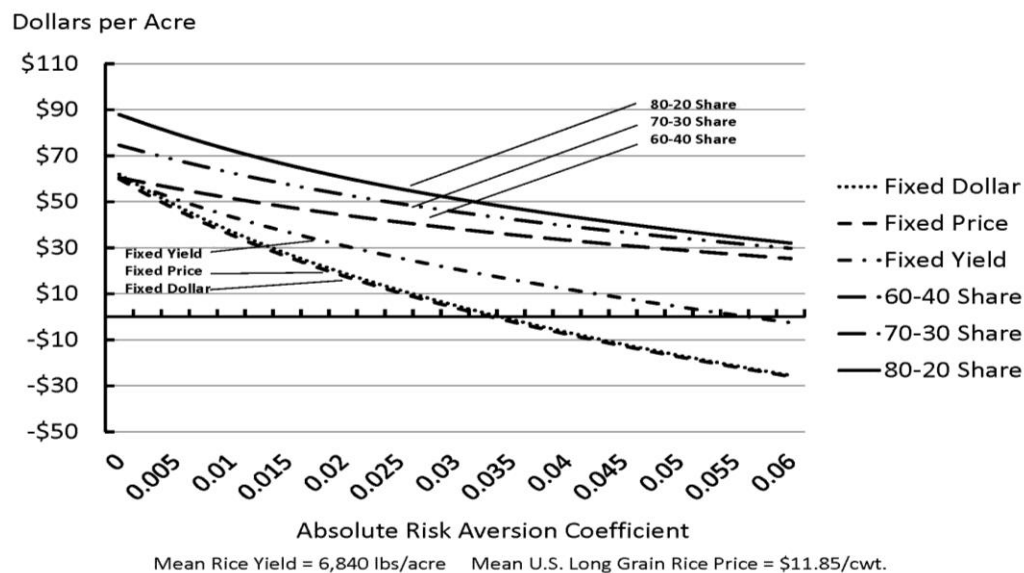


Figure 4.6 – SERF Analysis Results, Grower Net Returns,  
Scenario B – Prev. 3-yr Yield, Price Not Detrended

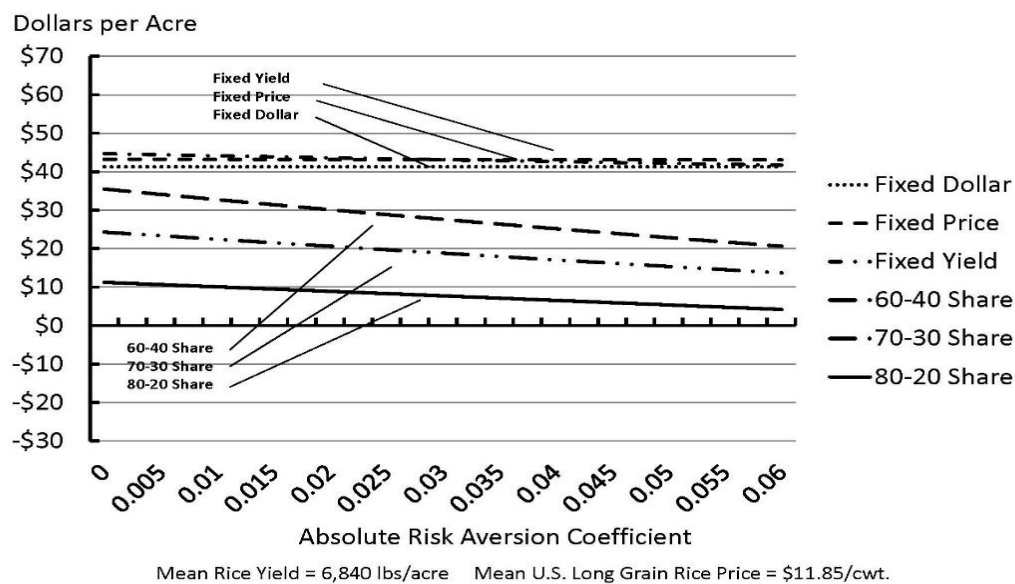


Figure 4.7 – SERF Analysis Results, Landlord Net Returns,  
Scenario A – Prev. 3-yr Yield, Price Detrended

