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An evaluation of cost of production insurance as an income support tool for rice and cotton producers in Louisiana

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AN EVALUATION OF COST OF PRODUCTION INSURANCE AS AN INCOME SUPPORT TOOL FOR RICE AND COTTON PRODUCERS IN LOUISIANA

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ABSTRACT

Crop insurance has received a great deal of attention over the past several years. The main interest and focus of analysis on crop insurance has been to evaluate its use and performance as a risk management tool for agricultural producers. Several different types of crop insurance policies are currently available, ranging from minimal yield coverage to revenue coverage. Cost of production crop insurance has been proposed recently as a low cost, safety net type of insurance policy for agricultural producers. This study evaluated the performance of cost of production crop insurance for cotton and rice producers in Louisiana.

Crop income and production expenses were simulated on a per acre basis for representative cotton and rice production situations in Louisiana. Cotton yields and production costs for Franklin and Tensas Parishes in Northeast Louisiana and rice yields and production costs for Acadia and Vermilion Parishes in Southwest Louisiana were used to model per acre income and expenses under various insurance coverage levels. Gross income, production expenses, and net income were simulated over a five-year period. Crop yields and market prices were stochastically simulated for 1,000 replications. Results were evaluated by comparing mean net present value of net returns, the percent of time net returns were negative, and the percent of time cost of production crop insurance generates an indemnity payment.

General conclusions of the study were that cost of production crop insurance is a low cost, safety net type of insurance which can help support farm income during times of extremely low prices or yields. Farms with below average yields tended to benefit more from the program because of lower average net returns. One of the practical challenges for this type of insurance program would involve the collection of yield and production cost data necessary to operate it at the individual farm level.

CHAPTER 1 - INTRODUCTION

Rice and cotton are two of the major agricultural row crops produced in Louisiana. These crops have a long and rich production history in the state. Income from rice and cotton production supports an infrastructure of ginning and milling facilities located throughout the state, as well as supporting the local economies of many rural Louisiana communities. Although both crops are farm program commodities, with federal price supports available to help support and stabilize farm income, the financial structure and position of many rice and cotton farms is constantly being challenged by the effects of price and production risk. Producers are constantly seeking means of managing this price and production risk to help ensure the long term economic viability of their farming operations.

In 2002, the acreage planted to cotton in Louisiana was down from 848,738 acres in 2001 to 490,918 acres. This was the lowest acreage level since 1983 and was well below the 50-year average of 618,000 acres. The decline in acreage was caused primarily by lower prices and the challenges of cotton production in 2000 and 2001. Unpredictable weather resulted in below-average yields in these two years and forced many producers to seek alternative commodities. A substantial amount of cotton acreage has been replaced by acreage planted to corn. This decline came at a time when average cotton yields had increased every decade since the 1950s, with the exception of the 1970s, when it remained relatively stable (2002 Louisiana Summary, 2002).

The number of cotton producers in 2002 dropped to 2,049, down from 2,747 the previous year. There were 212,821 irrigated acres of cotton in 2002 and 278,097 acres of non-irrigated cotton. The irrigated cotton average yield was 794 pounds of lint per acre for a gross farm value of $50.7 million. Seed yield on irrigated cotton was 1,280 pounds per acre, producing additional income of $10.9 million. Non-irrigated cotton had a lint yield of 689 pounds per acre and a seed yield of 1,110 pounds per acre. The non-irrigated cotton lint gross farm income was $57.5

million, and the seed gross farm income was $12.4 million. The average lint yield per acre for irrigated and non-irrigated cotton was 734 pounds. The gross farm value of the 2002 cotton crop was $131.4 million (2002 Louisiana Summary, 2002).

Rice acreage in Louisiana decreased from 540,596 acres in 2001 to 531,791 acres in 2002. The primary causes of the decrease were low commodity prices for rice and government programs that favored other commodities. Acreage remains below the recent high figure of 640,000 in 1999 (2002 Louisiana Summary, 2002).

Average rice yield per acre was 5,772 pounds per acre in 2002, above average but well below the record 5,914 pounds per acre harvested in 2001. Part of the decrease in yield was the result of three tropical weather systems, including a hurricane which moved through the state. These weather systems all but wiped out an excellent looking second crop in southern Louisiana and delayed or completely prevented harvest of some of the northeastern Louisiana rice crop. Lower yields combined with fewer acres caused a drop in total production to 30,694,144 hundredweight in 2002, or about 1.2 million hundredweight less than 2001 (2002 Louisiana Summary, 2002).

The 2002 Louisiana rice crop, harvested by 1,715 producers, had a gross farm value of $122.8 million. Lower commodity prices suppressed gross farm value. Value added in marketing, processing, and transportation increased the value by $36.8 million, for a total value of $159.6 million. This was about 70 percent of the gross farm value of the 2001 crop. The number of producers fell by nearly 100 from the previous year, and continues to follow the trend of decreasing numbers of rice producers for the past 10 years (2002 Louisiana Summary, 2002).

As indicated by the drastic reductions in market prices brought about by the before mentioned factors in these two markets, it is imperative that farmers receive price supports in order to maintain positive cash flow. Currently in Louisiana, rice and cotton farmers require

more capital and resources per acre in order to produce these commodities. They are more dependent upon effective farm bill legislation and require more effective price support tools than those of other row crops. Risk management plays a vital role in the success of rice and cotton farmers in Louisiana.

Payment limitations put ceilings on payments to farm operations as a means of targeting benefits and reducing commodity program costs. The 2002 Farm Bill sets the payment limit for direct payments at $40,000 per person, with counter-cyclical payments at $65,000 per person. Marketing loan benefits are limited to $75,000 per person. The payment limitation on marketing loan gains and loan deficiency payments is $75,000 per person per crop year.

The three-entity rule is maintained. Under this rule, an individual can receive a full payment directly and up to a half payment from two additional entities. Thus, the maximum payment that an individual can receive is $360,000 per year. There are no current limits on the use of commodity certificates in conjunction with the commodity loan program other than the size of the farmer's loan eligible program. Recently, legislation has been introduced into Congress by Sen. Charles Grassley of Iowa that would cap farm program payments at around $225,000 per farmer and eliminate generic commodity certificates for cotton and rice.

In addition to the aid that price supports exact, another tool used in risk management is crop/revenue insurance. The next section will expand on the different types of crop/revenue insurance policies available and their predicted usages (USDA Risk Management Agency, 2003).

Types of Crop Insurance Programs Currently Available

There are several types of crop insurance or revenue insurance currently available to agricultural producers. The major types of insurance, yield based and revenue insurance plans,

are briefly described below. Some of the insurance types are basic minimal coverage polices, while others are policies designed to maintain higher levels of income coverage.

Yield Based (APH) Coverage

Multiple Peril Crop Insurance (MPCI): These policies insure producers against losses due to natural causes such as drought, excessive moisture, hail, wind, frost, insects, and disease. The farmer selects the amount of average yield he or she wishes to insure, from 50 to 75 percent (in some areas to 85 percent). The farmer also selects the percent of the predicted price he or she wants to insure, between 55 and 100 percent of the crop price established annually by RMA. If the harvest is less than the yield insured, the farmer is paid an indemnity based on the difference. Indemnities are calculated by multiplying this difference by the insured percentage of the established price selected when crop insurance was purchased.

Group Risk Plan (GRP): These policies use a county index as the basis for determining a loss. When the county yield for the insured crop, as determined by the National Agricultural Statistics Service (NASS), falls below the trigger level chosen by the farmer, an indemnity is paid. Payments are not based on the individual farmer's loss records. Yield levels are available for up to 90 percent of the expected county yield. GRP protection involves less paperwork and costs less than the farm-level coverage described above. However, individual crop losses may not be covered if the county yield does not suffer a similar level of loss. This type of insurance is most often selected by farmers whose crop losses typically follow the county pattern.

Revenue Insurance Plans

Group Revenue Insurance Policy (GRIP): GRIP makes indemnity payments only when the average county revenue for the insured crop falls below the revenue chosen by the farmer.

Adjusted Gross Revenue (AGR): **I**nsures the revenue of the entire farm, rather than an individual crop, by guaranteeing a percentage of average gross farm revenue, including a small

amount of livestock revenue. The plan uses information from a producer's Schedule F tax forms to calculate the policy revenue guarantee.

Crop Revenue Coverage (CRC): Provides revenue protection based on price and yield expectations by paying for losses below the guarantee at the higher of an early-season price or the harvest price.

Income Protection (IP): Protects producers against reductions in gross income when either a crop's price or yield declines from early-season expectations.

Revenue Assurance (RA): Provides dollar-denominated coverage by the producer selecting a dollar amount of target revenue from a range defined by 65-75 percent of expected revenue.

Catastrophic Coverage (CAT): Pays 55 percent of the established price of the commodity on crop losses in excess of 50 percent. The premium on CAT coverage is paid by the Federal Government; however, producers must pay a $100 administrative fee for each crop insured in each county. CAT coverage is not available on all types of policies.

Farmers may select from various types of policies; however, all too often these price support tools go unused due to the high premiums associated with the major policies. Rather than being utilized as a debt management tool, many farmers buy crop policies as a form of revenue adjustment. Claims are being paid out at higher than market prices for many commodities, thus causing the insurance companies to raise premiums. This cycle will continue unless measures are taken which will allow farmers to reduce their losses, while still maintaining stable premium levels.

A summary of crop/revenue insurance policies purchased by agricultural producers in Louisiana in 2002 is presented in Table 1.1. As evidenced by data in the table, the overwhelming majority of insurance policies purchased are basic yield coverage policies. Very

few of the buy up, revenue type policies have been purchased, primarily due to the higher cost of these policies.

Table 1.1 Louisiana Crop/Revenue Insurance Policies Purchased in 2002

Insurance Plan	Delivery	Number of Policies Sold	Net Acres Insured
APH	RBUP	9,322	1,114,630
APH	RCAT	11,059	1,309,911
CRC	RBUP	3,302	425,851
Dollar Amount	RBUP	8	0
Dollar Amount	RCAT	46	0
Fixed Dollar	RBUP	1	3
Fixed Dollar	RCAT	3	56
Group Risk Plan	RBUP	5	1,674
Totals		23,746	2,852,125

Source: Risk Management Agency, USDA.

Review of Literature

Insurance Program Incentives

While no one can question the benefits of crop insurance programs, some observers can still question as to whether these benefits are causing a strong influence on farmers' planting decisions (Young et al, 2001). In deciding between planting a risky crop and a hardier one, most farmers would choose the latter, simply because their production yield is more assured. Crop insurance can alter that. Farmers may make the decision to plant a different commodity based on the fact that he knows he will be insured if the crop fails. The premiums of the insurance policy could have a direct influence on this as well. The premium amount that a farmer pays is equal to Risk Management Agency (RMA) total premiums minus the expected subsidy. Before the crop is even planted, farmers can already realize an input cost savings. Commodities are classified into perspective categories based upon the premium paid for that crop. Subsidies are calculated

based on a percentage of the premium, so the higher the premium, the higher the subsidy. The general insurance premium is based upon three factors: the expected value of the crop (determined by Annual Production History or APH), its yield uncertainty as represented by the premium rate, and amount of coverage chosen. Therefore, the premium subsidy is a reflection of whether the crop is considered “high risk” or “low risk”, and “high value” or “low value”.

In order to determine the risk associated with each crop, an underwriter must determine the necessary information to elicit from the farmer. Underwriters use this information to assign a risk classification to potential policyholders. The intent is to assign each farmer to a specific classification where they are all exposed to the same amount of risk. For most federal crop insurance programs, policy holders are placed in these classes based upon expected yield-higher risk is associated with lower yields and vice versa. Those located in the higher risk classes must pay higher premiums in order to purchase a policy (Barnett and Coble, 1999).

It can also be argued that high premiums will discourage “low risk” farmers from taking part in crop insurance programs. Many times, “high risk” producers are paying too little for their protection, and “low risk” producers are paying too much. To make the policies more attractive, it is recommended that premiums need to reflect the farmers’ level of risk, instead of the average risk type for that particular commodity. To accomplish this, each individual farmer could measure their risk as a function of their yield and revenue variabilities, in conjunction with their APH (Young et al, 2001).

A second proposal to attract more farmers into purchasing crop insurance is the addition of more products. Everyone likes a variety to choose from, and in this case, farmers are no exception. In hopes of increasing the importance of crop insurance, the four following proposals would hope to provide better risk protection, maintain actuarial soundness, and improve the efficiency of resource allocation (Makki et al, 2001).

The first of these is Adjusted Gross Revenue Insurance (AGR). Its goal is to offer coverage on a whole-farm basis rather than just crop by crop. This method bases its coverage on the revenue generated from agricultural commodities included on Schedule F of the producer's Federal income tax return. It is calculated by multiplying the approved gross income and the coverage percentage level chosen by the farmer. This method would include all crops under one plan, instead of having multiple policies. AGR has two distinct advantages: limited market influence and wide-spread coverage. If a farmer has one policy that covers his entire farm, his production decisions would be less likely to be influenced by the coverage level of his crop insurance because all commodities hold the same amount of risk. As well, the safety net of this plan covers a wider range of farm sectors and could easily be incorporated into the dairy, livestock and poultry industries.

A program of tax-deferred savings accounts for farmers is another proposal to help producers manage their year-to-year income variability (Makki et al, 2001). This plan's main goal is to build a cash reserve by depositing money into the account during times of high profits, which could be utilized when income is low. Federal income taxes would be deferred until withdrawal. This tool would also cause little market distortion due to the slight impact on production decisions. As with other plans, this too has its strengths and weaknesses. This program is easy to follow and would be fairly inexpensive to maintain. As well, it would encompass those commodities that aren't covered by insurance. However, savings accounts require time to build up, a luxury that many farmers do not possess.

The third proposal is the implementation of area revenue insurance, or Group Risk Income Protection (GRIP). This policy would not cover individual farmers, but the entire county (or parish here in Louisiana). Indemnities are paid when the county production levels fall below a guaranteed level. This idea offers "safety in numbers", but you run into problems any time

there is an average taken in any situation. Those farmers who produce well above the average would suffer losses either way, while those sitting right at average would benefit from the misfortune of others (Makki et al, 2001).

Insurance policies are often based on acts of nature. Regional weather index insurance would serve to capitalize on these unforeseen conditions by basing its contracts on area yield, rainfall, soil moisture, temperature, or a combination of the before mentioned factors. The proposal is that insurance contracts would be sold in fixed units with a standard amount to be paid if one or more of the events occur. Farmers would be free to purchase as many policies as they wish and are not restricted to any certain commodity. The main advantage of this plan is that it is basically free from moral hazard and adverse selection problems. Farmers receive payments based on the weather conditions for that region, not upon their own individual losses. The terms are not farm specific, yet region specific. The drawback is that if weather is productive, you are bound to maintain your level of production no matter what other factors come into play.

Impact on Production Decisions

Resource allocation is a prime factor in determining which crops are grown in specific locales. Therefore, producer decisions are also going to change as we cross from region to region. Each farmer will account for different levels of risk based upon the crops he produces and the amount of capital he is able to invest into this venture.

The availability of crop insurance has allowed farmers to have some breathing room when it comes to production yields, but it has also created an incentive to expand production in order to maintain APH (Makki et al, 2001). If a farmer maintains a high APH, then the likelihood that he will receive subsidy payments is usually low. But on the same issue, if that same farmer were to experience a catastrophic loss one year, his subsidy payments would be much higher

than normal. If acreage allotments became a factor, farmers would possibly steer away from their traditional production decisions. With limited land, a producer would likely change the amount of each crop he plants in relation with the effect of insurance on relative net returns. If land was no constraint, then the farmer would hope to expand production.

The amount of crop insurance a particular producer buys is related to his preferences for risk (Makki et al, 2001). Those farmers who purchase the minimum coverage level generally have a higher risk-taking strategy and would be willing to take a chance on their crop(s) in exchange for paying less in premiums. They would consider any loss they receive as being equal to paying out a premium. However, those risk adverse producers generally purchase the highest amount of coverage available (Makki et al, 2001). Even though they are paying higher premiums, their utility is still maximized. These producers gain peace of mind from knowing that they are covered if ever in need. Studies show that those producers with higher APH usually purchase greater levels of coverage (Chambers & Quiggin, 2002).

Sadly, higher premiums are generally an effect of misuse of crop insurance policies by producers. Certain farmers will go into the contract already knowing, for whatever reason, that they will not reach their expected yield. Some even take steps to insure this outcome by not taking the appropriate steps needed to produce a successful crop. As insurers continue to pay out more and more in subsidy payments, they are forced to raise premiums in order to “keep their heads above water”. It is for this reason that most states in the U.S. have varying crop insurance rates. For example, counties in the Southern and Eastern United States tend to have higher rates than those in the Midwest (Goodwin et al, 2002).

Impact on Prices

To capture the potential cross-commodity, interregional, and intertemporal effects, market impacts were analyzed using the POLYSYS-ERS simulation model. This model was

designed to start with a collection of production variables and generate results on commodity supply, demand, ending stocks, prices, net returns, and government payments (Young et al, 2001). This simulation was conducted for eight crops: corn, grain sorghum, barley, oats, wheat, soybeans, rice, and cotton. The POLYSYS-ERS model was designed to take supply elasticities and use these to generate market clearing prices for each commodity. These prices are very responsive to flexibility due to the provisions that were made in the 1996 "Freedom to Farm" Act. These exercises were conducted for seven specific regions.

For the purpose of this study, the crop insurance program was divided into two categories: with and without the subsidies. These two groups were compared against each other to determine the specific price wedges that each category determines. These responses can also be likened to acreage changes. The amount of land that any particular farmer utilizes may be influenced by expected prices and marketing loan benefits. If the loan rate is lower than the market price, then farmers will tend to leave the loan unpaid and allow the government to keep the crop as repayment. However, if the market price is higher than the loan rate, then producers will sell at this market-clearing price and repay the amount of the loan. Higher prices for either marketing tool may affect how much acreage is planted.

The first step in determining specific price wedges for each region was to calculate expected net indemnity for alternative types of coverage. These numbers were estimated as total premium plus expected underwriting gains or losses. These gains or losses were calculated by multiplying the total premium by the ratio of indemnities to total premiums. These figures were calculated for three types of insurance: CAT (Catastrophic Risk Protection), APH, and Crop Revenue Coverage (CRC). A loss ratio greater than 1.0 means that total indemnities exceed total premiums. If the ratio is less than 1.0, then the opposite is true. In retrospect, it is estimated that farmers will insure more acres at higher levels of coverage, while increasing their buy-up of

revenue crop insurance. The above mentioned price wedges do not completely capture the full effects of the crop insurance program; however, it can be said that the amount of risk associated with acreage concerns is small in relation to the total picture.

While the effects of this study are in no way meant to be all inclusive, it should be pointed out that these results should be viewed as indicative of the current crop insurance program. A set of three qualifications should be mentioned when analyzing this data.

1) The net indemnities were calculated as averages across the three types of coverage insurance. Higher premiums were estimated for higher coverage levels, but this case may not be true for all rates across the board. Some rates for lower coverage rates tend to be higher in specific regions than they would be in others.
2) Payments made to farmers are received on a more irregular basis, and thus, may not affect income shifts as much as a change in market price. This may account for lower net returns than expected when the farmer is using this system.
3) The simulation does not capture the reduction of risk associated with the implementation of crop insurance. Since we cannot give this measure an actual monetary value, it is hard to put an exact cost on this benefit as it appeals to the farmer.

While the simulation does account for these factors, it cannot be said that the study is not representative.

Impacts on the Agricultural Sector

When we begin our first Agricultural Economics class, we are taught that the basic functions of the market revolve around supply and demand. However, once we progress into more complicated fare, we begin to understand that prices are composed of several other factors as well. Changes in the market can be influenced by insurance or added costs that tend to

fluctuate around the equilibrium price. Input costs would naturally increase because insurance can be reasoned as an input variable.

Over the years, premiums for varying levels of insurance coverage have decreased as subsidies have increased. Premium discounts have further reduced farmers' costs by from existing amounts on a yearly basis above the CAT level. The Agricultural Protection Act of 2000 increased the underlying subsidy rates, narrowed the difference in subsidy rates across coverage levels, and equalized the subsidy rates between the farm-level crop yield and farm-level crop revenue insurance programs (Young et al, 2001). With the encouragement of government policy writers, farmers are finding it more and more attractive to purchase crop insurance as a means to minimize risk, while at the same time, maximizing income. The positive impact can be felt throughout the sector with the expected stabilization or market prices due to this risk management tool. If each producer would choose to develop his management profile, it could create a windswept effect on the market and hopefully, bring some sanity to the chaotic world of production agriculture.

Problem Statement

Although several types of crop/revenue insurance programs, in addition to the basic catastrophic coverage, are available today for producers to use as a risk management tool, relatively few producers in Louisiana are actually buying these insurance policies. One of the biggest disadvantages of some of these revenue insurance policies has been their high cost. Cost of production crop insurance has been proposed as a low-cost risk management tool with the primary purpose of enhancing producers' ability to survive natural disasters and economic crisis by providing insurance coverage for a large portion of production costs while limiting the federal government's budget exposure to agriculture. However, there has been no research conducted on the potential ability of this type of risk management tool to support and stabilize farm income

for rice and cotton farms in Louisiana. No information is available on the effectiveness of cost of production crop insurance to support farm income for various sizes and types of farms.