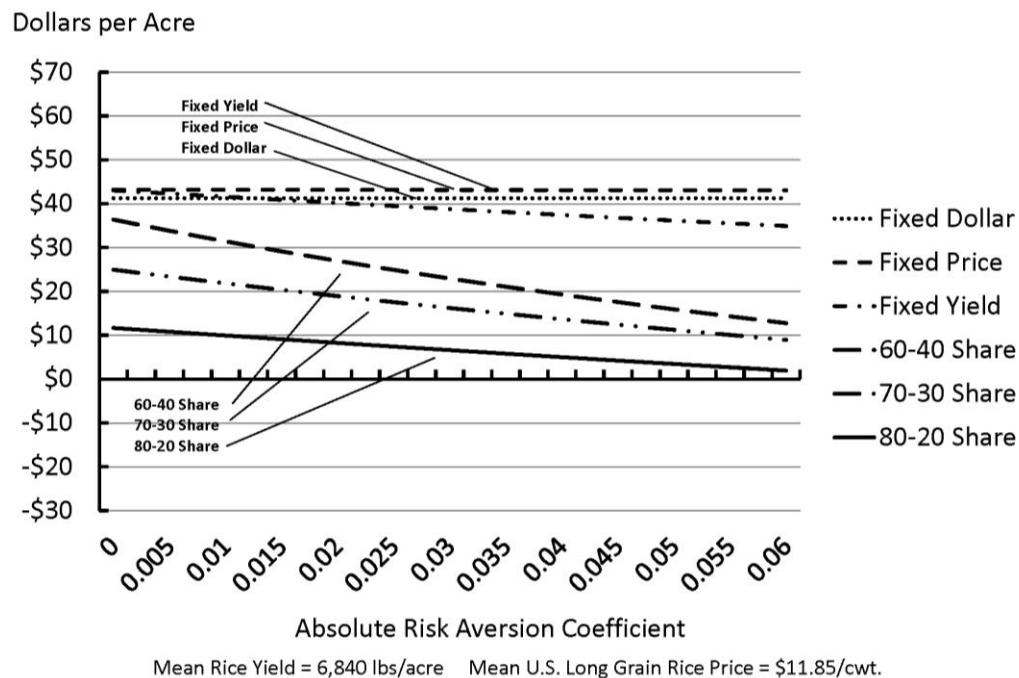


Figure 4.8 – SERF Analysis Results, Landlord Net Returns,  
Scenario B – Prev. 3-yr Yield, Price Not Detrended

## CHAPTER 5. SUMMARY AND CONCLUSIONS

The purpose of this thesis was threefold: To review the commodity section of the newly adopted Agricultural Act of 2014, to specify the terms of an equitable rice rental arrangement for twenty four alternatives, and to use Monte Carlo simulations (*Simetar*) and three different risk measure techniques to rank these alternatives.

The results of this study indicate that crop share rental arrangements result in higher expected net returns for the growers, compared to cash rents, and that rental rate adjustment based on current prices and/or yields do mitigate net income risk faced by rice growers.

Taking into consideration all the results of the last objective and retaining only the dominant options in all three risk measures one can conclude that the 80/20 arrangement (sometimes with particular price or yield trigger) would be preferred by any rational tenant and that any rational landlord would choose the Fixed price base as his or her best rice rental arrangement choice.

This study was conducted under the assumption that rice producers in the United State Delta region to choose the PLC option over the ARC (whether county or individual). Therefore only the PLC payment was included in the model. This assumption was motivated, among other considerations, by the fact that rice irrigation, which is predominant in this region, reduces significantly its yield variability which makes the ARC option less likely to be chosen. Further studies can prove or disprove this assumption.

Another limitation of this study is that it does not include the SCO insurance option, which many scholars in the field consider as one of the major innovations of this Farm Bill. The

inclusion of such option would complicate the model and is reasonably out of the scope of a thesis research. A Ph.D. research may offer the time and resource necessary to conduct it.

The last word is about who would benefit from this thesis. The obvious answer is: the equitable rental arrangement specifications and the results of the three risk measures can be useful for rice tenants, landlords and extension service researchers in the U. S. Delta region.

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**APPENDIX A. CERTAINTY EQUIVALENTS FOR 1-A TENANT PRICES  
DETRENDED**

RAC	Fixed Dollar	Fixed Price	Fixed Yield	60/40	70/30	80/20
0	59.74	57.78	56.32	59.25	73.08	86.16
0.0025	56.38	54.55	53.81	58.16	71.61	84.21
0.005	53.20	51.49	51.42	57.11	70.20	82.35
0.0075	50.19	48.59	49.13	56.10	68.86	80.58
0.01	47.31	45.81	46.92	55.13	67.57	78.88
0.0125	44.54	43.15	44.79	54.19	66.32	77.25
0.015	41.88	40.58	42.73	53.28	65.13	75.67
0.0175	39.31	38.10	40.72	52.40	63.97	74.14
0.02	36.82	35.70	38.77	51.54	62.84	72.65
0.0225	34.41	33.36	36.86	50.71	61.75	71.20
0.025	32.06	31.09	35.00	49.89	60.69	69.78
0.0275	29.77	28.87	33.18	49.10	59.65	68.39
0.03	27.54	26.71	31.39	48.32	58.64	67.03
0.0325	25.37	24.60	29.65	47.56	57.65	65.68
0.035	23.25	22.54	27.93	46.81	56.68	64.36
0.0375	21.18	20.53	26.25	46.08	55.73	63.05
0.04	19.16	18.57	24.60	45.36	54.79	61.76
0.0425	17.20	16.65	22.99	44.66	53.87	60.76
0.045	15.28	14.78	21.41	43.96	52.97	59.21
0.0475	13.41	12.95	19.86	43.27	52.07	57.96
0.05	11.58	11.16	18.35	42.60	51.20	56.72
0.0525	9.81	9.42	16.86	41.93	50.33	55.49
0.055	8.08	7.73	15.41	41.27	49.48	54.27
0.0575	6.40	6.08	14.00	40.62	48.63	53.06
0.06	4.77	4.47	12.61	39.98	47.80	51.86

**APPENDIX B. CERTAINTY EQUIVALENTS FOR 1-B TENANT PRICES NOT  
DETRENDED**

RAC	Fixed Dollar	Fixed Price	Fixed Yield	60/40	70/30	80/20
0	61.89	59.93	60.13	60.54	74.59	87.88
0.0025	54.92	53.09	55.49	58.11	71.31	83.59
0.005	48.5	46.79	51.19	55.81	68.21	79.58
0.0075	42.6	40.98	47.21	53.62	65.31	75.84
0.01	37.17	35.64	43.51	51.54	62.57	72.36
0.0125	32.15	30.69	40.07	49.58	60.01	69.11
0.015	27.49	26.1	36.84	47.72	57.6	66.07
0.0175	23.15	21.83	33.81	45.95	55.32	63.23
0.02	19.08	17.82	30.94	44.27	53.18	60.57
0.0225	15.26	14.05	28.22	42.67	51.16	58.07
0.025	11.65	10.49	25.63	41.15	49.24	55.71
0.0275	8.23	7.12	23.15	39.7	47.42	53.47
0.03	4.97	3.91	20.77	38.32	45.7	51.35
0.0325	1.86	0.85	18.49	36.99	44.05	49.34
0.035	-1.11	-2.07	16.28	35.72	42.48	47.42
0.0375	-3.96	-4.88	14.14	34.51	40.97	45.59
0.04	-6.71	-7.57	12.08	33.33	39.53	43.84
0.0425	-9.35	-10.16	10.07	32.21	38.15	42.16
0.045	-11.89	-12.66	8.11	31.12	36.81	40.54
0.0475	-14.35	-15.07	6.22	30.08	35.53	38.99
0.05	-16.73	-17.39	4.37	29.06	34.3	37.5
0.0525	-19.02	-19.64	2.56	28.08	33.11	36.06
0.055	-21.25	-21.81	0.8	27.14	31.96	34.67
0.0575	-23.41	-23.91	-0.91	26.22	30.84	33.33
0.06	-25.5	-25.95	-2.59	25.33	29.76	32.03

**APPENDIX C. CERTAINTY EQUIVALENTS FOR 2-A LANDLORD PRICES  
DETRENDED**

RAC	Fixed Dollar	Fixed Price	Fixed Yield	60/40	70/30	80/20
0	41.26	43.22	44.68	35.51	24.30	11.23
0.0025	41.26	43.21	44.55	34.80	23.84	10.94
0.005	41.26	43.20	44.41	34.11	23.37	10.65
0.0075	41.26	43.20	44.28	33.43	22.91	10.36
0.01	41.26	43.19	44.15	32.75	22.45	10.07
0.0125	41.26	43.18	44.02	32.09	21.99	9.78
0.015	41.26	43.18	43.89	31.43	21.54	9.49
0.0175	41.26	43.17	43.76	30.78	21.08	9.19
0.02	41.26	43.16	43.63	30.13	20.08	8.90
0.0225	41.26	43.16	43.50	29.49	20.18	8.61
0.025	41.26	43.15	43.38	28.86	19.74	8.31
0.0275	41.26	43.14	43.25	28.24	19.29	8.02
0.03	41.26	43.14	43.13	27.62	18.85	7.72
0.0325	41.26	43.13	43.00	27.00	18.41	7.43
0.035	41.26	43.12	42.88	26.40	17.97	7.13
0.0375	41.26	43.12	42.76	25.79	17.53	6.84
0.04	41.26	43.11	42.64	25.20	17.10	6.54
0.0425	41.26	43.10	42.52	24.61	16.67	6.25
0.045	41.26	43.10	42.41	24.02	16.24	5.95
0.0475	41.26	43.09	42.29	23.44	15.81	5.66
0.05	41.26	43.09	42.17	22.87	15.39	5.37
0.0525	41.26	43.08	42.06	22.30	14.96	5.07
0.055	41.26	43.07	41.95	21.74	14.54	4.78
0.0575	41.26	43.07	41.84	21.19	14.13	4.49
0.06	41.26	43.06	41.73	20.64	13.72	4.20