Objectives

The general objective of this study is to evaluate the use of cost of production crop insurance as an income support tool for Louisiana rice and cotton farms. The specific objectives of this study are:

1. Review current commodity price support provisions, existing crop/revenue insurance program provisions, and provisions for proposed cost of production crop insurance.
2. Identify specific cost of production crop insurance programs to evaluate in the study.
3. Identify specific types of Louisiana rice and cotton farms to be included in the analysis.
4. Develop representative farming situation models to be utilized in analyzing the impact of alternative insurance programs on net farm income and cash flow.
5. Evaluate the impact of alternative cost of production crop insurance programs and selected crop/revenue insurance programs as an income support tool on farm financial structure and performance.

General Procedures

Various published information on the study of cost of production crop insurance will be reviewed for specifications of provisions. Present provisions for all policies will be reviewed, not only that of COP insurance, in order to illustrate the differences in coverage levels and premiums. Crop insurance industry personnel, Farm Bureau personnel, and others related to this matter will be contacted to obtain information regarding the specific impact that COP crop insurance would exact on the rice and cotton farmers of Louisiana. Their input will be used to evaluate the proposals and determine their effectiveness on the present problem.

Census of Agriculture data and other relevant data will be used to identify representative rice and cotton farming situations in Louisiana. Simulation models will be developed to evaluate the impact of present crop/revenue insurance policies versus that of cost of production crop insurance over a multi-year period.

A background of various crop insurance policies currently being utilized is presented in Chapter 2 along with a discussion of the general research procedures employed in this research study. Chapter 3 presents the results of per acre net income simulations of alternative levels of cost of production crop insurance policies compared with no insurance. Results are presented for cost of production crop insurance analysis for two major cotton-producing parishes and two major rice-producing parishes in Louisiana. A summary and conclusions of the research are presented in Chapter 4.

CHAPTER 2 – BACKGROUND AND PROCEDURES

The different types of crop insurance available to Louisiana farmers were briefly discussed in the previous chapter. However, this chapter will provide more insight into the workings of the various insurance programs, how indemnity payments are calculated, under what conditions can farmers utilize the coverage, and how premiums are determined. Methodological procedures utilized in this analysis are also presented.

Multiple Peril Crop Insurance

Multiple Peril Crop Insurance (MPCI), also known as Actual Production History (APH) insurance, protects against production losses from a wide range of natural causes. Producers can choose to insure their crops at levels ranging from 50 to 85 percent of their actual production history (APH) yield. These units can be insured at a price ranging from 60 percent to 100 percent of the insurable market price set by RMA each year.

If the farm's actual yield is less than the guaranteed yield, the MPCI payment is equal to the production deficit multiplied by the price election.

Premiums increase in direct proportion to the price coverage level selected, and at an increasing rate for higher yield guarantees. The level of government subsidy of the MPCI premiums ranges from 100 percent at the lowest yield and price coverage level (catastrophic) to over 38 percent at the maximum coverage level.

An MPCI policyholder establishes an actual production history (APH) yield based on the grower's actual verifiable production records for the most recent ten years on the insured unit. If the grower does not have ten years of production records, an APH yield can be based on as little as four years of yield data. Growers who cannot provide at least four years of actual production records are penalized by receiving less insurance protection per premium dollar. The APH yield is extremely important since it is used to determine both the dollar amount of protection being

purchased and also the yield threshold below which an indemnity will be paid to the policyholder (Barnett et al, 2000).

The indemnity payment from a typical APH insurance is given by:

$$(1)\ I = \max \{0, (Yg - Ya)\ Pg\}$$

where Yg is the guaranteed yield, Ya is the actual yield, and Pg is the guaranteed price (or elected price). The guaranteed price, Pg, is a certain fixed proportion of the expected price, which is usually USDA's projected farm-level price for the crop year. The guaranteed yield, Yg, is a certain fixed proportion of the expected yield (Ye), usually based on the average historical yield (Yahy) of each given farm, and the chosen coverage level:

$$(2)\ Yg = q * Ye = q * Yahy$$

where q is the chosen coverage level. CAT and APH contracts allow for basic units, which combine each of the fields of a crop under a single type of ownership arrangement, and optional units, which allow insurance by section line and practice (dry land versus irrigated crops) (Makki et al, 2001).

Catastrophic Insurance

Growers of eligible crops can obtain a catastrophic (CAT) MPCI policy by paying an administrative fee of $60 per crop per parish. The federal government fully subsidizes the insurance premium on CAT policies. The CAT policy pays indemnities equal to 55 percent of the expected market price on yield losses greater than 50 percent of expected yield. While the policy provides very minimal insurance protection – only 27.5 percent of the expected crop value would be covered in the event of a complete crop loss – the cost to growers is also very low (Barnett et al, 2000).

Growers may also choose to "buy-up" to higher levels of insurance protection. While CAT policies cover only 50 percent of the expected yield, buy-up policies are available that will

cover up to 75 percent of the expected yield. Coverage levels up to 85 percent are available in some regions, but not in the mid-South. CAT policies indemnify covered losses at 55 percent of expected market price, but buy-up policies will indemnify covered losses at up to 100 percent of expected market price (Barnett et al, 2000).

CAT offers partial protection against significant crop failures at a low cost, and is a useful option for producers with high risk-bearing ability. It replaces the ad hoc crop disaster programs offered by USDA in the past.

CAT policies are based on "basic" units which allow for the production of a given crop in a given county to be insured separately according to share-partners. Each share-rent partner constitutes a different basic unit. Owned land and cash-rented land together constitute a basic unit. Buy-up policyholders can further divide their production of a given crop in a given parish into subdivisions of basic units known as optional units. The criteria for establishing optional units varies across crops and geographic areas but typically require that parcels have separate USDA Farm Service Agency (FSA) serial numbers and/or be located in different sections (Barnett et al, 2000).

Policies on optional units are more likely to be indemnified than policies on basic units. As production is aggregated into larger and larger units, the law of large numbers ensures that there will be less variation in yield around the expected value. For this reason, buy-up policyholders who take advantage of optional units forego a premium discount available to those who are willing to insure their production at the basic unit level (Barnett et al, 2000).

Crop Revenue Insurance

Revenue insurance protects against reductions in both price and yield rather than yield alone. Three different individual revenue insurance plans are available to Louisiana producers.

Crop Revenue Coverage (CRC) is one of the most widely used crop insurance policies in Louisiana. Part of the revenue guarantee is based on the APH yield, just as for an MPCI policy. However, the insurable price level is equal to 100 percent of the average new crop futures market price during the month of February rather than the RMA expected price. The insurable price times the APH yield times the level of coverage chosen equals the gross income guarantee. Coverage options are 50, 55, 60, 65, 70, 75, 80, and 85 percent (Barnett et al, 2000).

If prices for the insured crop are higher by harvest time, the revenue guarantee increases accordingly, with no additional premium. The revenue guarantee cannot be lowered, however.

If the producer's actual gross revenue, calculated as the actual yield times 100 percent of the new crop futures price at harvest, is below the insured level an indemnity payment equal to the difference is paid. Thus, indemnity payments can be triggered by various combinations of low prices and low yields.

A similar plan is called *Income Protection***.** The Income Protection plan uses the new crop futures prices during February to set the level of gross income protection, but protection levels do not increase if prices rise by harvest. It insures all of a producer's acres as a single unit, whereas the CRC plan allows separate units for farms in different townships.

A third revenue insurance plan, called *Revenue Assurance* (RA), also guarantees a minimum gross income per acre for the selected crops. The price used to calculate the income guarantee is also the average of the new crop futures price in February. The yield levels used to calculate the guaranteed revenue per acre can range from 65 to 85 percent of the APH yield.

The fall price used to calculate the actual revenue is the average futures market closing price during the seasonal month for that particular commodity. Under the standard RA contract the revenue guarantee does not increase if prices rise between February and harvest. RA does

offer an increased guarantee when prices rise as an option. However, premium costs will generally be lower without this feature (Barnett et al, 2000).

CRC, RA, and IP are revenue insurance plans that protect the farmer from lost revenue caused by low yields, low prices, or a combination of both. They are all based on the farmer's historical average yield and futures prices, but differ somewhat in their specific design and operation. CRC provides replacement-cost protection to producers in addition to a revenue guarantee.

Indemnities are paid if the producer's calculated revenue (based on his or her actual yield in that year, multiplied by the harvest-time quote on the harvest time futures contract) falls below the predetermined guarantee level (based on the coverage level chosen by the producer, the farmer's average historical yield, and the higher of the planting-time quote or the harvest time quote on the harvest-time futures contract). In other words, under a typical CRC contract, the indemnity payment is defined by:

$$(3)\ I = MAX\ \{0, (\ Yg\ \max(Pg\ ,\ Pm) - Ya\ Pm\ )\ \}$$

where Pm is the harvest futures market quote on the harvest-time futures contract, Pg is the planting-time quote on the harvest-time futures contract, Yg is the guaranteed yield, and Ya is the actual yield. Since CRC uses the higher of the planting-time price for the harvest-futures contract or the actual-futures contract quote at harvest in setting the guarantee, the producer's revenue guarantee may actually increase over the season. This is because CRC allows producers to purchase "replacement bushels" if yields are low and prices increase during the season. CRC, which allows for enterprise units, basic unit, and optional unit coverage, has rapidly expanded to all major crops in major growing areas (Makki et al, 2001).

RA and IP also protect farmers against reductions in gross income when either prices or yields decrease during the crop year from early-season expectations. Indemnity amounts are determined by individual farm yields and harvest-time futures prices:

$$(4)\ I = MAX\ \{0, (\ Yg\ Pg - Ya\ Pm\ )\ \}$$

where Pm is the harvest futures market quote on the harvest-time futures contract, Pg is the planting-time quote on the harvest-time futures contract, Yg is the guaranteed yield, and Ya is the actual yield.

There are, however, key differences between RA and IP contracts. RA provides the option of enterprise level farm insurance (where the guarantee is based on expected revenue from all the farmer's acreage in a given crop in the parish) as well as whole farm insurance (where the guarantee is based on the expected revenue from multiple crops grown by the farmer in a given parish). RA also allows both basic unit coverage (where the insurance contract is based on ownership and parish) and optional unit coverage (where the insurance contract is based on ownership, farming practice, parish, and section line) (Makki et al, 2001).

IP is offered only on the basis of enterprise units, meaning that all fields of a crop which a farmer owns or has a share of the commodity in the county are combined into one unit. IP and RA (without the HP option) offer exactly the same coverage if the farmer chooses enterprise units. IP and RA also differ in the way price guarantees are set. The IP revenue guarantee is based on the futures price with no basis adjustment (using an average of Chicago Board of Trade (CBOT) February price quotes for the December contract), while the RA guarantee is based on an approximate local price (the December price adjusted for a county factor). In both cases, indemnities are paid if the producer's gross income falls below the predetermined guarantee (Makki et al., 2001).

Group Risk Plan

Group Risk Plan (GRP) insurance protects producers against a widespread crop failure. If the average yield for the parish in which the insured crop is located falls below the trigger level chosen, the producer receives a payment, regardless of the farm's individual yield.

Policies with trigger levels of 70 to 90 percent of the long-term expected parish yield can be purchased. Rather than selecting a price guarantee, the producer selects a dollar value of coverage per acre. The maximum dollar value that can be chosen is equal to 150 percent of the guaranteed county yield multiplied by the current RMA expected market price. Premiums increase in direct proportion to the dollar coverage selected, and at an increasing rate for higher trigger yields (Barnett et al, 2000).

Gross revenue can also be insured under a group risk policy. This plan is known as Group Risk Income Protection, or GRIP. The income guarantee level is based on the parish expected yield and the average futures price during the last 5 days of February. Likewise, the actual gross revenue is based on the actual parish yield and the average futures price at harvest. Trigger levels and indemnity payments for GRIP are calculated in a manner similar to that used for GRP.

The GRP and GRIP policies generally have lower premiums than comparable MPCI coverage, and do not require any farm production history. This makes them attractive to producers who have no production records, or a low APH yield. Producers whose farm yields closely follow the year-to-year pattern of the county averages received the most risk protection from GRP. Because payments are not based on individual farm yields, however, some short-term yield risk remains. Generally, GRP and GRIP will result in smaller, but more frequent indemnity payments (Barnett et al, 2000).

GRP is a yield insurance product, but is tied to the parish average yield rather than the individual farm yield. GRP contracts provide indemnity payments when the county average yield (Yc) drops below a critical or guaranteed level, regardless of the yield of the individual farmer:

$$(5)\ I = \max \{0, (Yg - Yc)\, Pg\}.$$

This indemnity function is similar to equation (1), except that the individual farm yield is replaced by the parish yield and the critical yield is estimated based on past parish yield histories.

Table 2.1 Comparison of Crop Insurance Policies

	MPCI	CAT	GRP	CRC	RA
Insures Against	Individual production risk	Individual production risk	Parish production risk	Individual production risk	Individual production risk
Yield coverage	50 to 85 % of APH yield	50% of APH yield	70 to 90% of parish yield	50 to 85% of APH yield	65 to 85% of APH yield
Price coverage	60 to 100% of RMA price	55% of RMA price	90 to 150% of RMA price	Higher of futures price in Feb. or at harvest	Futures price in Feb. or higher of futures price in Feb. or at harvest
Results on which indemnity payments are based	Actual yield	Actual yield	Parish average yield	Actual yield and futures price at harvest	Actual yield and futures price at harvest
Insurable units	Basic and optional units	Basic units	Enterprise units	Basic, optional and enterprise units	Basic, optional, enterprise and whole farm units
Coverage available	50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%	50%	70%, 75%, 80%, 85%, 90%	50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%	65%, 70%, 75%, 80%, 85%

GRP buyers can insure up to 90 percent of the expected parish yield at up to 150 percent of the expected price. A brief summary of the various crop insurance policies is presented in Table 2.1, showing type of insurance, yield coverage, basis of indemnity payments, insurable units, and coverage available (Makki et el, 2001).

Insurance Analysis Procedures

Cost of production crop insurance for rice and cotton was analyzed on a per acre basis over a multi-year period in this study. Historical rice and cotton parish yields from leading production parishes were utilized in the analysis. Cotton production in Franklin and Tensas Parishes and rice production in Acadia and Vermilion Parishes were evaluated. Gross returns, variable production costs, net returns above variable costs, fixed production costs, and net returns above total specified production costs were estimated for each crop over the 2004-2008 period. Gross returns per acre included market returns as well as government payments (direct payments, counter cyclical payments and loan deficiency payments). Variable and fixed production costs for representative cotton and rice production situations were taken from current published estimates and then adjusted for yield differences (Appendix).

Random prices and yields were generated over a five-year projection period. These price and yield projections were based on historical observations from the previous ten-year period, 1993-2002 (USDA, NASS). Random prices and yields were simulated using a procedure developed by No and Salassi (2004). Mean price levels over the projection period were set at their historical mean levels. Rice and cotton mean yield levels in the projection period were based on trend regression estimates. Net income above production costs were simulated over a five-period for 1,000 replications. Summary statistics and other measures were developed based on the results of these simulations.

Alternative cost of production insurance cases analyzed included various coverage levels of variable and fixed production expenses. Coverage levels analyzed ranged from 70 percent to 90 percent of total specified expenses. These coverage levels were based on a specified percentage of current year production costs. Premiums for each level of coverage were assumed to be four percent of historical production costs (assumed to be the 2004 published cost projections), with one-half of the premium cost subsidized by the federal government. As a result, actual producer premium costs were determined at two percent of covered costs.

Insurance indemnity payments in a given year were calculated using the following equation:

$$(6)\quad COPPMT_{CL,YR} = MAX\ (0, ((COST_{YR} * CL\%) - INCOME_{YR}))$$

where $COPPMT_{CL,YR}$ is the cost of production insurance indemnity payment per acre at coverage level CL in year YR, $COST_{YR}$ is the total production cost per acre in year YR, CL% is the coverage level percentage and $INCOME_{YR}$ is the total gross income per acre. Summary statistics utilized to evaluate the various coverage levels included: net present value of net returns above variable and totals costs over a five-year period, percent of time a crop insurance indemnity payment is made, and percent of time net returns above variable and fixed costs were negative. Net present value of net returns above variable and total production costs over a five-year period were calculated using a five percent discount rate. Percent of time net returns were negative and percent of time a cost of production crop insurance indemnity payment was generated are calculated for the number of years out of the five-year projection period.

CHAPTER 3 - RESULTS

This chapter presents results of simulation analysis of cost of production crop insurance for rice and cotton farming situations in Louisiana. Simulation of net returns above variable costs and total costs of production were evaluated on a per acre basis for major rice and cotton producing parishes. Results for the two major cotton-producing parishes, Franklin and Tensas, are presented as well as results for the two major rice producing parishes, Vermilion and Acadia.

Franklin Parish Cotton Results

Table 3.1 presents the results of 1,000 simulation runs that were calculated using various production factors. These particular results are only pertinent to cotton farmers in Franklin parish, as ten year historical prices and yields were used to calculate these values. All simulations were done assuming equivalent risk, with the only difference being the levels of COP coverage. All values are done on a per acre basis. The base case was done for those farmers who chose not to purchase any insurance. Mean net returns over variable costs were found to be $301.79 per acre, with net returns over total costs equaling -$92.68 per acre. This indicates that with no insurance at equivalent risk, average returns for the five year period would not be

Table 3.1 Net present value of net returns over five-year period, cotton, Franklin Parish, projected trend mean cotton yields with equivalent risk.

Type of insurance	NPV[1] of net returns above variable costs		NPV[1] of net returns above total costs	
	Mean	Std. Dev.	Mean	Std. Dev.
No insurance	301.79	130.77	-92.68	130.77
70% COP	271.02	130.72	-123.45	130.72
75% COP	270.80	129.38	-123.80	129.38
80% COP	276.46	124.62	-118.07	124.62
85% COP	294.55	114.29	-99.92	114.29
90% COP	329.43	98.78	-65.04	98.78

[1] NPV = net present value

enough to cover total cotton production costs, based on parish average cotton yields and published production costs. Standard deviation for this scenario is $130.77 per acre. This standard deviation estimate is applicable to both net returns over variable costs and net returns over total costs since the only difference between the two values are fixed costs per acre which are assumed to be constant in this study. The percentage of negative net returns was also determined using the simulation results. Still assuming no insurance, variable net returns were negative 40.6 percent of the time for one year out of five, 18 percent of the time for two years of five, 3.6 percent for three of five, and 0.5 percent of the time for four years of five (Table 3.2). Only 37.3 percent of the time were no negative variable returns calculated. The percentage of negative total returns was much larger than those of the variable – only 0.6 percent of the time were no negative returns over total costs calculated. Approximately 4.9 percent of the time returns were negative for one year out of five, 21.4 percent of the time for two years out of five, 37 percent for three of five, 28.9 percent of the time for four years out of five, and 7.2 percent for all five years.

Table 3.2 Percent of time net returns are negative over a five-year period, cotton, Franklin Parish, projected trend mean cotton yields with equivalent risk.

Type of insurance	Number of years with negative net returns over 5-year period					
	0	1	2	3	4	5
	Net returns above variable costs					
No insurance	37.3%	40.6%	18.0%	3.6%	0.5%	-
70% COP	29.4%	41.6%	22.6%	5.4%	0.9%	0.1%
75% COP	28.6%	41.6%	23.2%	5.6%	0.8%	0.2%
80% COP	28.1%	41.0%	24.0%	5.8%	0.9%	0.2%
85% COP	100.0%	-	-	-	-	-
90% COP	100.0%	-	-	-	-	-
	Net returns above total costs					
No insurance	0.6%	4.9%	21.4%	37.0%	28.9%	7.2%
70% COP	0.6%	4.1%	18.9%	35.5%	32.1%	8.8%
75% COP	0.6%	4.0%	18.7%	35.5%	32.3%	8.9%
80% COP	0.5%	4.1%	18.7%	35.2%	32.6%	8.9%
85% COP	0.5%	3.8%	18.7%	35.3%	32.7%	9.0%
90% COP	0.5%	3.8%	18.4%	35.3%	32.8%	9.2%

Those cotton farmers in Franklin parish who chose the 70 percent coverage level for COP insurance saw a decrease of $30.77 per acre in both NPVRVC and NPVRTC due to increased costs for premiums paid (Table 3.1). Returns over variable costs fell to $271.02 per acre, with returns over total costs falling to -$123.45 per acre. Standard deviation only decreased slightly to $130.72 per acre. At 70 percent coverage, indemnity payments were made only 1.8 percent of the time for one year out of five (Table 3.3), with no payments being made 98.2 percent of the time. With such few indemnity payments being made, the percentage of negative net returns increased from the base case. Net returns above variable costs were negative 41.6 percent of the time for one year out of five, 22.6 percent of the time for two years of five, 5.4 percent of the time for three of five, and 1 percent for four or more years (Table 3.2). Again, only 0.6 percent of the time was returns above totals costs not negative. Approximately 4.1 percent of the time they were negative for one year out of five, 18.9 percent for two years out of five, 35.5 percent for three of five, 32.1 percent for four years out of five, and 8.8 percent for all five years.

An increase in coverage to 75 percent increased the amount of indemnity payments being paid by 15.1 percent (Table 3.3). While 83.1 percent of the time saw no payments being made, they were paid 16.1 percent of the time for one year out of five, and 0.7 percent of the time for two of five. Net returns continued to fall under 75 percent coverage, although not significantly. NPVRVC decreased $0.22 per acre to $279.80 per acre (Table 3.1). NPVRTC reduced by $0.35 per acre to -$123.80 per acre. These declines are most assuredly not positive, but the reduction in standard deviation is positive in this case. Standard deviation shrank to $129.38 per acre, $1.34 per acre less than 70 percent coverage. While yield risk for this scenario became smaller, it had little effect on net returns. Only 28.6 percent of the time did net returns above variable costs remain positive (Table 3.2). Net returns were negative 41.6 percent of the time for one year of five, 23.2 percent of the time for two years out of five, 5.6 percent for three of five years, 0.8

percent of the time for four years, and 0.2 percent for all five years. Net returns above total costs maintained the same values as that of the 70 percent coverage level.

Table 3.3 Percent of time cost of production crop insurance indemnity payment is made over a five-year period, cotton, Franklin Parish, projected trend mean cotton yields with equivalent risk.

Type of insurance	Number of years indemnity payment is made over 5-year period					
	0	1	2	3	4	5
70% COP	98.2%	1.8%	-	-	-	-
75% COP	83.1%	16.1%	0.7%	-	0.1%	-
80% COP	51.0%	38.7%	9.3%	0.9%	0.1%	-
85% COP	23.4%	38.7%	27.0%	9.3%	1.4%	0.2%
90% COP	6.8%	24.6%	33.1%	25.8%	9.0%	0.7%

While net returns for 80 percent coverage were still lower than no insurance, they did increase from that of 75 percent coverage. NPVRVC rose 2 percent to $276.46 per acre, with NPVRTC increasing 5 percent to -$118.07 per acre (Table 3.1). Standard deviation decreased to $124.62 per acre, 4 percent less than the 75 percent coverage level. Percentage of years with negative returns remained fairly close to that of the previous level at 71.9 percent (Table 3.2). 41 percent of the time saw negative variable returns for one year out of five, 24 percent of the time for two years of five, 5.8 percent for three of five, 0.9 percent of the time for four years of five, and 0.2 percent for all five years. Net returns over total costs again were again negative for 99.5 percent of the time, with the highest percentages coming at 35.2 percent of the time for three of five years and 32.6 percent for four of five years. Decreased positive returns causes a need for increased indemnity payments. No indemnity payments were made only 51 percent of the time, down from 83.1 percent from the previous coverage level (Table 3.3). Instead, payments were made 38.7 percent of the time for one year out of five, 9.3 percent of the time for two years of three, and 1 percent for three or more years.

Net returns continue to trend upward as coverage levels rise, as is evidenced when coverage increases to 85 percent. NPVRVC rose to $294.55 per acre, $18.09 per acre more than 80 percent coverage (Table 3.1). NPVRTC improved by $18.15 per acre to -$99.92 per acre. Price risk fell 8 percent, as standard deviation decreased to $114.29 per acre. During this five year period, net returns above variable costs were always positive (Table 3.2). However, net returns over total costs cannot make that same claim; only 0.5 percent of the time were they positive. Approximately 3.8 percent of the time they were negative for one year out of five, 18.7 percent of the time for two years of five, 35.3 percent of the time for three years out of five, 32.7 percent for four of five, and 9 percent of the time for all five years. Under 85 percent coverage, the highest amount of indemnity payments generated were 38.7 percent of the time for one year out of five and 27 percent for two years of five (Table 3.3). The remaining payments were stretched out as 9.3 percent of the time for three years of five, 1.4 percent for four years and 0.2 percent for five years.

No negative returns were calculated for variable costs at 90 percent coverage (Table 3.2). Returns above total costs remain the same as 85 percent coverage, with only 0.5 percent of returns being positive. This evidence is reinforced when viewing net present values of these same variables. NPVRVC increased $34.88 per acre over 85 percent coverage and $27.64 per acre over the base case, to $329.43 per acre (Table 3.1). NPVRTC escalated to -$65.04 per acre, with standard deviation falling to $98.78 per acre – a decrease of $31.99 per acre from the base case. Indemnity payments also reached their highest levels of this scenario. Only 6.8 percent of the time were no payments generated (Table 3.3). Just under 25.0 percent of the time saw payments for one year out of five, 33.1 percent of the time for two years out of five, 25.8 percent for three of five years, 9 percent for four years, and 0.7 percent for all five years.

Table 3.4 Net present value of net returns over five-year period, cotton, Franklin Parish, projected trend mean cotton yields with greater yield risk.

Yield risk increase	Type of insurance			
	No insurance	70% COP	80% COP	90% COP
Base case:				
Mean NPVRVC[1]	301.78	271.02	276.46	329.43
Mean NPVRTC[2]	-92.68	-123.45	-118.07	-65.04
Std. Dev.[3]	130.77	130.72	124.62	98.78
25% greater risk:				
Mean NPVRVC[1]	303.12	273.03	284.57	341.31
Mean NPVRTC[2]	-91.35	-121.43	-109.89	-53.15
Std. Dev.[3]	144.07	143.56	133.80	106.44
50% greater risk:				
Mean NPVRVC[1]	304.45	276.50	293.50	353.63
Mean NPVRTC[2]	-90.01	-117.97	-100.97	-40.83
Std. Dev.[3]	158.70	156.57	143.91	115.39
75% greater risk:				
Mean NPVRVC[1]	305.78	282.07	303.14	366.22
Mean NPVRTC[2]	-88.69	-112.40	-91.32	-28.24
Std. Dev.[3]	174.32	169.23	154.70	125.34
100% greater risk:				
Mean NPVRVC[1]	307.11	288.60	313.55	379.02
Mean NPVRTC[2]	-87.36	-105.86	-80.91	-15.45
Std. Dev.[3]	190.69	182.14	165.93	136.09

[1] NPVRVC = net present value of net returns above variable costs per acre.
[2] NPVRTC = net present value of net returns above total costs per acre.
[3] Std. Dev. = standard deviation of net returns above variable costs and total costs per acre.

In Table 3.4, the levels of cotton yield risk were varied from 25 percent to 100 percent of the parish historical mean cotton yield risk in order to evaluate the performance of COP crop insurance for increased yield risk at various levels of coverage. The increased yield risk levels evaluated essentially represent the change in the coefficient of variation of the cotton yield per acre. Over a five year period with average yield risk, cotton farms in Franklin parish with no COP insurance were expected to have an estimated mean net present value of returns over variable costs of $301.78 per acre. For the same scenario, the net present value of returns over total costs was actually negative at -$92.68 per acre. The standard deviation of net returns for this

scenario was estimated to be $130.77 per acre, based on 1,000 simulations of cotton prices and yields over the five-year period.

With a 70 percent COP coverage level, mean NPVRVC decreased by 10.2 percent to $271.02 per acre in the base yield risk case. Mean NPVRTC decreased to -$123.45 per acre. This mean net return reduction is due primarily to the reduction in net returns resulting from the additional cost of COP insurance premiums paid. Insurance indemnity payments, received as income, were minimal in this scenario. At the 70 percent COP coverage level, crop insurance indemnity payments were made only 1.8 percent of the time in only one year out of five (Table 3.5). No indemnity payments were made 98.2 percent of the time under this scenario.

At the 80 percent COP coverage level, crop insurance indemnity payments were received a larger percent of the time than with the 70 percent coverage level. Indemnity payments were paid out 49 percent of the time at the 80 percent coverage level (Table 3.5). Simulated indemnity payments were received one year out of five 38.7 percent of the time, two years out of five 9.3 percent of the time and three years out of five 0.9 percent of the time. Although mean net returns were lower than the no coverage case, they were greater than estimated returns for the 70 percent coverage case (Table 3.4). At the 80 percent coverage level, mean NPVRVC were estimated to be $276.46 per acre, 8.4 percent below the no insurance case, but were $5.44 per acre greater than mean net returns for the 70 percent coverage case. Mean NPVRTC were -$118.07. Although still negative, they were greater than the 70 percent coverage case. The standard deviation of net returns decreased slightly to $124.62.

Estimated net returns above cotton production costs per acre exhibited the greatest improvement under the 90 percent COP coverage case. Estimated mean NPVRVC were $329.43 per acre, significantly higher than the estimates for the 70 percent and 80 percent case and 9.2 percent higher than the no insurance case. Mean NPVRTC, although still negative based on

assumed production costs, showed significant improvement. At the 90 percent coverage level, COP insurance indemnity payments were received 93.2 percent of the time. Payments were made in one year out of five 24.6 percent of the time, two years out of five 33.1 percent of the time, three years out of five 25.8 percent of the time, four out of five 9.0 percent of the time, and five years out of five 0.7 percent of the time (Table 3.5). Standard deviation of net returns was reduced by 24.4 percent from the no insurance case to $98.78 per acre. Net income risk was reduced significantly as estimated coefficient of variation for mean NPVRVC at the 90 percent coverage level was 30.0 percent, compared to 43.3 percent for the no insurance case.

Over a five year period with 25 percent greater yield risk, cotton farmers in Franklin parish with no COP coverage were expected to have a mean NPVRVC of $303.12 per acre. This is an improvement from that of farmers with normal risk by $1.34 per acre. Mean NPVRTC continues to be negative at -$91.35 per acre; however, this improvement indicates that the ability to begin covering returns over total costs goes hand-in-hand with greater yield variability. Standard deviation increases 10 percent, to $144.07 per acre. This translates to greater variability about the mean for those farmers whose yields tend to fluctuate widely from year to year.
A Franklin parish cotton farmer who chose at least a 70 percent coverage level saw NPVRVC decrease to $273.03 per acre, with NPVRTC declining to -$121.43 per acre (Table 3.4). An decrease in standard deviation to $143.56 per acre, down from $144.07 per acre in the no insurance case, exhibits the risk minimization power of COP insurance when greater yield risk is introduced into the equation. With greater yield variabilities comes a higher incidence of indemnity payments. Payments were only made 8.9 percent of the time in one year out of five, with 0.4 percent made in 2 years out of five (Table 3.5). No payments were made 90.7 percent of the time, but this is a 7.6 percent decrease from the base case when no payments were made 98.2 percent of the time.

Table 3.5 Percent of time cost of production crop insurance indemnity payment is made over a five-year period, cotton, Franklin Parish, projected trend mean cotton yields with greater yield risk.

Yield risk increase	Number of years indemnity payment is made over 5-year period					
	0	1	2	3	4	5
Base case:						
70% COP	98.2%	1.8%	-	-	-	-
80% COP	51.0%	38.7%	9.3%	0.9%	0.1%	-
90% COP	6.8%	24.6%	33.1%	25.8%	9.0%	0.7%
25% greater risk:						
70% COP	90.7%	8.9%	0.4%	-	-	-
80% COP	42.9%	41.0%	13.7%	2.3%	0.1%	-
90% COP	6.4%	25.5%	32.8%	25.7%	8.8%	0.8%
50% greater risk:						
70% COP	76.9%	21.1%	1.9%	-	0.1%	-
80% COP	38.4%	41.7%	16.3%	3.1%	0.4%	0.1%
90% COP	0.7%	25.0%	33.2%	25.1%	8.9%	0.8%
75% greater risk:						
70% COP	68.6%	27.9%	3.3%	0.1%	0.1%	-
80% COP	32.7%	42.4%	19.5%	4.6%	0.7%	0.1%
90% COP	7.3%	25.7%	32.5%	24.9%	8.8%	0.8%
100% greater risk:						
70% COP	63.1%	31.4%	4.9%	0.5%	0.1%	-
80% COP	28.3%	41.7%	22.7%	6.1%	1.0%	0.2%
90% COP	7.9%	24.6%	32.6%	25.1%	9.1%	0.7%

Indemnity payments saw a significant increase under 80 percent coverage. In this scenario, payments were made more than 50 percent of the time, with 41 percent coming one year out of five, 13.7 percent two years out of five, and 2.4 percent made three or more years out of five (Table 3.5). Only 42.9 percent of the time saw no payments being made. NPVRVC were again lower than that of the base case, but at $284.57 per acre, were $11.54 per acre higher than mean net returns for 70 percent coverage. Mean NPVRTC also saw a 9.5 percent increase to -$109.89 per acre (Table 3.4). The increased level of insurance decreased the standard deviation even further at $133.80 per acre, down almost $10 per acre from 70 percent coverage.

Mean net returns for variable and total costs saw their peak in the 25 percent greater risk group at the 90 percent coverage level. NPVRVC was $341.31 per acre and NPVRTC was -$53.15 per acre, considerably higher than the two previous coverage levels, and $38.19 per acre higher than the no insurance scenario (Table 3.4). Most importantly, the increased coverage level knocked the standard deviation down to $106.44 per acre, reducing yield risk by 26 percent from the no insurance case. Along with higher net returns per acre, it was also found that indemnity payments were made more often in this period of coverage than any other under the 25 percent greater risk category. Only 6.4 percent of the time was it not necessary to make any payments (Table 3.5). Approximately 25.5 percent of payments were made one year out of five, 32.8 percent were paid out 2 years of five, and 25.7 percent were made three years out of five. Only 8.8 percent of payments were made four years out of five, with 0.8 percent being made all five years.

Fifty percent greater yield risk was introduced into the equation for the next set of scenarios. In the instance where no insurance was purchased, it was discovered that mean NPVRVC increased slightly from that of 25 percent greater risk to $304.45 per acre (Table 3.4). Mean NPVRTC also increased to -$90.01 per acre. Both increases were just a little over a dollar per acre; hardly enough to justify risking another drastic increase in yield risk with no crop protection.

Indemnity payments were received 23.1 percent of the time at the 70 percent coverage level (Table 3.5). Indemnity payments were made 21.1 percent of the time one year out of five, 1.9 percent of the time for two years out of five, and 0.1 percent of the time four years out of five. No payments were made 76.9 percent of the time under this coverage. Net returns decreased from the no insurance case due to an increase in COP premiums, as NPVRVC was $276.50 per acre and NPVRTC was -$117.97 per acre (Table 3.5). Standard deviation decreased as well,

lowering $2.13 per acre to $156.57 per acre. Even though the change is not considerable, it continues to demonstrate the ability of COP insurance to counteract the variability of increases in yield risk.

Under 80 percent coverage, net returns were on the rebound after the decreases seen in the 70 percent level, but were still less than those found in the no insurance case. NPVRVC increased 6 percent to $293.50 per acre (Table 3.5). Returns over total costs doubled that, increasing 14 percent to -$100.97 per acre. For the same scenario, the standard deviation decreased significantly to $143.91 per acre. Indemnity payments increased greatly at the 80 percent coverage level; only 38.4 percent of the time was no payments made (Table 3.5). Approximately 41.7 percent of the time payments were made one year of five, 16.3 percent of the time two years of five, 3.1 percent of the time three years of five, and 0.5 percent of the time indemnities were paid out four or five years.

Farmers who chose the 90 percent coverage level received indemnity payments 99.3 percent of the time – 25 percent of the time was one year out of five, 33.2 percent of the time was two years out of five, three years out of five 25.1 percent of the time, 8.9 percent of the time four years of five, and all five years for 0.8 percent of the time (Table 3.5). This large increase in indemnity payments leads to increased net returns. NPVRVC jumped to $353.63 per acre, $60.13 per acre greater than the 80 percent coverage level case and $49.18 per acre more than no insurance (Table 3.4). NPVRTC improved to -$40.83 per acre, $60.14 per acre more than 80 percent coverage and $49.18 per acre more than no insurance. The lowest standard deviation for the 50 percent greater risk category can also be found at the 90 percent coverage level. This decrease was 20 percent less than 80 percent coverage, 26 percent less than 70 percent coverage, and 27 percent less than no insurance.

Increasing yield risk to 75 percent greater than normal gave us a NPVRVC of $305.78 per acre for the base case, only $1.33 per acre more than the 50 percent risk category (Table 3.4). Net returns over total costs calculated to -$88.69 per acre, another minimal increase of $1.32 per acre over the base case. This 25 percent increase in risk from the previous scenario causes the standard deviation to increase due to the larger yield risk. This value was $174.32 per acre, a 9 percent increase over no insurance.

With every increase in yield risk, there comes an increase in the amount of indemnity payments. At the 70 percent coverage level for 75 percent greater risk, 68.6 percent of the time no payments are made (Table 3.5). 27.9 percent of the time payments are made one year of five, with less than 5 percent being paid two or more years out of five. As has been the case for the other levels of risk, net returns decreased in both categories. NPVRVC was $282.07 per acre, with NPVRTC totaling -$112.40 per acre (Table 3.4). However, yield risk took a hit as standard deviation decreased $5.09 per acre from the base case to $169.23 per acre.

The highest percentage of simulated indemnity payments for the 80 percent coverage level under 75 percent greater yield risk were received 42.4 percent of the time for one year out of five (Table 3.5). Payments were generated for 19.5 percent of the time for two years out of five, 4.6 percent of the time for three of five, 0.7 percent of the time for four of five, and 0.1 percent for all five years. While net returns were still less than the base case, they increased 7 percent over the 70 percent coverage level to $303.14 per acre (Table 3.4). NPVRTC increased as well, jumping 19 percent higher than 70 percent coverage to -$91.32 per acre. The only category that decreased was standard deviation, and this remains a positive situation. This value decreased to $154.70 per acre, 9 percent larger than the 70 percent coverage and 11 percent greater than the base case.

The most profitable coverage level in this scenario was 90 percent coverage. Net returns totaled $366.22 per acre and -$28.24 per acre, roughly $60.44 per acre each more than the case with no insurance (Table 3.4). These returns also showed significant improvements over the 70 percent and 80 percent coverage levels. Standard deviation for this coverage level was $125.34 per acre. This value reduced the net income risk for 90 percent coverage to 34 percent, down from 57 percent for the base case. The highest amount of indemnity payments for this amount of yield risk can be found within this coverage level. Only 7.3 percent of the time were no indemnity payments not made (Table 3.5). Exactly 25.7 percent of the time indemnities were paid one year out of five, with 32.5 percent paid two years of five. Approximately 24.9 percent of the time saw payments being made three years, 8.8 percent of payments were made four years of five, and 0.8 percent were made all five years.

By increasing yield risk to 100 percent greater than normal, mean net returns naturally increased as well. NPVRVC grew to $307.11 per acre for the base case – only a $1.33 per acre increase over the previous risk level of 75 percent with no insurance (Table 3.4). NPVRTC increased by the exact same dollar amount to -$87.36 per acre. After taking note of all four scenarios of various risk levels within the base case, it is evident that without additional income, cotton farmers in Franklin parish will not be able to meet their total costs. As well, the variability of the yield risk for this set of data, with a standard deviation of $190.69 per acre, indicates that losses could be much higher than estimated.

Increasing the yield risk to 100 percent greater than normal also caused various changes in indemnity payments, as are evidenced in Table 3.5. Under 70 percent coverage at this level, payments were made 36.9 percent of the time. The highest occurrences of payments were made 31.4 percent of the time for one year of five. Payments were also made 4.9 percent of the time for two years out of five, and less than 1 percent for three or more years. Returns over variable

costs were found to be $288.60 per acre, with returns over total costs totaling -$105.86 per acre (Table 3.4). Standard deviation decreased as well, falling 4 percent to $182.14.

NPVRVC was found to be $313.55 per acre for those farmer purchasing at least 80 percent coverage (Table 3.4). This total was found to be $6.44 per acre greater than the no insurance case, and $24.95 per acre greater than 70 percent coverage. Ability to begin covering more total costs is evidenced in this case as NPVRTC increased to -$80.91 per acre, 24 percent higher than the 70 percent level. A fall in standard deviation to $165.93 per acre demonstrates the decline of net income risk from the base case. Net income risk for a farmer with at least 80 percent coverage and 100 percent greater risk was 53 percent, as compared to 63 percent for a farmer with no insurance and the same amount of risk. Again, the amount of indemnity payments being made has increased. No payments were made only 28.3 percent of the time, with the largest amount being paid 41.7 percent of the time for one year out of five (Table 3.5). The remaining payments were distributed as follows: 22.7 percent of the time for two of three years, 6.1 percent of the time for three of five, 1 percent being made for four out of five years, and only 0.2 percent made all five years.

The largest amounts of indemnity payments were made under 90 percent coverage (Table 3.5). Indemnities were paid a whopping 92.1 percent of the time; 24.6 percent of the time for one year out of five, 32.6 percent of the time for two of five, 25.1 percent of the time for three years out of five, 9.1 percent of the time for four years, and 0.7 percent of the time for all five years. The largest net returns for this simulation were found in this scenario. NPVRVC totaled $379.02 per acre, significantly higher than the 70 percent and 80 percent coverage levels, and $71.91 per acre higher than the base case (Table 3.4). NPVRTC increased $65.46 per acre from the 80 percent coverage level and $90.41 per acre over the 70 percent coverage level. But more

importantly, this value was $71.91 per acre greater than the base case. Standard deviation for this set of data was the only variable that decreased, falling 18 percent to $136.09 per acre.