**APPENDIX D. CERTAINTY EQUIVALENTS FOR 2-B LANDLORD PRICES NOT  
DETRENDED**

RAC	Fixed Dollar	Fixed Price	Fixed Yield	60/40	70/30	80/20
0.00	41.26	43.22	43.02	36.37	24.95	11.66
0.00	41.26	43.21	42.66	35.08	24.15	11.22
0.01	41.26	43.20	42.31	33.82	23.37	10.79
0.01	41.26	43.20	41.95	32.60	22.60	10.36
0.01	41.26	43.19	41.60	31.60	21.84	9.93
0.01	41.26	43.18	41.24	30.25	21.09	9.50
0.02	41.26	43.18	40.89	29.13	20.36	9.08
0.02	41.26	43.17	40.53	28.03	19.64	8.66
0.02	41.26	43.16	40.18	26.96	18.93	8.24
0.02	41.26	43.16	39.83	25.92	18.24	7.82
0.03	41.26	43.15	39.48	24.90	17.55	7.41
0.03	41.26	43.14	39.13	23.91	16.88	7.00
0.03	41.26	43.14	38.79	22.95	16.21	6.59
0.03	41.26	43.13	38.45	22.00	15.56	6.19
0.04	41.26	43.12	38.11	21.07	14.91	5.79
0.04	41.26	43.12	37.77	20.17	14.28	5.39
0.04	41.26	43.11	37.44	19.28	13.65	4.99
0.04	41.26	43.10	37.11	18.41	13.04	4.60
0.05	41.26	43.10	36.79	17.56	12.43	4.21
0.05	41.26	43.09	36.46	16.72	11.83	3.82
0.05	41.26	43.09	36.15	15.90	11.23	3.44
0.05	41.26	43.08	35.83	15.10	10.65	3.05
0.06	41.26	43.07	35.52	14.30	10.07	2.67
0.06	41.26	43.07	35.22	13.52	9.50	2.29
0.06	41.26	43.06	34.92	12.76	8.93	1.92

**APPENDIX E. ESTIMATED CERTAINTY EQUIVALENTS FOR TENANT NET RETURNS OVER ALTERNATIVE RISK AVERSION COEFFICIENT VALUES – SCENARIO A**

Rice Rental Arrangement	Alternative Risk Aversion Coefficient			
	0.00	0.02	0.04	0.06
(1-A) Fixed dollar – base <sup>1</sup>	60	37	19	5
(1-B) Fixed dollar – yld trigger <sup>1</sup>	61	38	21	7
(1-C) Fixed dollar – prc trigger <sup>1</sup>	64	43	28	15
(1-D) Fixed dollar – yld/prc trigger <sup>1</sup>	64	45	30	18
(2-A) Fixed price – base <sup>2</sup>	58	36	19	4
(2-B) Fixed price – yld trigger <sup>2</sup>	59	37	20	6
(2-C) Fixed price – prc trigger <sup>2</sup>	62	42	27	15
(2-D) Fixed price – yld/prc trigger <sup>2</sup>	63	44	29	18
(3-A) Fixed yield – base <sup>3</sup>	56	39	25	13
(3-B) Fixed yield – yld trigger <sup>3</sup>	57	40	27	15
(3-C) Fixed yield – prc trigger <sup>3</sup>	60	44	30	19
(3-D) Fixed yield – yld/prc trigger <sup>3</sup>	61	45	33	22
(4-A) 60/40 – base <sup>4</sup>	59	52	45	40
(4-B) 60/40 – yld trigger <sup>4</sup>	63	54	47	42
(4-C) 60/40 – prc trigger <sup>4</sup>	72	64	57	52
(4-D) 60/40 – yld/prc trigger <sup>4</sup>	75	67	60	55
(5-A) 70/30 – base <sup>5</sup>	73	63	55	48
(5-B) 70/30 – yld trigger <sup>5</sup>	76	65	57	50
(5-C) 70/30 – prc trigger <sup>5</sup>	82	73	67	61
(5-D) 70/30 – yld/prc trigger <sup>5</sup>	84	76	69	63
(6-A) 80/20 – base <sup>6</sup>	86	73	62	52
(6-B) 80/20 – yld trigger <sup>6</sup>	89	75	64	54
(6-C) 80/20 – prc trigger <sup>6</sup>	95	84	75	67
(6-D) 80/20 – yld/prc trigger <sup>6</sup>	97	86	77	70