The historical prices and yields information for Franklin parish cotton farmers was slightly modified and simulated again, this time reducing the historical annual mean yield by 5 percent. Table 3.6 displays the results using this 5 percent reduced yield and parish historical cotton mean risk was again varied at levels from 25 to 100 percent. Over a five year period with average yield risk and 5 percent estimated reduced yields, cotton farms in Franklin parish with no COP insurance were expected to have an estimated mean net present value of returns over variable costs of $239.00 per acre. For the same scenario, the net present value of returns over

Table 3.6 Net present value of net returns over five-year period, cotton, Franklin Parish, projected trend mean cotton yields reduced 5 percent with greater yield risk.

Yield risk increase	Type of insurance			
	No insurance	70% COP	80% COP	90% COP
Base case:				
Mean NPVRVC[1]	239.00	208.75	223.17	295.69
Mean NPVRTC[2]	-155.47	-185.72	-171.29	-98.77
Std. Dev.[3]	129.94	129.58	118.97	88.51
25% greater risk:				
Mean NPVRVC[1]	240.26	211.75	232.49	306.41
Mean NPVRTC[2]	-154.20	-182.72	-161.97	-88.05
Std. Dev.[3]	142.07	140.41	126.43	95.14
50% greater risk:				
Mean NPVRVC[1]	241.53	216.85	242.56	317.58
Mean NPVRTC[2]	-152.94	-177.62	-151.91	-76.88
Std. Dev.[3]	155.50	151.21	134.90	103.19
75% greater risk:				
Mean NPVRVC[1]	242.79	223.10	253.31	329.10
Mean NPVRTC[2]	-151.68	-171.36	-141.15	-65.37
Std. Dev.[3]	169.93	162.37	144.05	112.32
100% greater risk:				
Mean NPVRVC[1]	244.06	230.04	264.62	340.93
Mean NPVRTC[2]	-150.41	-164.42	-129.85	-53.53
Std. Dev.[3]	185.11	173.91	153.85	122.27

[1] NPVRVC = net present value of net returns above variable costs per acre.
[2] NPVRTC = net present value of net returns above total costs per acre.
[3] Std. Dev. = standard deviation of net returns above variable costs and total costs per acre.

total costs was negative at -$155.47 per acre. The standard deviation of net returns for this scenario was estimated to be $129.94 per acre.

With a 70 percent COP coverage level, mean NPVRVC decrease by 12.6 percent to $208.75 per acre in the base yield risk case (Table 3.6). Mean NPVRTC decrease to -$185.72 per acre. This mean net return reduction is due primarily to the reduction in net returns resulting from the additional cost of COP insurance premiums paid. Insurance indemnity payments, received as income, were higher in this scenario than that of average yields with equivalent risk. At the 70 percent COP coverage level, crop insurance indemnity payments were made only 8.1 percent of the time in only one year out of five, with 0.2 percent paid in two years out of five (Table 3.7). No indemnity payments were made 91.7 percent of the time under this scenario.

At the 80 percent COP coverage level, crop insurance indemnity payments were received a larger percent of the time than with the 70 percent coverage level. Indemnity payments were paid out 66.7 percent of the time at the 80 percent coverage level (Table 3.7). Simulated indemnity payments were received one year out of five 41.4 percent of the time, two years out of five 20.5 percent of the time, three years out of five 4.1 percent of the time, 0.6 percent for four of five years, and 0.1 percent received payments for all five years. Although mean net returns were lower than the no coverage case, they were greater than estimated returns for the 70 percent coverage case (Table 3.6). At the 80 percent coverage level, mean NPVRVC were estimated to be $223.17 per acre, 6.6 percent below the no insurance case, but were $14.42 per acre greater than mean net returns for the 70 percent coverage case. Mean NPVRTC were -$171.29. The standard deviation of net returns decreased 8 percent to $118.97 per acre.

Estimated net returns above cotton production costs per acre exhibited the greatest improvement under the 90 percent COP coverage case, despite the reduction in yields. Estimated mean NPVRVC were $295.69 per acre, significantly higher than the estimates for the

70 percent and 80 percent case and 19.2 percent higher than the no insurance case (Table 3.6). Mean NPVRTC, although still negative based on assumed production costs, showed significant improvement. At the 90 percent coverage level, COP insurance indemnity payments were received 97 percent of the time. Payments were made in one year out of five 17.8 percent of the time, two years out of five 32.3 percent of the time, three years out of five 30.8 percent of the time, four out of five 14.4 percent of the time, and five years out of five 1.7 percent of the time (Table 3.7). Standard deviation of net returns was reduced by 31.9 percent from the no insurance

Table 3.7 Percent of time cost of production crop insurance indemnity payment is made over a five-year period, cotton, Franklin Parish, projected trend mean cotton yields reduced 5 percent with greater yield risk.

Yield risk increase	Number of years indemnity payment is made over 5-year period					
	0	1	2	3	4	5
Base case:						
70% COP	91.7%	8.1%	0.2%	-	-	-
80% COP	33.3%	41.4%	20.5%	4.1%	0.6%	0.1%
90% COP	3.0%	17.8%	32.3%	30.8%	14.4%	1.7%
25% greater risk:						
70% COP	80.6%	17.8%	1.4%	0.2%	-	-
80% COP	27.7%	41.8%	23.2%	6.2%	0.9%	0.2%
90% COP	3.8%	18.3%	32.4%	30.7%	13.0%	1.8%
50% greater risk:						
70% COP	68.4%	27.9%	3.5%	0.1%	0.1%	-
80% COP	24.3%	39.1%	27.2%	7.7%	1.4%	0.3%
90% COP	4.3%	19.0%	32.5%	30.0%	12.3%	1.9%
75% greater risk:						
70% COP	62.2%	31.7%	5.5%	0.5%	0.1%	-
80% COP	20.8%	37.1%	29.4%	10.5%	1.8%	0.4%
90% COP	4.7%	20.2%	32.7%	28.8%	12.0%	1.6%
100% greater risk:						
70% COP	57.3%	35.6%	6.1%	0.9%	0.1%	-
80% COP	18.3%	36.9%	29.1%	13.1%	2.2%	0.4%
90% COP	5.1%	20.4%	33.0%	28.1%	11.8%	1.6%

case to $88.51 per acre. Net income risk was reduced significantly as estimated coefficient of variation for mean NPVRVC at the 90 percent coverage level was 29.9 percent, compared to 54.4 percent for the no insurance case.

Over a five year period with 25 percent greater yield risk, cotton farmers in Franklin parish with no COP coverage were expected to have a mean NPVRVC of $240.26 per acre. This is an improvement from that of farmers with normal risk by $1.26 per acre. Mean NPVRTC continues to be negative at -$154.20 per acre; however, this improvement indicates that the ability to begin covering returns over total costs goes hand-in-hand with greater yield variability. Standard deviation increased 8.5 percent, to $142.07 per acre. This upward trend puts net income risk in jeopardy of increasing as well.

A Franklin parish cotton farmer who chose at least a 70 percent coverage level saw NPVRVC decrease to $211.75 per acre, with NPVRTC declining to -$182.72 per acre (Table 3.6). A decrease in standard deviation to $140.41 per acre, down from $142.07 per acre in the no insurance case, exhibits the risk minimization power of COP insurance when greater yield risk is introduced into the equation. While there were no indemnity payments made for either four or five years out of five, there was a considerable increase in payments from the previous data set with normal yields (Table 3.7). Indemnities were paid 17.8 percent of the time for one year out of five, 1.4 percent of the time for two of five years, and 0.2 percent for three of five. No payments were made 80.6 percent of the time, but this is also a cut from the base case when no payments were made 91.7 percent of the time.

Indemnity payments saw another significant increase under 80 percent coverage. In this scenario, payments were made more than 70 percent of the time, with 41.8 percent coming one year out of five, 23.2 percent two years out of five, and 7.3 percent made three or more years out of five (Table 3.7). NPVRVC were again lower than that of the base case, but at $232.49 per

acre, were $20.74 per acre higher than mean net returns for 70 percent coverage. Mean NPVRTC also saw an 11.4 percent increase to -$161.97 per acre (Table 3.6). The increased level of insurance decreased the standard deviation even further at $126.43 per acre, down almost $14 per acre from the 70 percent level.

Mean net returns for variable and total costs saw their peak in the 25 percent greater risk group at the 90 percent coverage level. NPVRVC was $306.41 per acre and NPVRTC was -$88.05 per acre, considerably higher than the two previous coverage levels, and $66.15 per acre higher than the no insurance scenario (Table 3.6). Most importantly, the increased coverage level cut the standard deviation down to $95.14 per acre, reducing yield risk by 33 percent from the no insurance case. Along with higher net returns per acre, it was also found that indemnity payments were made more often in this period of coverage than any other under the 25 percent greater risk category. Only 3.8 percent of the time was it not necessary to make any payments (Table 3.7). Approximately 18.3 percent of payments were made one year out of five, 32.4 percent were paid out 2 years of five, and 30.7 percent were made three years out of five. Only 13 percent of payments were made four years out of five, with 1.8 percent being made all five years.

Fifty percent greater yield risk was introduced into the equation for the next set of scenarios. In the instance where no insurance was purchased, it was discovered that mean NPVRVC increased slightly from that of 25 percent greater risk to $241.53 per acre (Table 3.6). Mean NPVRTC also increased to -$152.94 per acre. Again, both increases were just a little over a dollar per acre and hardly enough to justify risking another drastic increase in yield risk with no crop protection. $155.50 per acre was calculated as the standard deviation.

Indemnity payments were received 31.6 percent of the time at the 70 percent coverage level (Table 3.7). Indemnity payments were made 27.9 percent of the time one year out of five,

3.5 percent of the time for two years out of five, and 0.2 percent of the time four years out of five. No payments were required 68.4 percent of the time under this coverage. Net returns decreased from the no insurance case due to an increase in COP premiums, as NPVRVC was $216.85 per acre and NPVRTC was -$177.62 per acre (Table 3.7). Standard deviation decreased as well, lowering $4.29 per acre to $151.21 per acre. Even though the change is not considerable, it continues to demonstrate the ability of COP insurance to counteract the variability of increases in yield risk.

Under 80 percent coverage, net returns saw an influx after the decreases seen at 70 percent coverage. Both NPVRVC and NPVRTC increased $25.71 per acre to $242.56 per acre and -$151.91 per acre, respectively (Table 3.7). For the same scenario, the standard deviation decreased significantly to $134.90 per acre. Indemnity payments increased greatly at the 80 percent coverage level; only 24.3 percent of the time were no payments made (Table 3.7). 39.1 percent of the time payments were made one year of five, 27.2 percent of the time two years of five, 7.7 percent of the time three years of five, and less than 2 percent for four or more years.

Farmers who chose the 90 percent coverage level received indemnity payments 95.7 percent of the time – 19 percent of the time was one year out of five, 32.5 percent of the time was two years out of five, three years out of five 30 percent of the time, 12.3 percent of the time four years of five, and all five years for 1.9 percent of the time (Table 3.7). This large increase in indemnity payments led to increased net returns. NPVRVC jumped to $317.58 per acre, $75.02 per acre greater than the 80 percent coverage level, $100.73 per acre above 70 percent coverage, and $76.05 per acre more than no insurance (Table 3.6). NPVRTC improved to -$76.88 per acre, $75.03 per acre more than 80 percent coverage, $100.74 per acre more than 70 percent coverage, and $76.06 per acre more than no insurance. The lowest standard deviation for the 50 percent

greater risk category can also be found at the 90 percent coverage level. This decrease was much lower than previous coverage levels, and 3.6 percent less than no insurance.

Increasing yield risk to 75 percent greater than normal gave us a NPVRVC of $242.79 per acre for the base case, only $1.26 per acre more than the 50 percent risk category (Table 3.6). Net returns over total costs calculated to -$151.68 per acre, another minuscule increase of 0.8 percent over the base case. This 25 percent increase in risk from the previous scenario causes the standard deviation to increase due to the larger yield risk. This value was $169.93 per acre, a $14.43 per acre increase over the 50 percent greater risk category in the same scenario.

At the 70 percent coverage level for 75 percent greater risk, 62.2 percent of the time no payments are made (Table 3.7). 31.7 percent of the time payments are made one year of five, with 5.5 percent being paid two years out of five and less than 1 percent for three or more years. As has been the case for the other levels of risk, net returns decreased in both categories. NPVRVC was $223.10 per acre, with NPVRTC totaling -$171.36 per acre (Table 3.6). However, yield risk slid as standard deviation decreased $7.56 per acre from the base case to $162.37 per acre.

The highest percentage of simulated indemnity payments for the 80 percent coverage level under 75 percent greater yield risk and 5 percent reduced yields were received 37.1 percent of the time for one year out of five (Table 3.7). Payments were generated for 29.4 percent of the time for two years out of five, 10.5 percent of the time for three of five, 1.8 percent of the time for four of five, and 0.4 percent for all five years. While net returns were still less than the base case, they increased 11.9 percent over the 70 percent coverage level to $253.31 per acre (Table 3.6). NPVRTC increased as well, climbing 17.6 percent to -$141.15 per acre. Standard deviation continued to drop as coverage levels raised, decreasing to $144.05 per acre.

The most profitable coverage level in this scenario was 90 percent coverage. Net returns totaled $329.10 per acre and -$65.37 per acre, roughly $86.31 per acre each more than the case with no insurance (Table 3.6). These returns showed significant improvements over the 70 percent and 80 percent coverage levels. Standard deviation for this coverage level was $112.32 per acre. This value reduced the net income risk for 90 percent coverage to 34 percent, down from 70 percent for the base case. The highest amount of indemnity payments for this amount of yield risk can be found within this coverage level. Only 4.7 percent of the time were no indemnity payments made (Table 3.7). About 20.2 percent of the time indemnities were paid one year out of five, with 32.7 percent paid two years of five. 28.8 percent of the time saw payments being made three years, 12 percent of payments were made four years of five, and 1.6 percent were made all five years.

By increasing yield risk to 100 percent greater than normal under 5 percent reduced yields, mean net returns were expected to follow suit. NPVRVC grew to $244.06 per acre for the base case – only a $1.27 per acre increase over the previous risk level of 75 percent with no insurance (Table 3.6). NPVRTC increased by the exact same dollar amount to -$150.41 per acre. The variability of the yield risk for this set of data is evidenced with a standard deviation of $185.11 per acre, indicating that losses could reach much higher levels.

Increasing the yield risk to 100 percent greater than normal also caused various changes in indemnity payments, as are evidenced in Table 3.7. Under 70 percent coverage at this level, payments were made 42.7 percent of the time. The highest occurrence of payments was made 35.6 percent of the time for one year of five. Payments were also made 6.1 percent of the time for two years out of five, and 1 percent for three or more years. Returns over variable costs were found to be $230.04 per acre, with returns over total costs totaling -$164.42 per acre (Table 3.6). Standard deviation decreased as well, falling 6 percent to $173.91.

NPVRVC was found to be $264.62 per acre for those farmers purchasing at least 80 percent coverage (Table 3.6). This total was found to be $20.56 per acre greater than the no insurance case, and $34.58 per acre greater than 70 percent coverage. Ability to begin covering a greater percentage of total costs is evidenced in this case as NPVRTC increased to -$129.85 per acre, 21 percent higher than the 70 percent level. A fall in standard deviation to $153.85 per acre demonstrates the decline of net income risk from the base case. Again, the amount of indemnity payments being made has increased. No payments were made only 18.3 percent of the time, with the largest amount being paid 36.9 percent of the time for one year out of five (Table 3.7). The remaining payments were distributed as follows: 29.1 percent of the time for two of three, 13.7 percent of the time for three of five, 2.2 percent being made for four out of five years, and only 0.4 percent made all five years.

The largest amounts of indemnity payments were made under 90 percent coverage (Table 3.7). Indemnities were paid 94.9 percent of the time; 20.4 percent of the time for one year out of five, 33.7 percent of the time for two of five, 28.1 percent of the time for three years out of five, 11.8 percent of the time for four years, and 1.6 percent of the time for all five years. The largest net returns for this simulation were found in this scenario. NPVRVC totaled $340.93 per acre, significantly higher than the 70 percent and 80 percent coverage levels, and $96.87 per acre higher than the base case (Table 3.6). NPVRTC increased $76.32 per acre from the 80 percent coverage level and $110.89 per acre over the 70 percent coverage level. Standard deviation for this set of data was the only variable that decreased, falling 20.5 percent to $122.27 per acre.

Table 3.8 further reduced parish historical yields by 10 percent and varied mean yield risk levels from 25 percent to 100 percent. Over a five year period with average yield risk, cotton farms in Franklin parish with no COP insurance were expected to have an estimated mean net present value of returns over variable costs of $176.22 per acre. For the same scenario, the net

Table 3.8 Net present value of net returns over five-year period, cotton, Franklin Parish, projected trend mean cotton yields reduced 10 percent with greater yield risk.

Yield risk increase	Type of insurance			
	No insurance	70% COP	80% COP	90% COP
Base case:				
Mean NPVRVC[1]	176.22	147.55	175.65	266.91
Mean NPVRTC[2]	-218.25	-246.92	-218.82	-127.56
Std. Dev.[3]	129.38	127.91	111.69	78.46
25% greater risk:				
Mean NPVRVC[1]	177.42	152.33	186.11	275.90
Mean NPVRTC[2]	-217.05	-242.14	-208.36	-118.57
Std. Dev.[3]	140.36	136.56	117.59	84.05
50% greater risk:				
Mean NPVRVC[1]	178.62	158.47	196.97	285.47
Mean NPVRTC[2]	-215.85	-235.97	-197.50	-108.99
Std. Dev.[3]	152.60	145.66	124.56	91.11
75% greater risk:				
Mean NPVRVC[1]	179.81	165.31	208.06	295.56
Mean NPVRTC[2]	-214.65	-229.16	-186.41	-98.91
Std. Dev.[3]	165.83	155.35	132.48	99.33
100% greater risk:				
Mean NPVRVC[1]	181.01	172.72	219.39	306.12
Mean NPVRTC[2]	-213.45	-221.75	-175.08	-88.35
Std. Dev.[3]	179.83	165.57	141.18	108.46

[1] NPVRVC = net present value of net returns above variable costs per acre.
[2] NPVRTC = net present value of net returns above total costs per acre.
[3] Std. Dev. = standard deviation of net returns above variable costs and total costs per acre.

present value of returns over total costs remained grossly negative at -$218.25 per acre. The standard deviation of net returns for this scenario was estimated to be $129.38 per acre, based on 1,000 simulations of cotton prices and yields over the five-year period using the reduced yield level.

With a 70 percent COP coverage level, mean NPVRVC decrease by 16.3 percent to $147.55 per acre in the base yield risk case (Table 3.8). Mean NPVRTC decrease to -$246.92 per acre. This mean net return reduction is due primarily to the reduction in net returns resulting from the additional cost of COP insurance premiums paid. At the 70 percent COP coverage level, crop insurance indemnity payments were never made 80.9 percent of the time (Table 3.9).

Indemnity payments remained low for this coverage level, but when compared to no payments 91.7 percent of the time for farms with 70 percent coverage and only 5 percent reduced yields, there is a significant difference. Payments were received 17.6 percent of the time for one year out of five, 1.3 percent for two years of five, and 0.2 percent of the time for three years.

At the 80 percent COP coverage level, crop insurance indemnity payments were received a larger percent of the time than with the 70 percent coverage level. Indemnity payments were paid out 82.8 percent of the time at the 80 percent coverage level (Table 3.9). Simulated indemnity payments were received one year out of five 36.1 percent of the time, two years out of five for 31 percent of the time, three years out of five 13.1 percent of the time, 2.2 percent of the time for four years, and all five years for 0.4 percent. Although mean net returns are slightly lower than the no coverage case, they were $28.10 per acre greater than estimated returns for the 70 percent coverage case (Table 3.9). Mean NPVRTC were -$218.82, only $0.57 per acre less than the 70 percent coverage case. The standard deviation of net returns decreased $16.22 per acre to $111.69.

Estimated net returns above cotton production costs per acre exhibited the greatest improvement under the 90 percent COP coverage case. Estimated mean NPVRVC were $266.91 per acre, significantly higher than the estimates for the 70 percent and 80 percent case and 34 percent higher than the no insurance case (Table 3.8). Mean NPVRTC rebounded 41.7 percent over 70 percent coverage. At the 90 percent coverage level, COP insurance indemnity payments were received 98.6 percent of the time. Payments were made in one year out of five 10.2 percent of the time, two years out of five 28.9 percent of the time, three years out of five 34.2 percent of the time, four out of five 22.1 percent of the time, and five years out of five 3.27 percent of the time (Table 3.9). Standard deviation of net returns was reduced by 39.4 percent from the no insurance case to $78.46 per acre.

Table 3.9 Percent of time cost of production crop insurance indemnity payment is made over a five-year period, cotton, Franklin Parish, projected trend mean cotton yields reduced 10 percent with greater yield risk.

Yield risk increase	Number of years indemnity payment is made over 5-year period					
	0	1	2	3	4	5
Base case:						
70% COP	80.9%	17.6%	1.3%	0.2%	-	-
80% COP	17.2%	36.1%	31.0%	13.1%	2.2%	0.4%
90% COP	1.4%	10.2%	28.9%	34.2%	22.1%	3.2%
25% greater risk:						
70% COP	66.6%	29.1%	4.1%	0.1%	0.1%	-
80% COP	15.0%	36.2%	30.6%	14.6%	3.2%	0.4%
90% COP	1.8%	12.0%	28.9%	34.1%	20.6%	2.6%
50% greater risk:						
70% COP	58.8%	34.6%	5.9%	0.6%	0.1%	-
80% COP	14.6%	34.6%	32.0%	14.7%	3.7%	0.4%
90% COP	2.1%	13.0%	30.2%	33.2%	18.9%	2.6%
75% greater risk:						
70% COP	52.9%	38.2%	7.5%	1.3%	0.1%	-
80% COP	13.8%	34.2%	32.3%	15.2%	4.1%	0.4%
90% COP	3.0%	13.9%	30.4%	32.9%	17.2%	2.6%
100% greater risk:						
70% COP	48.5%	38.9%	11.0%	1.4%	0.2%	-
80% COP	12.8%	32.3%	33.4%	16.6%	4.5%	0.4%
90% COP	3.2%	14.5%	29.7%	33.5%	16.2%	2.9%

Over a five year period with 25 percent greater yield risk, cotton farmers in Franklin parish with no COP coverage were expected to have a mean NPVRVC of $177.42 per acre (Table 3.8). This is an improvement from that of farmers with normal risk by $1.20 per acre. Mean NPVRTC continues to be negative at -$217.05 per acre; however, this improvement indicates that the ability to begin covering returns over total costs goes hand-in-hand with greater yield variability. Standard deviation increased 7.8 percent, to $140.36 per acre. This upward trend puts net income risk in jeopardy of increasing as well.

A Franklin parish cotton farmer who chose at least a 70 percent coverage level saw NPVRVC decrease to $152.23 per acre, with NPVRTC declining to -$242.14 per acre (Table 3.8). A decrease in standard deviation to $136.56 per acre, down from $140.36 per acre in the no insurance case, exhibits the risk minimization power of COP insurance when greater yield risk is introduced into the equation. There were no indemnity payments made for all five years, but there was a considerable increase in payments from the previous data set with normal yields (Table 3.9). Indemnities were paid 29.1 percent of the time for one year out of five, 4.1 percent of the time for two of five years, 0.1 percent for three of five, and four years for 0.1 percent of the time.

Indemnity payments saw an extreme increase under 80 percent coverage. In this scenario, payments were received more than 85 percent of the time, with 36.2 percent coming one year out of five, 30.6 percent two years out of five, 14.6 percent of the time for three years of five, 3.2 percent for four of five, and 0.4 percent for all five (Table 3.9). NPVRVC were again lower than that of the base case, but at $186.11 per acre, were $33.78 per acre higher than mean net returns for 70 percent coverage. Mean NPVRTC also saw a 14 percent increase to -$208.36 per acre (Table 3.8). The increased level of insurance decreased the standard deviation even further at $117.59 per acre, down $18.97 per acre from the 70 percent level.

Mean net returns for variable and total costs saw their peak in the 25 percent greater risk group at the 90 percent coverage level. NPVRVC was $275.90 per acre and NPVRTC was -$118.57 per acre, considerably higher than the two previous coverage levels, and $98.48 per acre higher than the no insurance scenario (Table 3.8). Most importantly, the increased coverage level cut the standard deviation down to $84.05 per acre, reducing yield risk by 30 percent from the no insurance case. Along with higher net returns per acre, it was also found that indemnity payments were made more often in this period of coverage than any other under the 25 percent

greater risk category. Only 1.8 percent of the time was it not necessary to make any payments (Table 3.9). Twelve percent of payments were made one year out of five, 28.9 percent were paid out 2 years of five, and 34.1 percent were made three years out of five. Only 20.6 percent of payments were made four years out of five, with 2.6 percent being made all five years.

Fifty percent greater yield risk was introduced into the equation for the next set of scenarios. In the instance where no insurance was purchased, it was discovered that mean NPVRVC increased slightly from that of 25 percent greater risk to $178.62 per acre (Table 3.8). Mean NPVRTC also increased to -$215.85 per acre. Again, both increases were just a little over a dollar per acre and hardly enough to justify risking another drastic increase in yield risk with no crop protection. Standard deviation for this case was $152.60 per acre.

Indemnity payments were received 41.2 percent of the time at the 70 percent coverage level (Table 3.9). Indemnity payments were made 34.6 percent of the time one year out of five, 5.9 percent of the time for two years out of five, 0.6 percent of the time for three years of five, and 0.1 percent for four of five years. Net returns decreased from the no insurance case due to an increase in COP premiums, as NPVRVC was $158.47 per acre and NPVRTC was -$235.97 per acre (Table 3.9). Standard deviation decreased as well, lowering $6.94 per acre to $145.66 per acre. Even though the change is not considerable, it continues to demonstrate the ability of COP insurance to counteract the variability of increases in yield risk.

Under 80 percent coverage, net returns began an upward climb after the decreases seen at 70 percent coverage. NPVRVC increased $38.50 per acre to $196.97 per acre and NPVRTC increased $38.47 per acre to -$197.50 per acre (Table 3.8). For the same scenario, the standard deviation decreased significantly to $124.56 per acre. Indemnity payments increased greatly at the 80 percent coverage level; only 14.6 percent of the time were no payments made (Table 3.9). 34.6 percent of the time payments were made one year of five, 32 percent of the time two years

of five, 14.7 percent of the time three years of five, 3.7 percent for four years, and 0.4 percent of the time for five out of five years.

Farmers who chose the 90 percent coverage level received indemnity payments 97.9 percent of the time – 13 percent of the time was for one year out of five, 30.2 percent of the time was two years out of five, three years out of five 33.2 percent of the time, 18.9 percent of the time four years of five, and all five years for 2.6 percent of the time (Table 3.9). This large increase in indemnity payments led to increased net returns. NPVRVC grew to $285.47 per acre, $88.50 per acre greater than the 80 percent coverage level, $127.00 per acre above 70 percent coverage, and $106.85 per acre more than no insurance (Table 3.8). NPVRTC improved to -$108.99 per acre, $106.86 per acre more than no insurance. The lowest standard deviation for the 50 percent greater risk category can also be found at the 90 percent coverage level. This decrease was much lower than previous coverage levels, and 61.49 percent less than the no insurance value at $91.11 per acre.

Increasing yield risk to 75 percent greater than normal gave us a NPVRVC of $179.81 per acre for the base case, only $1.19 per acre more than the 50 percent risk category (Table 3.8). Net returns over total costs calculated to -$214.65 per acre, a small increase of $1.20 per acre over the base case. This 25 percent increase in risk from the previous scenario causes the standard deviation to increase due to the larger yield risk. This value was $165.83 per acre, a $13.23 per acre increase over the 50 percent greater risk category.

At the 70 percent coverage level for 75 percent greater risk, 52.9 percent of the time no payments are made (Table 3.9). 38.2 percent of the time payments are made one year of five, with 7.5 percent being paid two years out of five and less than 2 percent for three or more years. As has been the case for the other levels of risk, net returns decreased in both categories.

NPVRVC was $165.31 per acre, with NPVRTC totaling -$229.16 per acre (Table 3.8). Yield risk fell as standard deviation decreased $10.48 per acre from the base case to $155.35 per acre.

The highest percentage of simulated indemnity payments for the 80 percent coverage level under 75 percent greater yield risk and 10 percent reduced yields were received 34.2 percent of the time for one year out of five (Table 3.9). Payments were generated for 32.3 percent of the time for two years out of five, 15.2 percent of the time for three of five, 4.1 percent of the time for four of five, and 0.4 percent for all five years. While net returns were still less than the base case, they increased 20.5 percent over the 70 percent coverage level to $208.06 per acre (Table 3.8). NPVRTC increased as well, climbing 18.7 percent to -$186.41 per acre. Standard deviation continued to drop as coverage levels elevated, decreasing to $132.48 per acre.

The most profitable coverage level in this scenario was 90 percent coverage. Net returns over variable costs totaled $295.56 per acre, and increase of $115.75 per care higher than no insurance (Table 3.8). Net returns over total costs increased to -$98.91 per acre, $115.74 per acre higher than the same coverage with no insurance. These returns also showed significant improvements over the 70 percent and 80 percent coverage levels. Standard deviation for this coverage level was $99.33 per acre. This value reduced the net income risk for 90 percent coverage to 33.6 percent, down from 92.2 percent for the base case. The highest amount of indemnity payments for this amount of yield risk can be found within 13.9 percent of the time indemnities were paid one year out of five, with 30.4 percent paid two years of five. 32.9 percent of the time saw payments being made three years, 17.2 percent of payments were made four years of five, and 2.6 percent were made all five years.

By increasing yield risk to 100 percent greater than normal under 10 percent reduced yields, mean net returns were expected to follow suit. NPVRVC grew to $181.01 per acre for the base case – only a $1.20 per acre increase over the previous risk level of 75 percent with no

insurance (Table 3.8). NPVRTC increased by the exact same dollar amount to -$213.45 per acre. The variability of the yield risk for this set of data is evidenced with a standard deviation of $179.83 per acre, indicating that losses could reach much higher levels.

Increasing the yield risk to 100 percent greater than normal also caused various changes in indemnity payments, as are evidenced in Table 3.9. Under 70 percent coverage at this level, payments were made 51.5 percent of the time. The highest occurrence of payments was made 38.9 percent of the time for one year of five. Payments were also made 11 percent of the time for two years out of five, and less than 2 percent for three or more years. Returns over variable costs were found to be $172.72 per acre, with returns over total costs totaling -$-221.75 per acre (Table 3.8). Standard deviation decreased as well, falling 7.9 percent to $165.57.

NPVRVC was found to be $219.39 per acre for those farmers purchasing at least 80 percent coverage (Table 3.8). This total was found to be $38.38 per acre greater than the no insurance case, and $46.67 per acre greater than 70 percent coverage. NPVRTC increased to -$175.08 per acre, 21 percent higher than the 70 percent level and the exact same increase as that of the same scenario for 5 percent reduced yields. A fall in standard deviation to $141.18 per acre demonstrates the decline of net income risk from the base case. Again, the amount of indemnity payments being made has increased. No payments were made only 12.8 percent of the time, with the largest amount being paid 33.4 percent of the time for two years out of five (Table 3.9). The remaining payments were distributed as follows: 32.3 percent of the time for one year out of three, 16.6 percent of the time for three of five, 4.5 percent being made for four out of five years, and only 0.4 percent made all five years.

The largest amounts of indemnity payments were made under 90 percent coverage (Table 3.9). Indemnities were paid a whopping 96.8 percent of the time; 14.5 percent of the time for one year out of five, 29.7 percent of the time for two of five, 33.5 percent of the time for three

years out of five, 16.2 percent of the time for four years, and 2.9 percent of the time for all five years. The largest net returns for this simulation were found in this scenario. NPVRVC totaled $306.12 per acre, significantly higher than the 70 percent and 80 percent coverage levels, and $125.11 per acre higher than the base case (Table 3.8). NPVRTC increased $86.73 per acre from the 80 percent coverage level and $133.40 per acre over the 70 percent coverage level. Standard deviation for this set of data was the only variable that decreased, falling 23.2 percent to $108.46 per acre from 80 percent coverage.

Tensas Parish Cotton Results

Tensas parish was the highest cotton producing parish in the state of Louisiana for the past five years. Using 10-year historical parish prices and yields, net returns were projected for five years for Tensas parish. Returns over total costs for Franklin parish were always projected to be negative, based on assumed production costs and historical yields for that parish. However, as is evidenced in Table 3.10, Tensas parish has increasingly higher returns per acre than Franklin and easily covers its total costs. For farmers in Tensas who chose not to purchase COP insurance, net present value of returns over variable costs equaled $679.78 per acre, with net present value of net returns above total costs calculated as $279.52 per acre. Standard deviation for net returns was $135.41 per acre. Positive returns over variable costs were generated 100 percent of the time; however, such was not the case for total costs. Negative returns over total costs were expected 41 percent of the time for one year out of five, 24.5 percent of the time for two years of five, 7.2 percent of the time for three out of five years, 1.4 percent for four of five, and 0.1 percent of the time for all five years (Table 3.11).

Table 3.10 Net present value of net returns over five-year period, cotton, Tensas Parish, projected trend mean cotton yields with equivalent risk.

Type of insurance	NPV[1] of net returns above variable costs		NPV[1] of net returns above total costs	
	Mean	Std. Dev.	Mean	Std. Dev.
No insurance	679.78	135.41	279.52	135.41
70% COP	648.94	135.41	248.69	135.41
75% COP	646.74	135.41	246.49	135.41
80% COP	644.54	135.41	244.28	135.41
85% COP	642.34	135.41	242.08	135.41
90% COP	642.54	133.63	242.28	133.63

[1]NPV = net present value

Assuming 70 percent COP insurance with equivalent risk, mean net returns initially decreased due to premiums paid for the coverage. NPVRVC decreased $30.84 per acre from the base case to $648.94 per acre, while NPVRTC fell $30.83 per acre to $248.69 per acre (Table 3.10). Standard deviation remained the same at $135.41 per acre. Returns over variable costs were positive 100 percent of the time, but returns over total costs were always positive only 22.5 percent of the time (Table 3.11). These returns were negative 40.1 percent of the time for one year out of five, 26.7 percent of the time for two of five years, 8.9 percent for three years, 1.6 percent of the time for four of five, and 0.2 percent for all five years. This high occurrence of positive returns gave no reason to need indemnity payments; therefore, none were paid out for the five year period under 70 percent coverage (Table 3.12).

Increasing the coverage level to 75 percent continued the downward trend of net returns. Mean NPVRVC totaled $646.74 per acre, $2.20 per acre less than 70 percent coverage (Table 3.10). Mean NPVRTC fell to $246.49 per acre, also down $2.20 per acre from the previous level. Standard deviation remained steady at $135.41 per acre, indicating that the increases in insurance coverage have not exacted any significant effect on net income risk. There was again no need for

Table 3.11 Percent of time net returns are negative over a five-year period, cotton, Tensas Parish, projected trend mean cotton yields with equivalent risk.

Type of insurance	Number of years with negative net returns over 5-year period					
	0	1	2	3	4	5
	Net returns above variable costs					
No insurance	100.0%	-	-	-	-	-
70% COP	100.0%	-	-	-	-	-
75% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
85% COP	100.0%	-	-	-	-	-
90% COP	100.0%	-	-	-	-	-
	Net returns above total costs					
No insurance	25.8%	41.0%	24.5%	7.2%	1.4%	0.1%
70% COP	22.5%	40.1%	26.7%	8.9%	1.6%	0.2%
75% COP	22.4%	39.9%	26.7%	9.2%	1.6%	0.2%
80% COP	22.2%	39.7%	27.0%	9.1%	1.8%	0.2%
85% COP	21.9%	39.9%	27.1%	9.1%	1.8%	0.2%
90% COP	21.4%	40.0%	27.5%	9.1%	1.8%	0.2%

indemnity payments to be made under 75 percent coverage (Table 3.12), and returns above variable costs never dipped into the negative under this scenario. Returns over total costs saw negative returns 77.6 percent of the time: 39.9 percent of the time for one year out of five, 26.7 percent of the time for two years out of five, 9.2 percent for three of five, 1.6 percent of the time for four years out of five, and 0.2 percent for all five years (Table 3.11).

When increased to 80 percent, COP insurance will require increased premiums. This accounts for the only monetary difference between 75 percent and 80 percent coverage. NPVRVC was $644.54 per acre and NPVRTC was $244.28 per acre , both a minimal decrease of $2.20 per acre (Table 3.10). As was the case for the two previous coverage levels, standard deviation held stable at $135.41 per acre. Net returns above variable costs never experienced any negativity; yet, returns over total costs continue to do so. Approximately 39.7 percent of the time returns over total costs were negative for one year out of five, 27 percent of the time for two years out of five, 9.1 percent of the time for three of five, 1.8 percent for four years, and 0.2 percent for four or more years (Table 3.11). Despite the higher occurrences of negative returns

over total costs, they were still not great enough to require any indemnity payments to be generated (Table 3.12).

Table 3.12 Percent of time cost of production crop insurance indemnity payment is made over a five-year period, cotton, Tensas Parish, projected trend mean cotton yields with equivalent risk.

Type of insurance	Number of years indemnity payment is made over 5-year period					
	0	1	2	3	4	5
70% COP	100.0%	-	-	-	-	-
75% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
85% COP	100.0%	-	-	-	-	-
90% COP	72.7%	23.7%	3.4%	0.2%	-	-

No indemnity payments were received for cotton farmers in Tensas parish who chose 85 percent coverage (Table 3.12). The mean net returns for this coverage level continued to decrease in increments of $2.20 per acre, with NPVRVC declining to $642.34 per acre and NPVRTC falling to $242.08 per acre (Table 3.10). Standard deviation for this scenario has not changed, remaining $135.41 per acre. Net returns over total costs were always positive for 21.9 percent of the time (Table 3.11), with net returns over variable costs always positive 100 percent of the time for the five year period. Returns over total costs were negative for one year of five 39.9 percent of the time, 27.1 percent of the time for two of five, 9.1 percent for three years, 1.8 percent of the time for four of five, and 0.2 percent for all five years.

Indemnities are finally paid out under 90 percent coverage (Table 3.12). 23.7 percent of the time payments were made for one year out of five, 3.4 percent of the time for two of five, and 0.2 percent of the time for three of five years. These indemnities, received as income, increased net returns very slightly. NPVRVC rose to $642.54 per acre, a $0.20 per acre increase over the same value in 80 percent coverage (Table 3.10). NPVRTC also rose $0.20 per acre to $242.28 per acre. This coverage level was also the only one that noted a change in standard deviation, as it fell to $133.63 per acre, a $1.78 per acre decrease. Net returns continued to follow their

previous trends. Net returns above variable costs were always positive 100 percent of the time (Table 3.11). Net returns over total costs were always positive only 21.4 percent of the time. These same returns were negative 40 percent of the time for one year out of five, 27.5 percent of the time for two years out of five, 9.1 percent for three of five, 1.8 percent for four years, and 0.2 percent of the time for all five years.

Greater yield risk was incorporated into Tensas parish's data in the same way that Franklin was conducted. The levels were varied from 25 to 100 percent based on their historical prices and yields. As outlined in Table 13 below, the base case included those farmers with equivalent risk who chose not to purchase COP insurance. Their mean NPVRVC were projected to be $679.77 per acre, with a mean NPVRTC of $279.52 per acre. Standard deviation was $135.41 per acre, the same value that was discussed in Table 3.10.

Incorporating 70 percent coverage under equivalent risk greatly decreases net returns. Returns over variable costs fell 4.5 percent to $648.94 per acre due to expenses for insurance premiums (Table 3.13). Returns over total costs declined to $248.69 per acre, a $30.83 per acre decrease from no insurance. Standard deviation remained the same. In this base case, no indemnity payments were made because the only decrease seen in net returns was due to insurance premiums paid on a per acre basis (Table 3.14).

Net returns continue to dwindle as COP coverage levels increase. The mean value of returns over variable costs for 80 percent coverage was $644.54 per acre, $4.40 per acre less than 70 percent coverage and $35.23 per acre less than no insurance (Table 3.13). NPVRTC was calculated at $244.28 per acre, $4.41 per acre less than 70 percent coverage and $35.24 per acre less than no insurance. Income risk remains relatively fixed as standard deviation held firm at

Table 3.13 Net present value of net returns over five-year period, cotton, Tensas Parish, projected trend mean cotton yields with greater yield risk.

Yield risk increase	Type of insurance			
	No insurance	70% COP	80% COP	90% COP
Base case:				
Mean NPVRVC[1]	679.77	648.94	644.54	642.54
Mean NPVRTC[2]	279.52	248.69	244.28	242.28
Std. Dev.[3]	135.41	135.41	135.41	133.63
25% greater risk:				
Mean NPVRVC[1]	679.95	649.11	644.71	648.16
Mean NPVRTC[2]	279.69	248.86	244.45	247.90
Std. Dev.[3]	153.85	153.85	153.85	148.05
50% greater risk:				
Mean NPVRVC[1]	680.12	649.28	644.95	657.28
Mean NPVRTC[2]	279.86	249.03	244.69	257.02
Std. Dev.[3]	173.52	173.52	173.47	161.72
75% greater risk:				
Mean NPVRVC[1]	680.29	649.45	646.89	671.26
Mean NPVRTC[2]	280.03	249.20	246.63	271.00
Std. Dev.[3]	194.03	194.03	192.73	173.66
100% greater risk:				
Mean NPVRVC[1]	680.46	649.62	652.49	686.62
Mean NPVRTC[2]	280.20	249.37	252.23	286.37
Std. Dev.[3]	215.15	215.15	209.88	185.50

[1] NPVRVC = net present value of net returns above variable costs per acre.
[2] NPVRTC = net present value of net returns above total costs per acre.
[3] Std. Dev. = standard deviation of net returns above variable costs and total costs per acre.

$135.41 per acre. From these totals, it is obvious to see that variable and total costs seem to have a closely linked correlation to one another. No indemnities were paid under this coverage (Table 3.14).

A change in standard deviation was finally generated at the 90 percent coverage level (Table 3.13). For the last three scenarios in the base case, it had been holding steady at $135.41 per acre; however, this value finally decreased to $133.63 per acre. This decrease indicates that no significant change in risk minimization occurs until cotton farmers in Tensas parish reach the 90 percent level. NPVRVC fell to $642.54 per acre, a $2.00 per acre decrease from 80 percent coverage and $37.23 per acre less than no insurance. NPVRTC fell $2.00 per acre as well to

$242.28 per acre. Indemnity payments are finally made for this scenario when the 90 percent level is reached (Table 3.14). While no indemnities were paid 72.7 percent of the time, there were payments made 23.7 percent of the time for one year out of five, 3.4 percent for two years of five, and 0.2 percent of the time for three of five.