<sup>1</sup> Base cash rent = \$80 per acre, or \$60 per acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>2</sup> Base cash rent = \$1.20 per cwt, or \$0.90 per cwt if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>3</sup> Base cash rent = value of 6.8 cwt/acre, or 5.1 cwt/acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>4</sup> Base share rent = 40% of crop proceeds, or 30% per acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre.

<sup>5</sup> Base share rent = 30% of crop proceeds, or 23% if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>6</sup> Base share rent = 20% of crop proceeds, or 15% if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre.

**APPENDIX F. ESTIMATED CERTAINTY EQUIVALENTS FOR TENANT NET RETURNS OVER ALTERNATIVE RISK AVERSION COEFFICIENT VALUES – SCENARIO B**

Rice Rental Arrangement	<u>Alternative Risk Aversion Coefficient</u>			
	0.00	0.02	0.04	0.06
(1-A) Fixed dollar – base <sup>1</sup>	62	19	-7	-25
(1-B) Fixed dollar – yld trigger <sup>1</sup>	63	21	-4	-21
(1-C) Fixed dollar – prc trigger <sup>1</sup>	66	28	7	-9
(1-D) Fixed dollar – yld/prc trigger <sup>1</sup>	66	29	8	-8
(2-A) Fixed price – base <sup>2</sup>	60	18	-8	-26
(2-B) Fixed price – yld trigger <sup>2</sup>	61	19	-5	-22
(2-C) Fixed price – prc trigger <sup>2</sup>	64	27	6	-9
(2-D) Fixed price – yld/prc trigger <sup>2</sup>	64	28	7	-9
(3-A) Fixed yield – base <sup>3</sup>	60	31	12	-3
(3-B) Fixed yield – yld trigger <sup>3</sup>	61	32	14	1
(3-C) Fixed yield – prc trigger <sup>3</sup>	63	36	19	6
(3-D) Fixed yield – yld/prc trigger <sup>3</sup>	64	37	21	8
(4-A) 60/40 – base <sup>4</sup>	61	44	33	25
(4-B) 60/40 – yld trigger <sup>4</sup>	64	47	36	28
(4-C) 60/40 – prc trigger <sup>4</sup>	72	60	51	45
(4-D) 60/40 – yld/prc trigger <sup>4</sup>	75	62	54	47
(5-A) 70/30 – base <sup>5</sup>	75	53	40	30
(5-B) 70/30 – yld trigger <sup>5</sup>	77	56	42	32
(5-C) 70/30 – prc trigger <sup>5</sup>	83	67	57	50
(5-D) 70/30 – yld/prc trigger <sup>5</sup>	85	69	59	52
(6-A) 80/20 – base <sup>6</sup>	88	61	44	32
(6-B) 80/20 – yld trigger <sup>6</sup>	90	63	46	35
(6-C) 80/20 – prc trigger <sup>6</sup>	96	75	63	54
(6-D) 80/20 – yld/prc trigger <sup>6</sup>	97	77	65	56

<sup>1</sup> Base cash rent = \$80 per acre, or \$60 per acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>2</sup> Base cash rent = \$1.20 per cwt, or \$0.90 per cwt if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>3</sup> Base cash rent = value of 6.8 cwt/acre, or 5.1 cwt/acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>4</sup> Base share rent = 40% of crop proceeds, or 30% per acre if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre.

<sup>5</sup> Base share rent = 30% of crop proceeds, or 23% if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre. <sup>6</sup> Base share rent = 20% of crop proceeds, or 15% if market price < \$10.42/cwt and/or yield < 66.35 cwt/acre.

## **VITA**

Abdallahi Ould Abderrahmane was born in Aioun El Atrouss, Mauritania. In 2002, he received a Bachelor of Art degree from the University of Nouakchott. In 2006 he was admitted as a special graduate student in the University of Maryland College Park. In 2012, he was admitted in Louisiana State University where he is a candidate to receive a Master of Science in the summer of 2015.