After increasing yield risk by 25 percent, a slight overall increase in net returns followed. In the no insurance case, NPVRVC increased to $679.95 per acre – only $0.18 per acre greater than the base case with equivalent risk (Table 3.13). NPVRTC did not fair any better, increasing $0.17 per acre to $279.69 per acre. The only significant change to be found was concerning standard deviation. This increased 12 percent to $153.85 per acre, a definite indication of greater yield risk.

Buying at least 70 percent COP coverage caused net returns to initially decline, as was also seen in the base case. NPVRVC fell $30.84 per acre to $649.11 per acre, while NPVRTC deflated to $248.86 per acre (Table 3.13). Yield risk was not affected by the insurance as standard deviation remained $153.85 per acre. But despite 25 percent greater risk, there was no call for indemnity payments to be made (Table 3.14).

There were no indemnity payments generated for 80 percent coverage either (Table 3.14). Standard deviation held steady at $153.85 per acre, but net returns fell once again (Table 3.13). Returns over variable costs dropped 0.7 percent from 70 percent coverage and 5.2 percent from no insurance. Returns over total costs had a similar reaction, falling 1.8 percent from 70 percent coverage and 12.6 percent from no insurance.

Those farmers choosing to purchase 90 percent COP coverage saw an increase in net returns and a decrease in yield risk from the previous scenarios. While NPVRVC was still less than no insurance, it did increase $3.45 per acre to $648.16 per acre (Table 3.13). NPVRTC experienced this same change as it rose to $247.90 per acre. It was not until coverage reached 90

percent that standard deviation saw a 3.8 percent reduction to $148.05 per acre. These increased returns can be attributed to the increase in indemnity payments (Table 3.14). Farmers received payments 40.5 percent of the time with 32.5 percent coming for one year out of five, 7.1 percent for two of five years, 0.8 percent of the time for three of five, and 0.1 percent for four of five.

Yield risk was increased to 50 percent for the next set of data, and this alteration caused net returns to make a slight advance. NPVRVC and NPVRTC both increased $0.17 per acre over the no insurance case with 25 percent greater risk (Table 3.13). Standard deviation jumped $19.67 per acre to $173.52.

Net returns continued to follow the projected trend and decreased under 70 percent coverage due to expenses for insurance premiums. Returns over variable costs dropped 4.5 percent from no insurance to $649.28 per acre (Table 3.13). Returns over total costs experienced an 11 percent decrease, falling to $249.03 per acre. As seen in the previous cases, standard deviation made no progress and retained its original value of $173.52 per acre. Despite 50 percent greater yield risk than the base case, no indemnities were paid under 70 percent coverage (Table 3.14).

Indemnity payments increased slightly under 80 percent coverage (Table 3.14). While no payments were made 97.6 percent of the time, 2.4 percent of the time did see payments being made for one year out of five. This is definitely a change from the previous scenarios, as before we did not see any payments being generated until farmers reached the 90 percent level. In spite of this slight increase in income, net returns continued to fall. NPVRVC declined $4.33 from 70 percent coverage and $35.17 from no insurance to $644.95 per acre (Table 3.13). NPVRTC experienced similar decreases as it dropped to $244.69 per acre. In previous scenarios, there were no changes in standard deviation until 90 percent coverage. However, this trend also

changed as standard deviation decreased a minuscule $0.05 per acre from 70 percent coverage to $173.47 per acre.

Net returns at 90 percent coverage were still less than no insurance, but significantly higher than the two previous coverage levels. NPVRVC was 1.2 percent higher than 70 percent coverage and 1.9 percent greater than 80 percent coverage at $657.28 per acre (Table 3.13). NPVRTC was 3.1 percent higher than 70 percent coverage and 4.8 percent greater than 80 percent coverage at $257.02 per acre. Standard deviation fell again, to $161.72 per acre. Indemnity payments were at their highest levels thus far. 41.7 percent of the time saw payments being made one year out of five, with 17.1 percent of the time for two of five years, 2.6 percent of the time for three of five, 0.4 percent for four years, and 0.1 percent for all five years. Net income risk for 90 percent coverage was 24.6 percent, as compared to the no insurance case at 25.5 percent; therefore, purchasing the highest level of COP insurance had little effect on reducing yield risk when the level was increased to 50 percent.

Yield risk was again increased to 75 percent greater risk, and standard deviation for no insurance under this risk reflected that increase. Standard deviation climbed $20.51 per acre from the previous risk level to $194.03 per acre (Table 3.13). Net returns saw slight increases of a few cents per acre, with NPVRVC totaling $680.29 per acre and NPVRTC at $280.03 per acre.

No indemnities were paid at 70 percent coverage, so there was no income compensation to make up for the lost returns experienced when premiums were paid (Table 3.14). As a result, returns over variable costs fell 4.5 percent to $649.45 per acre, and returns over total costs dropped 11 percent to $249.20 per acre (Table 3.13). The presence of COP insurance did nothing to reduce yield risk as standard deviation remained $194.03 per acre.

Mean net returns saw another initial decrease when coverage level was increased to 80 percent. NPVRVC declined $2.56 per acre from 70 percent coverage to $646.89 per acre (Table 3.13). NPVRTC saw a similar fate, falling $2.57 per acre to $246.63 per acre. While purchasing a higher level of insurance did not have a positive effect in net returns, it did reduce yield risk by 0.6 percent. It also affected the occurrence of indemnity payments as well. Monies were paid 20.9 percent of the time for one year out of five, 2.4 percent of the time for two of five years, and

Table 3.14 Percent of time cost of production crop insurance indemnity payment is made over a five-year period, cotton, Tensas Parish, projected trend mean cotton yields with greater yield risk.

Yield risk increase	Number of years indemnity payment is made over 5-year period					
	0	1	2	3	4	5
Base case:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	72.7%	23.7%	3.4%	0.2%	-	-
25% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	59.5%	32.5%	7.1%	0.8%	0.1%	-
50% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	97.6%	2.4%	-	-	-	-
90% COP	38.1%	41.7%	17.1%	2.6%	0.4%	0.1%
75% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	76.5%	20.9%	2.4%	0.2%	-	-
90% COP	30.7%	42.0%	21.8%	4.5%	0.9%	0.1%
100% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	58.5%	33.3%	7.0%	1.0%	0.1%	-
90% COP	27.0%	41.9%	23.6%	6.3%	1.1%	0.10%

0.2 percent for three of five (Table 3.14)

Net returns at 90 percent coverage continued to be at lower levels than no insurance, but significantly higher than the two previous coverage levels. NPVRVC increased to $671.26 per acre, $21.81 more than the 70 percent level and $24.37 greater than 80 percent (Table 3.13). NPVRTC was an even $271.00 per acre, $21.80 per acre higher than 70 percent coverage and $24.37 per ace more than 80 percent coverage. Standard deviation saw the biggest change, falling 10.5 percent from no insurance. This scenario also saw the greatest amount of indemnities paid under 75 percent greater risk. 69.3 percent of the time payments were generated: 42 percent of the time for one year of five, 21.8 percent of the time for two years out of five, 4.5 percent for three years, 0.9 percent for four years, and 0.1 percent of the time for all five years (Table 3.14).

Yield risk was increased 100 percent for the final set of simulations. For those cotton farmers in Tensas parish who possessed this amount of risk, yet still chose not to purchase COP insurance, net returns over variable costs and net returns over total costs both increased only1 $0.17 per acre from the 75 percent risk category (Table 3.13). As can be expected, standard deviation saw a large spike in value, rising almost 10 percent to $215.15 per acre.

No indemnity payments were made when 70 percent coverage was purchased, so net returns declined (Table 3.14). NPVRVC decreased to$649.52 per acre, a $30.84 per acre drop from no insurance (Table 3.13). NPVRTC also decreased similarly, falling $30.83 per acre to $249.37. There was no change in standard deviation, even after insurance was purchased.

Those farmers who purchased 80 percent coverage at this level of risk saw a change in trend for net returns. In previous scenarios, net returns did not increase until the 90 percent coverage level was reached. However, this is not the case for 100 percent greater risk. NPVRVC increased $2.87 per acre over 70 percent coverage to $652.49 per acre (Table 3.13). NPVRTC saw an increase of $2.86 per acre over 70 percent coverage to $252.23 per acre. Yield risk

declined 2.4 percent to $209.88 per acre due to risk minimization from increased levels of COP insurance. These increases in returns can partially be contributed to the higher level of indemnities paid at this juncture. Only 58.5 percent of the time was no money paid (Table 3.14). About 33 percent of the time saw indemnities being generated for one year out of five, 7 percent for two years out of five, 1 percent of the time for three of five years, and 0.1 percent for four of five.

Increasing coverage level to 90 percent caused another significant increase in net returns. Returns over variable costs rose again to $686.62 per acre, a 5.4 percent jump over 70 percent coverage and 5 percent greater than 80 percent (Table 3.13). Returns over total costs increased to $286.37 per acre, a 12.9 percent increase over 70 percent coverage and 11.9 percent more than 80 percent coverage. Standard deviation decreased significantly from previous levels to $185.50 per acre. The highest level of indemnity payments for Tensas parish was seen at 90 percent coverage under 100 percent greater risk (Table 3.14). Payments were made one year out of five for 41.9 percent of the time, two of five years for 23.6 percent of the time, three of five years for 6.3 percent of the time, four years for 1.1 percent, and 0.1 percent of the time for all five years.

Greater yield risk was again incorporated into Tensas parish's historical prices and yields data; however, this time simulations were run using 5 percent reduced yields, based upon historical yields from the past 10 years. As outlined in Table 3.15 below, the base case included those farmers with equivalent risk who chose not to purchase COP insurance. Their mean NPVRVC were projected to be $600.93 per acre, with a mean NPVRTC of $200.67 per acre. Standard deviation was $132.82 per acre.

Incorporating 70 percent coverage under equivalent risk greatly decreases net returns. Returns over variable costs fell 5.1 percent to $570.10 per acre due to expenses for insurance premiums (Table 3.15). Returns over total costs declined to $169.84 per acre, a $30.83 per acre

decrease from no insurance. Standard deviation remained the same. In this base case, no indemnity payments were made because the only decrease seen in net returns was due to insurance premiums paid on a per acre basis (Table 3.16).

Net returns continued to crumble as COP coverage levels increased. The mean value of returns over variable costs for 80 percent coverage was $565.69 per acre, $4.41 per acre less than 70 percent coverage and $35.24 per acre less than no insurance (Table 3.15). NPVRTC was calculated at $165.44 per acre, $4.40 per acre less than 70 percent coverage and $35.23 per acre

Table 3.15 Net present value of net returns over five-year period, cotton, Tensas Parish, projected trend mean cotton yields reduced 5 percent with greater yield risk.

Yield risk increase	Type of insurance			
	No insurance	70% COP	80% COP	90% COP
Base case:				
Mean NPVRVC[1]	600.93	570.10	565.69	569.30
Mean NPVRTC[2]	200.67	169.84	165.44	169.04
Std. Dev.[3]	132.82	132.82	132.82	126.98
25% greater risk:				
Mean NPVRVC[1]	601.09	570.26	565.89	577.94
Mean NPVRTC[2]	200.84	170.00	165.64	177.69
Std. Dev.[3]	149.85	149.85	149.82	138.32
50% greater risk:				
Mean NPVRVC[1]	601.25	570.42	567.44	591.30
Mean NPVRTC[2]	201.00	170.16	167.19	191.05
Std. Dev.[3]	168.12	168.12	167.12	148.43
75% greater risk:				
Mean NPVRVC[1]	601.42	570.58	572.34	606.08
Mean NPVRTC[2]	201.16	170.32	172.08	205.83
Std. Dev.[3]	187.27	187.27	182.75	158.67
100% greater risk:				
Mean NPVRVC[1]	601.57	570.77	581.89	621.79
Mean NPVRTC[2]	201.32	170.52	181.64	221.54
Std. Dev.[3]	207.05	207.03	196.24	169.26

[1] NPVRVC = net present value of net returns above variable costs per acre.
[2] NPVRTC = net present value of net returns above total costs per acre.
[3] Std. Dev. = standard deviation of net returns above variable costs and total costs per acre.

less than no insurance. Income risk remains relatively fixed as standard deviation held firm at $132.82 per acre. Again, no indemnity payments were made under this level of coverage (Table 3.16).

A change in standard deviation was finally generated at the 90 percent coverage level (Table 3.15). For the last three scenarios in the base case, it had been holding steady at $132.82 per acre; however, this value finally decreased to $126.98 per acre. The trend in returns appeared to have taken a turn when yields were reduced by 5 percent. Net returns now experienced an increase instead of a decline for the base case. NPVRVC rose to $569.30 per acre, a $3.61 per acre increase from 80 percent coverage. NPVRTC was close behind, rising $3.60 per acre to $169.04 per acre. Indemnity payments were finally made for this scenario when the 90 percent level was reached (Table 3.16). While no indemnities were paid 58.8 percent of the time, there were payments made 32.3 percent of the time for one year out of five, 8 percent for two years of five, 0.8 percent of the time for three of five, and 0.1 percent of the time for four years.

After increasing yield risk by 25 percent, a slight overall increase in net returns followed. In the no insurance case, NPVRVC increased to $601.09 per acre – only $0.16 per acre greater than the base case with equivalent risk (Table 3.15). NPVRTC did not see much better conditions, only increasing $0.17 per acre to $200.84 per acre. The only significant change to be found was concerning standard deviation. This increased 11.3 percent to $149.85 per acre, an indication of greater risk.

Buying at least 70 percent COP coverage caused net returns to initially decline, as was also seen in the base case. NPVRVC fell $30.83 per acre to $570.26 per acre, while NPVRTC declined to $170.00 per acre (Table 3.15). Yield risk was not affected by the insurance as standard deviation remained $149.85 per acre. There was no need for indemnity payments to be made under these conditions (Table 3.16).

Approximately 98.1 percent of the time, there were no indemnities paid under 80 percent coverage. Of course, that left only 1.9 percent to be paid one year out of five (Table 3.16). Previously, standard deviation had remained stable until it reached 90 percent coverage. But in this case, standard deviation actually fell to a three pennies to $149.82 per acre (Table 3.15). Returns over variable costs dropped 0.7 percent from 70 percent coverage and 5.9 percent from no insurance. Returns over total costs had a similar reaction, falling 2.6 percent from 70 percent coverage and 17.5 percent from no insurance.

Those farmers choosing to purchase 90 percent COP coverage saw an increase in net returns and a decrease in yield risk from the previous scenarios. While NPVRVC was still less than no insurance, it did increase $12.05 per acre to $577.94 per acre (Table 3.15). NPVRTC experienced this same change as it rose to $177.69 per acre. Standard deviation saw a 7.7 percent reduction to $138.32 per acre. These increased returns can be attributed to the increase in indemnity payments (Table 3.16). Farmers received payments 62.2 percent of the time with 41.5 percent coming for one year out of five, 17.4 percent for two of five years, 2.7 percent of the time for three of five, 0.5 percent for four of five, and 0.1 percent of the time for all five years.

Yield risk was increased to 50 percent for the next set of data, and this risk hike caused net returns to take an upward turn. NPVRVC and NPVRTC both increased $0.16 per acre over the no insurance case with 25 percent greater risk (Table 3.15). Standard deviation jumped $18.27 per acre to $168.12.

Net returns continued to follow the projected trend and decreased under 70 percent coverage due to expenses for insurance premiums. Returns over variable costs dropped 5.1 percent from no insurance to $570.42 per acre (Table 3.15). Returns over total costs experienced a 15 percent decrease, falling to $170.16 per acre. As seen in the previous cases, standard deviation made no progress and remained at its original value of $168.12 per acre. Despite 50

percent greater yield risk than the base case, no indemnities were paid under 70 percent coverage (Table 3.16).

Indemnity payments increased under 80 percent coverage (Table 3.16). While no payments were made 79.6 percent of the time, 18.8 percent of the time did see payments being made for one year out of five, 1.5 percent for two years out of five, and 0.1 percent for three years. In spite of this slight increase in income, net returns continued to fall. NPVRVC declined $2.98 from 70 percent coverage and $33.81 from no insurance to $567.44 per acre (Table 3.15). NPVRTC experienced similar decreases as it dropped to $167.19 per acre. Standard deviation decreased $1.00 per acre from 70 percent coverage to $167.12 per acre.

Net returns at 90 percent coverage were still less than no insurance, but significantly higher than the two previous coverage levels. NPVRVC was 3.5 percent higher than 70 percent coverage and 4 percent greater than 80 percent coverage at $591.30 per acre (Table 3.15). NPVRTC was 10.9 percent higher than 70 percent coverage and 12.5 percent greater than 80 percent coverage at $191.05 per acre. Standard deviation fell again, to $148.43 per acre. 42.3 percent of the time saw payments being made one year out of five, with 21.8 percent of the time for two of five years, 5.2 percent of the time for three of five, 0.8 percent for four years, and 0.1 percent for all five years. Net income risk for 90 percent coverage was 25.1 percent, as compared to the no insurance case at 28 percent. Purchasing this level of COP insurance had a greater positive effect when production yields were at normal levels as opposed to the 5 percent reduction.

Yield risk was again increased to 75 percent, and standard deviation for no insurance under this risk reflected that change. Standard deviation climbed $19.15 per acre from the previous risk level to $187.27 per acre (Table 3.15). Net returns saw slight increases with NPVRVC totaling $601.42 per acre and NPVRTC at $201.16 per acre.

No indemnities were paid at 70 percent coverage, so there was no income compensation to make up for the lost returns experienced when premiums were paid (Table 3.16). As a result, returns over variable costs fell 5 percent to $570.58 per acre, and returns over total costs dropped 15.3 percent to $170.32 per acre (Table 3.15). The presence of COP insurance did nothing to reduce yield risk as standard deviation remained $187.27 per acre.

Mean net returns increased when the coverage level was increased to 80 percent. NPVRVC and NPVRTC both climbed $1.76 per acre over 70 percent coverage to $572.34 per

Table 3.16 Percent of time cost of production crop insurance indemnity payment is made over a five-year period, cotton, Tensas Parish, projected trend mean cotton yields reduced 5 percent with greater yield risk.

Yield risk increase	Number of years indemnity payment is made over 5-year period					
	0	1	2	3	4	5
Base case:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	58.8%	32.3%	8.0%	0.8%	0.1%	-
25% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	98.1%	1.9%	-	-	-	-
90% COP	37.8%	41.5%	17.4%	2.7%	0.5%	0.1%
50% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	79.6%	18.8%	1.5%	0.1%	-	-
90% COP	29.8%	42.3%	21.8%	5.2%	0.8%	0.1%
75% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	61.7%	31.4%	6.1%	0.7%	0.1%	-
90% COP	26.2%	41.2%	24.8%	6.6%	1.1%	0.1%
100% greater risk:						
70% COP	98.5%	1.5%	-	-	-	-
80% COP	38.8%	42.1%	16.2%	2.3%	0.6%	-
90% COP	22.9%	41.3%	26.5%	7.8%	1.3%	0.2%

acre and $172.08 per acre, respectively (Table 3.15). This scenario also experienced a reduction in yield risk by 2.4 percent. Indemnity payments were made 31.4 percent of the time for one year out of five, 6.1 percent of the time for two of five years, 0.7 percent for three of five, and 0.1 percent of the time for four years (Table 3.16)

Net returns at 90 percent coverage continued to be at lower levels than no insurance, but significantly higher than the two previous coverage levels. NPVRVC increased at $671.26 per acre, $21.81 more than the 70 percent level and $24.37 greater than 80 percent (Table 3.13). NPVRTC was an even $271.00 per acre, $21.80 per acre higher than 70 percent coverage and $24.37 per acre more than 80 percent coverage. Standard deviation saw the biggest change, falling 10.5 percent from no insurance. This scenario also saw the greatest amount of indemnities paid under 75 percent greater risk. Payments were made 69.3 percent of the time, 42 percent in one year out of five, 21.8 percent in two years out of five, 4.5 percent in three years out of five, 0.9 percent in four years and 0.1 percent in all five years (Table 3.14).

Yield risk was increased 100 percent for the final set of simulations. For those cotton farmers in Tensas parish who possessed this amount of risk, yet still chose not to purchase COP insurance, net returns over variable costs and net returns over total costs both increased only $0.17 per acre from the 75 percent risk category (Table 3.13). As can be expected, standard deviation saw a large spike in value, rising almost 10 percent to $215.15 per acre.

No indemnity payments were made when 70 percent coverage was purchased, so net returns declined (Table 3.14). NPVRVC decreased to $649.52 per acre, a $30.84 per acre drop from no insurance (Table 3.13). NPVRTC also decreased similarly, falling $30.83 per acre to $249.37. There was no change in standard deviation, even after insurance was purchased.

Those farmers who purchased 80 percent coverage at this level of risk saw a change in trend for net returns. In previous scenarios, net returns did not increase until the 90 percent

coverage level was reached. However, this is not the case for 100 percent greater risk. NPVRVC increased $2.87 per acre over 70 percent coverage to $652.49 per acre (Table 3.13). NPVRTC saw an increase of $2.86 per acre over 70 percent coverage to $252.23 per acre. Yield risk declined 2.4 percent to $209.88 per acre due to risk minimization from increased levels of COP insurance. These increases in returns can partially be contributed to the higher level of indemnities paid at this juncture. Only 58.5 percent of the time was no money paid (Table 3.14). 33.3 percent of the time saw indemnities being generated for one year out of five, 7 percent for two years out of five, 1 percent of the time for three of five years, and 0.1 percent for four of five.

Increasing coverage level to 90 percent caused another significant increase in net returns. Returns over variable costs rose again to $686.62 per acre, a 5.4 percent jump over 70 percent coverage and 5 percent greater than 80 percent (Table 3.13). Returns over total costs increased to $286.37 per acre, a 12.9 percent increase over 70 percent coverage and 11.9 percent more than 80 percent coverage. Standard deviation decreased significantly from previous levels to $185.50 per acre. The highest level of indemnity payments for Tensas parish was seen at 90 percent coverage under 100 percent greater risk (Table 3.14). Payments were made one year out of five for 41.9 percent of the time, two of five years for 23.6 percent of the time, three of five years for 6.3 percent of the time, four years for 1.1 percent, and 0.1 percent of the time for all five years.

Greater yield risk was again varied from 25 to 100 percent based and Tensas parish's historical yields were reduced 10 percent. As outlined in Table 3.17 below, the base case included those farmers with equivalent risk and reduced yields who chose not to purchase COP insurance. Their mean NPVRVC was projected to be $522.05 per acre, with a mean NPVRTC of $121.79 per acre. Standard deviation was calculated at $130.62 per acre.

Incorporating 70 percent coverage under equivalent risk has trended in the direction of decreasing net returns. Returns over variable costs fell 5.9 percent to $491.21 per acre due to expenses for insurance premiums (Table 3.17). Returns over total costs declined to $90.96 per acre, a $30.83 per acre decrease from no insurance. Standard deviation remained the same. In this base case, no indemnity payments were made because the only decrease seen in net returns was due to insurance premiums paid on a per acre basis (Table 3.18).

Table 3.17 Net present value of net returns over five-year period, cotton, Tensas Parish, projected trend mean cotton yields reduced 10 percent with greater yield risk.

Yield risk increase	Type of insurance			
	No insurance	70% COP	80% COP	90% COP
Base case:				
Mean NPVRVC[1]	522.05	491.21	486.85	500.02
Mean NPVRTC[2]	121.79	90.96	86.60	99.77
Std. Dev.[3]	130.62	130.62	130.58	118.74
25% greater risk:				
Mean NPVRVC[1]	522.20	491.36	488.33	513.11
Mean NPVRTC[2]	121.94	91.11	88.08	112.86
Std. Dev.[3]	146.22	146.22	145.25	126.46
50% greater risk:				
Mean NPVRVC[1]	522.35	491.52	492.93	527.41
Mean NPVRTC[2]	122.10	91.26	92.68	127.16
Std. Dev.[3]	163.08	163.08	158.80	134.77
75% greater risk:				
Mean NPVRVC[1]	522.50	491.68	501.56	542.53
Mean NPVRTC[2]	122.25	91.42	101.31	142.28
Std. Dev.[3]	180.84	180.83	170.80	143.71
100% greater risk:				
Mean NPVRVC[1]	522.66	492.70	514.00	558.22
Mean NPVRTC[2]	122.40	92.44	113.75	157.97
Std. Dev.[3]	199.25	198.68	181.32	153.06

[1] NPVRVC = net present value of net returns above variable costs per acre.
[2] NPVRTC = net present value of net returns above total costs per acre.
[3] Std. Dev. = standard deviation of net returns above variable costs and total costs per acre.

Net returns continued to slump as COP coverage levels increase. The mean value of returns over variable costs for 80 percent coverage was $486.85 per acre, $4.36 per acre less than 70 percent coverage and $35.20 per acre less than no insurance (Table 3.17). NPVRTC was calculated at $86.80 per acre, also $4.36 per acre less than 70 percent coverage and $35.19 per acre less than no insurance. Income risk remains relatively stable, but did decrease $0.04 per acre as standard deviation fell to $130.58 per acre. The amount of indemnity payments did increase; however, no payments were generated 98 percent of the time (Table 3.18).

Typically, standard deviation did not decrease until coverage reached 90 percent. Under this reduced yield change, the value was projected to take a slight dip at the 80 percent coverage level, then decrease dramatically at 90 percent. Following the assumed projections, standard deviation significantly decreased to $118.74 per acre. NPVRVC increased to $500.02 per acre, a $13.17 per acre increase from 80 percent coverage and $8.81 per acre higher than 70 percent. NPVRTC reached a striking low of $99.77 per acre. Indemnity payments increased significant when the 90 percent level was obtained (Table 3.18). There were payments made 41.6 percent of the time for one year out of five, 18.5 percent for two years of five, 3.7 percent of the time for three of five, 0.5 percent of the time for four years, and 0.1 percent of the time for all five years.

While still keeping yields reduced by 10 percent, yield risk was then increased 25 percent for the next scenario. In the no insurance case, NPVRVC increased to $522.20 per acre – only $0.15 per acre greater than the base case with equivalent risk (Table 3.17). NPVRTC remained exactly parallel, also increasing $0.15 per acre to $121.94 per acre. The only significant change to be found was concerning standard deviation. This increased 11.9 percent to $146.22 per acre.

Buying at least 70 percent COP coverage caused net returns to initially decline, as was also seen in the base case. NPVRVC fell $30.84 per acre to $491.36 per acre, while NPVRTC declined to $91.11 per acre (Table 3.17). These declines in net returns produced no effect on

yield risk as standard deviation remained $146.22 per acre. Despite 25 percent greater risk, no indemnity payments were made (Table 3.18).

The propensity of indemnity payments generated for 80 percent coverage was quite small (Table 3.18). Payments were only made 19.2 percent of the time for one year out of five, 1.4 percent of the time for two of five years, and 0.1 percent for three years. Standard deviation fell $0.97 per acre (Table 3.17). Returns over variable costs dropped 0.6 percent from 70 percent coverage and 6.5 percent from no insurance. Returns over total costs had a larger reaction, falling 3.3 percent from 70 percent coverage and 27.8 percent from no insurance.

Those farmers choosing to purchase 90 percent COP coverage saw an increase in net returns and a decrease in yield risk from the previous scenarios. While NPVRVC was still less than no insurance, it did increase $24.78 per acre over 80 percent coverage to $513.11 per acre (Table 3.17). NPVRTC experienced this same change as it rose to $112.86 per acre. Standard deviation saw a 12.9 percent reduction to $126.46 per acre. These increased returns can be attributed to the increase in indemnity payments (Table 3.18). Farmers received payments 72.3 percent of the time with 42.3 percent coming for one year out of five, 22.9 percent for two of five years, 6 percent of the time for three of five, 1 percent for four of five, and 0.1 percent of the time for all five years.

Yield risk was increased to 50 percent for the next set of data, and this alteration caused net returns to make a increase. NPVRVC rose $0.15 to $522.35 per acre and NPVRTC increased $0.16 to $122.10 per acre over the no insurance case with 25 percent greater risk (Table 3.17). Standard deviation jumped $16.86 per acre to $163.08.

Net returns continued to follow the projected trend and decreased under 70 percent coverage due to expenses for insurance premiums. Returns over variable costs dropped 5.9 percent from no insurance to $491.52 per acre (Table 3.17). Returns over total costs experienced

a 25 percent decrease, falling to $91.26 per acre. Standard deviation continued to hold firm at this level and remained at $163.08 per acre. Despite 50 percent greater yield risk than the base case, no indemnities were paid under 70 percent coverage (Table 3.18).

Indemnity payments increased under 80 percent coverage (Table 3.18). While no payments were made 62.2 percent of the time, 31 percent of the time did see payments being made for one year out of five with less than 10 percent being made for the remaining years. NPVRVC increased $1.41 from 70 percent coverage to $492.93 per acre (Table 3.17). NPVRTC experienced similar increases as it elevated to $92.68 per acre. While the change was not tremendous, standard deviation did decrease $4.28 per acre from 70 percent coverage.

Net returns at 90 percent coverage were still less than no insurance, but significantly higher than the two previous coverage levels. NPVRVC was 6.8 percent higher than 70 percent coverage and 6.5 percent greater than 80 percent coverage at $527.41 per acre (Table 3.17). NPVRTC was 28.2 percent higher than 70 percent coverage and 27.1 percent greater than 80 percent coverage at $127.16 per acre. Standard deviation fell again, to $134.77 per acre. Indemnity payments made a dramatic impact (Table 3.18). 40.6 percent of the time saw payments being made one year out of five, with 25.8 percent of the time for two of five years, 7.1 percent of the time for three of five, 1.3 percent for four years, and 0.1 percent for all five years.

Yield risk was again increased, this time to 75 percent, and standard deviation for no insurance under this risk reflected that increase. Standard deviation climbed $17.76 per acre from the previous risk level to $180.84 per acre (Table 3.17). Net returns saw slight increases of a few cents per acre, with NPVRVC totaling $522.50 per acre and NPVRTC at $122.25 per acre.

Table 3.18 Percent of time cost of production crop insurance indemnity payment is made over a five-year period, cotton, Tensas Parish, projected trend mean cotton yields reduced 10 percent with greater yield risk.

	Number of years indemnity payment is made over 5-year period					
Yield risk increase	0	1	2	3	4	5
Base case:						
70% COP	100.0%	-	-	-	-	-
80% COP	98.0%	2.0%	-	-	-	-
90% COP	35.6%	41.6%	18.5%	3.7%	0.5%	0.1%
25% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	79.3%	19.2%	1.4%	0.1%	-	-
90% COP	27.7%	42.3%	22.9%	6.0%	1.0%	0.1%
50% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	62.2%	31.0%	6.0%	0.7%	0.1%	-
90% COP	25.1%	40.6%	25.8%	7.1%	1.3%	0.1%
75% greater risk:						
70% COP	99.2%	0.8%	-	-	-	-
80% COP	39.0%	42.1%	16.0%	2.4%	0.5%	-
90% COP	22.3%	39.8%	27.8%	8.6%	1.3%	0.2%
100% greater risk:						
70% COP	86.2%	12.9%	0.8%	0.1%	-	-
80% COP	33.8%	42.1%	19.4%	4.0%	0.7%	-
90% COP	21.0%	39.1%	28.6%	9.5%	1.5%	0.3%

Indemnities were paid out 1.8 percent of the time, and these payments were only made for one year out of five (Table 3.18). As a result, returns over variable costs fell 5.9 percent to $491.68 per acre, and returns over total costs dropped 25.2 percent to $91.42 per acre (Table 3.17). Standard deviation actually decreased $0.01 per acre at 70 percent coverage, the first time this has occurred in this particular simulation.

Mean net returns increased when the coverage level was increased to 80 percent. NPVRVC jumped $9.88 per acre from 70 percent coverage to $501.56 per acre (Table 3.17). NPVRTC saw a similar fate, climbing $9.89 per acre to $101.31 per acre. Purchasing a higher

level of insurance had a positive effect on net returns, and reduced yield risk by 5.5 percent. It also affected the occurrence of indemnity payments as well. Payments were made 42.1 percent of the time for one year out of five, 16 percent of the time for two of five years, 2.4 percent for three of five, and 0.5 percent of the time for four years (Table 3.18).

Net returns at 90 percent coverage continued to be at lower levels than no insurance, but significantly higher than the two previous coverage levels. NPVRVC increased to $542.53 per acre, $50.85 more than the 70 percent level and $40.97 greater than 80 percent (Table 3.17). NPVRTC was $142.28 per acre, $50.86 per acre higher than 70 percent coverage and $40.97 per acre more than 80 percent coverage. Standard deviation saw the biggest change, falling 20.5 percent from no insurance. This scenario also saw the greatest amount of indemnities paid under 75 percent greater risk. Indemnity payments were generated 77.7 percent of the time: 39.8 percent in one year out of five, 27.8 percent for two years, 8.6 percent for three years, 1.3 percent for four years, and 0.2 percent for five years out of five (Table 3.18).

Yield risk was increased 100 percent for the final set of simulations. For those cotton farmers in Tensas parish who possessed this amount of risk, yet still chose not to purchase COP insurance, net returns over variable costs and net returns over total costs both increased only $0.16 per acre from the 75 percent risk category (Table 3.17). As can be expected, standard deviation saw a large spike in value, rising almost 10 percent to $199.25 per acre.

Even though indemnity payments were made almost 20 percent of the time when 70 percent coverage was purchased, net returns declined (Table 3.18). NPVRVC decreased to $492.70 per acre, a $29.96 per acre drop from no insurance (Table 3.17). NPVRTC decreased similarly, falling the same value to $92.44 per acre. Standard deviation took a fall from the previous level to $198.68 per acre.

NPVRVC at 80 percent coverage increased $21.30 per acre $514.00 per acre (Table 3.17). NPVRTC experienced the same incremental increase to $113.75 per acre. Yield risk declined 8.7 percent to $181.32 per acre due to risk minimization from increased levels of COP insurance. A higher amount of indemnities was paid at this level, so that only 33.8 percent of the time was no money paid (Table 3.18). 42.1 percent of the time saw indemnities being generated for one year out of five, 19.4 percent for two years out of five, 4 percent of the time for three of five years, and 0.7 percent for four of five.

Increasing coverage level to 90 percent caused another significant increase in net returns. Returns over variable costs rose significantly to $558.22 per acre, an 11.7 percent jump over 70 percent coverage and 7.9 percent greater than 80 percent (Table 3.17). Returns over total costs increased to $157.97 per acre, a 41.5 percent increase over 70 percent coverage and 28 percent more than 80 percent coverage. Standard deviation decreased significantly from previous levels to $153.06 per acre. The highest level of indemnity payments for 10 percent reduced yields was seen at 90 percent coverage under 100 percent greater risk (Table 3.18). Payments were made one year out of five for 39.1 percent of the time, two of five years for 28.6 percent of the time, three of five years for 9.5 percent of the time, four years for 1.5 percent, and 0.3 percent of the time for all five years.

Vermilion Parish Rice Results

The same simulations that were conducted with the two cotton parishes were also used for rice. Acadia and Vermilion parishes, the top two rice producing parishes for the state of Louisiana the last five years running, were chosen. 1,000 simulations were run, using ten-year historical harvest prices and production yields for these two parishes. Rice budgets from the LSU AgCenter were used in order to determine average yearly production costs. As before, results

were projected for a five year period and reported on a per acre basis. The following tables dictate the results of these simulations.

Table 3.19 Net present value of net returns over five-year period, rice, Vermilion Parish, projected trend mean rice yields with equivalent risk.

Type of insurance	NPV[1] of net returns above variable costs		NPV[1] of net returns above total costs	
	Mean	Std. Dev.	Mean	Std. Dev.
No insurance	382.71	117.97	150.91	117.97
70% COP	357.47	117.97	125.67	117.97
75% COP	355.67	117.97	123.87	117.97
80% COP	353.87	117.97	122.07	117.97
85% COP	352.55	117.37	120.75	117.37
90% COP	355.33	112.99	123.53	112.99

[1]NPV = net present value

Table 3.19 displays the net returns generated for Vermilion parish, both above variable costs and total costs, assuming equivalent risk. Levels of COP crop insurance were varied on 5 percent increments from 70 percent coverage to 90 percent. The base case contains those farmers who chose not to purchase crop insurance. The mean NPVRVC for the base case was determined to be $382.71 per acre, with the NPVRTC coming in at $150.91 per acre. Standard deviation for no insurance was $117.97 per acre. Table 3.21 indicates the percentage of time that net returns can be expected to be negative over this five year period. Still assuming no insurance, net returns over variable costs are strictly positive for 78.2 percent of the time. They are reasoned to be negative 18.5 percent of the time for one year out of five, 3.1 percent of the time for two of five years, and 0.2 percent for three years. Returns over total costs have a higher propensity of negativity. Only 27.5 percent of the time are they always positive. 33.2 percent of the time they are negative for one year out of five, 24 percent of the time for two out of five years, 11.3 percent for three years, 3.5 percent of the time for four years, and 0.5 percent for all five years.

For those farmers who chose to purchase 70 percent COP coverage, net returns above variable costs were negative 21.9 percent of the time for one year out of five, 5.8 percent of the time for two of five years, 0.1 percent of the time for three years, and 0.1 percent for four years

(Table 3.21). Net returns above total costs were always positive only 25 percent of the time; however, they were negative 31.4 percent of the time for one year, 25.6 percent of the time for two years out of five, 12.3 percent for three out of five, 5.1 percent of the time for four of five, and 0.6 percent for five years. Table 3.20 provides a break-down of years that indemnity payments were generated at each coverage level. For 70 percent coverage, no indemnities were projected to be paid to the rice farmers. NPVRVC fell 6.6 percent to $357.47 per acre, and NPVRTC experienced a decrease of 16.7 percent to $125.67 per acre (Table 3.19). These decreases in net returns can be attributed to costs that are associated with premiums that must be paid for each acre that is insured. For every increase in coverage level, there is an increase in the amount of premiums paid. Despite the purchase of insurance, standard deviation did not decrease, but instead remained at $117.97 per acre.

Table 3.20 Percent of time cost of production crop insurance indemnity payment is made over a five-year period, rice, Vermilion Parish, projected trend mean rice yields with equivalent risk.

Type of insurance	Number of years indemnity payment is made over 5-year period					
	0	1	2	3	4	5
70% COP	100.0%	-	-	-	-	-
75% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
85% COP	91.9%	7.7%	0.4%	-	-	-
90% COP	66.6%	24.6%	7.8%	0.9%	0.1%	-

Both categories of net returns only fell $1.80 per acre under 75 percent coverage from the previous level, about the cost of the added COP insurance (Table 3.19). Therefore, there was no need for indemnity payments to be made at this level either (Table 3.20). Standard deviation continued to hold steady at $117.97 per acre. However, the percentage of years with negative returns continued to swell. Approximately 28.7 percent of the time, there were occurrences of negative returns above variable costs – 22.7 percent for one year, 5.8 percent for two years, and

0.1 percent for both three and four years out of five (Table 3.21). About 75.3 percent of the time found returns over total costs being negative; 31.6 percent of the time for one year out of five, 25.7 percent of the time for two years, 12.2 percent of the time for three of five, 5 percent for four years, and 0.7 percent of the time for five of five.

Standard deviation made no changes whatsoever once the 80 percent coverage level was reached (Table 3.19). Mean NPVRVC and NPVRTC did fall another $1.80 per acre, but these decreases are expected as coverage levels increase. Returns above variable costs were always positive 70.9 percent of the time under 80 percent coverage, but returns above total costs were always positive only 24.3 percent of the time (Table 3.21). The losses experienced were not enough to justify supplemental income, as no indemnity payments were made during the five year period (Table 3.20).

Table 3.21 Percent of time net returns are negative over a five-year period, rice, Vermilion Parish, projected trend mean rice yields with equivalent risk.

Type of insurance	Number of years with negative net returns over 5-year period					
	0	1	2	3	4	5
	Net returns above variable costs					
No insurance	78.2%	18.5%	3.1%	0.2%	-	-
70% COP	72.1%	21.9%	5.8%	0.1%	0.1%	-
75% COP	71.3%	22.7%	5.8%	0.1%	0.1%	-
80% COP	70.9%	22.8%	6.0%	0.2%	0.1%	-
85% COP	70.3%	23.2%	5.9%	0.5%	0.1%	-
90% COP	100.0%	-	-	-	-	-
	Net returns above total costs					
No insurance	27.5%	33.2%	24.0%	11.3%	3.5%	0.5%
70% COP	25.0%	31.4%	25.6%	12.3%	5.1%	0.6%
75% COP	24.7%	31.6%	25.7%	12.2%	5.0%	0.7%
80% COP	24.3%	31.7%	25.7%	12.4%	5.1%	0.7%
85% COP	24.0%	31.6%	25.9%	12.6%	5.1%	0.7%
90% COP	23.8%	31.4%	26.0%	12.9%	5.1%	0.7%

Indemnity payments were finally warranted at the 85 percent level. Payments were made 7.7 percent of the time for one year out of five (Table 3.20). It was this small increase in income that allowed net returns to adjust themselves. NPVRVC dropped $1.32 per acre to $352.55 per acre (Table 3.19). NPVRTC also declined $1.32 per acre to $120.75 per acre. The cost in

premiums was made up for by indemnities; this is the reason the $1.80 per acre trend in decreases was broken. This also marks the beginning of the upswing in net returns. Standard deviation finally decreases slightly, down $0.60 per acre to $117.37 per acre. Returns above variable costs were negative 29.7 percent of the time; 23.2 percent for one year out of five, 5.9 percent of the time for two of five years, 0.5 percent for three years, and 0.1 percent of the time for four years (Table 3.21). Returns above total costs were negative 76 percent of the time, with the highest occurrence being 31.6 percent of the time for one year out of five.

It is at the 90 percent coverage level that we view the most changes. Instead of continually decreasing, net returns began to increase. While still less than the base case, NPVRVC both increased $2.78 per acre over 85 percent coverage to $355.33 per acre and $123.53 per acre, respectively (Table 3.19). Standard deviation also made a significant change, falling $4.38 per acre to $112.99. The largest amount of indemnity payments was found within this coverage level as well (Table 3.20). 24.6 percent of the time saw payments being generated for one year out of five, 7.8 percent of the time for two out of five, 0.9 percent for three years, and 0.1 percent of the time for four of five years. The most important discovery is the effect that indemnities had on variable costs. Returns over variable costs were positive 100 percent of the time (Table 3.21). However, returns over total costs did not have such luck. These values were negative 31.4 percent of the time for one year out of five, 26 percent for two of five, 12.9 percent of the time for three of five years, 5.1 percent for four years out of five, and 0.7 percent for all five years.

Table 3.22 compounds upon the data that was displayed in the three previous tables. The base case remains that of no insurance, and coverage levels are varied 70 percent, 80 percent and 90 percent. The new variable in this scenario is that yield risk has also been varied from 25 to 100 percent. In the base case, the mean NPVRVC for rice farmers with no COP insurance was

$382.71 per acre, with mean NPVRTC calculated at $150.91 per acre. Standard deviation, as also shown in Table 3.19, was $117.97 per acre.

Table 3.22 Net present value of net returns over five-year period, rice, Vermilion Parish, projected trend mean rice yields with greater yield risk.

Yield risk increase	Type of insurance			
	No insurance	70 percent COP	80 percent COP	90 percent COP
Base case:				
Mean NPVRVC[1]	382.71	357.47	353.87	355.33
Mean NPVRTC[2]	150.91	125.67	122.07	123.53
Std. Dev.[3]	117.97	117.97	117.97	112.99
25% greater risk:				
Mean NPVRVC[1]	377.08	351.84	348.25	350.61
Mean NPVRTC[2]	145.28	120.04	116.45	118.81
Std. Dev.[3]	120.30	120.30	120.29	114.86
50% greater risk:				
Mean NPVRVC[1]	371.45	346.21	342.66	346.20
Mean NPVRTC[2]	139.65	114.41	110.86	114.40
Std. Dev.[3]	124.40	124.40	124.33	118.39
75% greater risk:				
Mean NPVRVC[1]	365.82	340.58	337.27	342.33
Mean NPVRTC[2]	134.02	108.78	105.47	110.53
Std. Dev.[3]	130.09	130.09	129.84	123.47
100% greater risk:				
Mean NPVRVC[1]	360.19	334.95	332.15	339.12
Mean NPVRTC[2]	128.39	103.15	100.35	107.32
Std. Dev.[3]	137.17	137.17	136.58	129.76

[1] NPVRVC = net present value of net returns above variable costs per acre.
[2] NPVRTC = net present value of net returns above total costs per acre.
[3] Std. Dev. = standard deviation of net returns above variable costs and total costs per acre.

Due to increased costs from insurance premiums, net returns over variable costs for the 70 percent coverage level fell $25.24 per acre to $357.47 per acre from no insurance (Table 3.22). NPVRTC also fell $25.24 to $125.67 per acre. The drop in net returns is exactly the same for both variable and total costs, leading to the assumption that these two have a one-to-one correlation with each other. Despite these changes in net returns, yield risk was not affected as standard deviation remained $117.97 per acre. No indemnity payments were made at this coverage level (Table 3.23).

Those farmers with normal risk who chose to purchase 80 percent coverage saw returns over variable costs dwindle to $353.87 per acre, a $3.60 per acre decrease from 70 percent coverage and $28.84 per acre less than no insurance (Table 3.22). Returns over total costs fell to $122.07 per acre, a 2.8 percent decrease from 70 percent coverage and 19 percent less than no insurance. Indemnity payments continued to be zero for the base case (Table 3.23). Standard deviation held firm at its previous value.

It was not until coverage reached 90 percent that net returns were halted in their downturn. NPVRVC raised $1.46 per acre to $355.33 per acre (Table 3.22). NPVRTC followed suit, also jumping $1.46 per acre to $123.53 per acre. This increase in income was a result of indemnity payments. Indemnities were paid 24.6 percent of the time for one year out of five, 7.8 percent of the time for two of five years, 0.9 percent for three years, and 0.1 percent for four out of five years (Table 3.23). The only decline in this scenario came from standard deviation, which dropped 4.2 percent from the previous insurance coverage levels. Net income risk was calculated at 31.7 percent for this scenario as compared to 30.8 percent for no insurance.

The next set of data was simulated using the assumption of 25 percent greater risk in yields. This increase in risk did not prove positive for net returns. NPVRVC for farmers with no insurance fell $5.63 per acre from the base case (Table 3.22). Likewise, NPVRTC decreased by the same amount to $145.28 per acre. As was expected with any increase in risk, standard deviation increased to $120.30 per acre, 1.9 percent higher than the base case.

A 6.7 percent decrease in NPVRVC was experienced when 70 percent coverage was purchased (Table 3.22). NPVRTC fell 17.4 percent to $120.04 per acre. Yield risk was not minimized when this level of insurance was purchased, so standard deviation remained $120.30 per acre. As this decrease in net returns can be explained by the cost of insurance premiums, there was no need for indemnity payments at 70 percent coverage (Table 3.23).

An important change occurred at 80 percent coverage. Where before there was no noted change in standard deviation until the 90 percent level was reached, there was a $0.01 per acre decrease in this value, lowering it slightly to $120.29 per acre (Table 3.22). Net returns continued to experience declining amounts, with NPVRVC totaling $348.25 per acre and NPVRTC at $116.45 per acre. There were very few indemnities paid out at this level; only 0.6 percent of the time for one year out of five (Table 3.23).

Table 3.23 Percent of time cost of production crop insurance indemnity payment is made over a five-year period, rice, Vermilion Parish, projected trend mean rice yields with greater yield risk.

Yield risk increase	Number of years indemnity payment is made over 5-year period					
	0	1	2	3	4	5
Base case:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	66.6%	24.6%	7.8%	0.9%	0.1%	-
25% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	99.4%	0.6%	-	-	-	-
90% COP	65.6%	26.0%	7.2%	1.1%	0.1%	-
50% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	98.2%	1.8%	-	-	-	-
90% COP	62.0%	29.6%	7.0%	1.2%	0.2%	-
75% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	94.7%	4.9%	0.4%	-	-	-
90% COP	59.0%	30.9%	8.4%	1.4%	0.3%	-
100% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	90.3%	9.1%	0.6%	-	-	-
90% COP	56.3%	32.6%	9.2%	1.6%	0.3%	-

Indemnity payments increased significantly at the 90 percent coverage level. Only 65.6 percent of the time were no payments generated (Table 3.23). Twenty-six percent of the time saw payments for one year out of five, 7.2 percent of the time for two of five, 1.1 percent of the

time for three years, and 0.1 percent for four out of five years. In the same fashion as that of the base case, net returns increased at this coverage level. NPVRVC increased $2.36 from 80 percent coverage to $350.61 per acre. NPVRTC also increased $2.36 to $118.81 per acre. Both set of returns have a standard deviation of $114.86 per acre, a 4.5 percent decrease from the previous coverage level.

Risk yield was increased again, this time to 50 percent greater than normal. As a result, net returns for the no insurance category fell significantly. NPVRVC decreased $5.63 per acre from 25 percent risk to $371.45 per acre (Table 3.22). NPVRTC also dropped $5.63 per acre to $139.65 per acre. The increase in yield risk led to an increase in standard deviation of $4.10 per acre, producing greater fluctuations in average yield.

Rice farmers received in Vermilion parish no indemnity payments for 70 percent coverage in this scenario (Table 3.23). Since no supplemental income was received from payments, insurance premiums took a bite out of net returns. Net returns declined $25.24 per acre from no insurance. Standard deviation increased $4.10 per acre to $124.40 per acre.

Net returns continued to steadily decline for 80 percent coverage as well. NPVRVC decreased $3.55 per acre to $342.66 per acre, and NPVRTC dropped $3.55 per acre to $110.86 per acre. Standard deviation took a small slip of $0.07 per acre to $124.33. These losses from the previous coverage level were not as severe as those at the 70 percent level because a small percentage of indemnities were paid. While 98.2 percent of the time no payments were made, indemnities were paid 1.8 percent of the time for one year out of five (Table 3.23).

As projected in the previous risk levels, net returns made a swift turn at 90 percent coverage under 50 percent risk. While they were still less than the returns made under no insurance, NPVRVC rose 1 percent over 80 percent coverage to $346.20 per acre, with NPVRTC increasing 3 percent to $114.40 per acre (Table 3.22). Standard deviation was at its

lowest level for this risk category at $118.39 per acre, $6.01 per less than no insurance and $5.94 per acre less than the 80 percent coverage. Indemnity payments were again the highest at the 90 percent level (Table 3.23). 29.6 percent of the time payments were made for one year out of five, 7 percent of the time for two years out of five, 1.2 percent for three of five, and 0.2 percent for four years out of five.

The fourth set of data in Tables 3.22 and 3.23 increased the level of risk to 75 percent. This increase in risk caused a drop in net returns. NPVRVC for farmers with no insurance fell $5.63 per acre from the base case (Table 3.22). Likewise, NPVRTC decreased by the same amount to $134.02 per acre. As was expected with any increase in risk, standard deviation increased to $130.09 per acre, 4.4 percent higher than the base case.

Vermilion parish rice farmers received no indemnity payments for 70 percent coverage in this scenario (Table 3.23). Again, no supplemental income was received from payments and insurance costs cut into mean net returns, causing them to decline $25.24 per acre from no insurance. Standard deviation continued to hold constant at $130.09 per acre.

Net returns continued to steadily decline for 80 percent coverage as well. NPVRVC decreased $3.31 per acre to $337.27 per acre, and NPVRTC dropped $3.31 per acre to $105.47 per acre. While 94.7 percent of the time no payments were made, indemnities were paid 4.9 percent of the time for one year out of five and 0.4 percent of the time for two of five (Table 3.23).

Net returns increased for 90 percent coverage under 50 percent risk. While they were still less than the returns made under no insurance, NPVRVC rose 1.5 percent over 80 percent coverage to $342.33 per acre, with NPVRTC increasing 4.6 percent to $110.53 per acre (Table 3.22). Standard deviation was at its lowest level for this risk category at $123.47 per acre, $6.62 per less than no insurance and $6.37 per acre less than 80 percent coverage. Indemnity payments

were again the highest at the 90 percent level (Table 3.23). 30.9 percent of the time payments were made for one year out of five, 8.4 percent of the time for two years out of five, 1.4 percent for three of five, and 0.3 percent for four years out of five.

Risk was increased to 100 percent for the final set of simulations under average production yields. Mean net returns over variable costs for those farmers who chose no insurance dwindled to $360.19 per acre, with returns over total costs totaling $128.39 per acre (Table 3.22). Both sets of returns decreased $5.63 per acre from 75 percent greater risk. While net returns fell, standard deviation rose to $137.17 per acre.

Indemnity payments for 70 percent coverage were nonexistent; none of the risk levels in this scenario required payments under 70 percent coverage (Table 3.23). NPVRVC fell 7 percent to $334.95 per acre, with NPVRTC falling 19.7 percent to $103.15 per acre (Table 3.22). Yield risk was not affected, positively or negatively, by the presence of COP insurance. It remained $137.17 per acre.

Net returns continued to fall under 80 percent coverage, but yield risk began to minimize. Returns over variable costs declined to $332.15 per acre, a $2.80 per acre decrease from 70 percent coverage (Table 3.22). Returns over total costs dropped another $2.80 per acre to $100.35. Yield risk fell slightly to $136.58 per acre. Indemnity payments were made 9.1 percent of the time for one year out of five and 0.6 percent of the time for two years out of five (Table 3.23).

Indemnity payments increased the most under 90 percent coverage (Table 3.23). Only 56.3 percent of the time were no payments generated, with 32.6 percent of payments coming in one year out of five. Yield risk was at its lowest level for 100 percent risk at $129.76 per acre, falling $6.82 per acre (Table 3.22). Net returns both increased $6.97 per acre from the previous coverage level.

Tables 3.24 and 3.25 carry Vermilion parish rice simulation results further; only this time, historical production yields have been reduced by 5 percent to document the results of lowered yields on net returns and indemnity payments. The base case remains that of no insurance, and coverage levels are varied 70 percent, 80 percent and 90 percent. Yield risk is still varied in levels from 25 to 100 percent. In the base case, the mean NPVRVC for rice farmers with no COP insurance was $319.99 per acre, with mean NPVRTC calculated at $88.19 per acre. Standard deviation was $110.86 per acre.

Due to increased costs from insurance premiums, net returns over variable costs for the 70 percent coverage level fell $25.24 per acre to $294.75 per acre from no insurance (Table 3.24). NPVRTC also fell $25.24 to $62.95 per acre. The drop in net returns is exactly the same for both variable and total costs, leading to the assumption that these two have a one-to-one correlation with each other. Despite these changes in net returns, yield risk was not affected as standard deviation remained $110.86 per acre. No indemnity payments were made at this coverage level (Table 3.25).

Those farmers with normal risk who chose to purchase 80 percent coverage saw returns over variable costs dwindle to $291.16 per acre, a $3.59 per acre decrease from 70 percent coverage and $28.83 per acre less than no insurance (Table 3.24). Returns over total costs fell to $59.36 per acre, a 5.7 percent decrease from 70 percent coverage and 32.7 percent less than no insurance. Indemnity payments were paid only 0.7 percent of the time for one year out of five (Table 3.25). Standard deviation decreased 2 cents to $110.84 per acre.

It was not until coverage reached 90 percent that net returns were halted in their downturn. NPVRVC rose $5.43 per acre to $296.59 per acre (Table 3.24). NPVRTC followed suit, also jumping $5.43 per acre to $64.79 per acre. This increase in income was a result of

Table 3.24 Net present value of net returns over five-year period, rice, Vermilion Parish, projected trend mean rice yields reduced 5 percent with greater yield risk.

Yield risk increase	Type of insurance			
	No insurance	70% COP	80% COP	90% COP
Base case:				
Mean NPVRVC[1]	319.99	294.75	291.16	296.59
Mean NPVRTC[2]	88.19	62.95	59.36	64.79
Std. Dev.[3]	110.86	110.86	110.84	102.64
25% greater risk:				
Mean NPVRVC[1]	314.64	289.40	285.87	292.32
Mean NPVRTC[2]	82.84	57.60	54.07	60.52
Std. Dev.[3]	113.61	113.61	113.52	105.10
50% greater risk:				
Mean NPVRVC[1]	309.29	284.05	280.80	288.68
Mean NPVRTC[2]	77.49	52.26	49.00	56.89
Std. Dev.[3]	118.01	118.01	117.70	109.08
75% greater risk:				
Mean NPVRVC[1]	303.94	278.71	275.99	285.57
Mean NPVRTC[2]	72.15	46.91	44.19	53.77
Std. Dev.[3]	123.88	123.88	123.87	114.44
100% greater risk:				
Mean NPVRVC[1]	298.60	273.36	271.49	283.32
Mean NPVRTC[2]	66.80	41.56	39.69	51.52
Std. Dev.[3]	131.03	131.03	129.77	120.79

[1] NPVRVC = net present value of net returns above variable costs per acre.
[2] NPVRTC = net present value of net returns above total costs per acre.
[3] Std. Dev. = standard deviation of net returns above variable costs and total costs per acre.

indemnity payments. Indemnities were paid 31.2 percent of the time for one year out of five, 11.8 percent of the time for two of five years, 3.5 percent for three years, and 0.5 percent for four out of five years (Table 3.25). The only decline in this scenario came from standard deviation, which dropped 7.4 percent from the previous insurance coverage levels. Net income risk was calculated at 34.6 percent for this scenario, the exact same amount of risk as that of no insurance.

The next set of data was simulated using the assumption of 25 percent greater risk in yields. This increase in risk did not prove positive for net returns. NPVRVC for farmers with no insurance fell $5.35 per acre from the base case (Table 3.24). Likewise, NPVRTC decreased by

the same amount to $82.84 per acre. As was expected with any increase in risk, standard deviation increased to $113.61 per acre, 2.4 percent higher than the base case.

An 8 percent decrease in NPVRVC was experienced when 70 percent coverage was purchased (Table 3.24). NPVRTC fell 30.5 percent to $57.60 per acre. Yield risk was not minimized when this level of insurance was purchased, so standard deviation remained $113.61 per acre. As this decrease in net returns can be explained by the cost of insurance premiums, there was no need for indemnity payments at 70 percent coverage (Table 3.25).

Table 3.25 Percent of time cost of production crop insurance indemnity payment is made over a five-year period, rice, Vermilion Parish, projected trend mean rice yields reduced 5 percent with greater yield risk.

Yield risk increase	Number of years indemnity payment is made over 5-year period					
	0	1	2	3	4	5
Base case:						
70% COP	100.0%	-	-	-	-	-
80% COP	99.3%	0.7%	-	-	-	-
90% COP	53.0%	31.2%	11.8%	3.5%	0.5%	-
25% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	97.6%	2.4%	-	-	-	-
90% COP	52.8%	32.6%	10.8%	3.5%	0.3%	-
50% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	94.0%	5.6%	0.4%	-	-	-
90% COP	50.5%	34.3%	11.3%	3.5%	0.4%	-
75% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	89.0%	10.4%	0.6%	-	-	-
90% COP	49.2%	33.7%	13.1%	3.5%	0.5%	-
100% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	85.1%	14.1%	0.8%	-	-	-
90% COP	37.6%	39.8%	15.9	5.9%	0.7%	0.1%

An important change occurred at 80 percent coverage. Where before there was no noted change in standard deviation until the 90 percent level was reached, there was a $0.09 per acre decrease in this value, lowering it to $113.52 per acre (Table 3.24). Net returns continued to experience declining amounts, with NPVRVC totaling $285.87 per acre and NPVRTC at $54.07 per acre. There were very few indemnities paid out at this level; only 2.4 percent of the time for one year out of five (Table 3.25).

Indemnity payments increased significantly at the 90 percent coverage level. Only 52.8 percent of the time were no payments generated (Table 3.25). Approximately 32.6 percent of the time saw payments for one year out of five, 10.8 percent of the time for two of five, 3.5 percent of the time for three years, and 0.3 percent for four out of five years. In the same fashion as that of the base case, net returns increased at this coverage level. NPVRVC increased $6.45 from 80 percent coverage to $292.32 per acre. NPVRTC also increased $6.45 to $60.52 per acre. Both set of returns have a standard deviation of $105.10 per acre, a 7.4 percent decrease from the previous coverage level.

Risk yield was increased again, this time to 50 percent greater than normal. As a result, net returns for the no insurance category fell significantly. NPVRVC decreased $5.35 per acre from 25 percent risk to $309.29 per acre (Table 3.24). NPVRTC also dropped $5.35 per acre to $77.49 per acre. The increase in yield risk led to an increase in standard deviation of $4.40 per acre, producing greater fluctuations in average yield.

Vermilion parish rice farmers received no indemnity payments for 70 percent coverage in this scenario (Table 3.25). Since no supplemental income was received from payments, insurance premiums reduced net returns. Net returns declined $25.24 per acre from no insurance. Standard deviation remained at $118.01 per acre.

Net returns continued to steadily decline for 80 percent coverage as well. NPVRVC decreased $3.25 per acre to $280.80 per acre, and NPVRTC dropped $3.26 per acre to $49.00 per acre (Table 3.24). Standard deviation took a dip of $0.31 per acre to $117.70. These losses from the previous coverage level were not as severe as those at the 70 percent level because a small percentage of indemnities were paid. While 94 percent of the time no payments were made, indemnities were paid 5.6 percent of the time for one year out of five and 0.4 percent of the time for two years (Table 3.25).

As projected in the previous risk levels, net returns increased at 90 percent coverage under 50 percent risk. While they were still less than the returns made under no insurance, NPVRVC rose 2.7 percent over 80 percent coverage to $288.68 per acre, with NPVRTC increasing 13.9 percent to $56.89 per acre (Table 3.24). Standard deviation was at its lowest level for this risk category at $109.08 per acre, $8.93 per acre less than no insurance and $8.62 per acre less than the 80 percent coverage. Indemnity payments were again the highest at the 90 percent level (Table 3.25). 34.3 percent of the time payments were made for one year out of five, 11.3 percent of the time for two years out of five, 3.5 percent for three of five, and 0.4 percent for four years out of five.

The fourth set of data in Tables 3.24 and 3.25 increased the level of risk to 75 percent. This increase in risk caused a drop in net returns. NPVRVC for farmers with no insurance fell $5.35 per acre from the base case (Table 3.24). Likewise, NPVRTC decreased $5.34 per acre to $72.15 per acre. As was expected with any increase in risk, standard deviation increased to $123.88 per acre, 4.7 percent higher than no insurance.

Vermilion parish rice farmers received no indemnity payments for 70 percent coverage in this scenario (Table 3.25). Again, no supplemental income was received from payments and insurance costs made a reduction in mean net returns, causing them to decline $25.23 per acre

from no insurance. Standard deviation continued to hold constant at $123.88 per acre (Table 3.24).

Net returns continued to steadily decline for 80 percent coverage as well (Table 3.24). NPVRVC decreased $2.72 per acre to $275.99 per acre, and NPVRTC dropped $2.72 per acre to $44.19 per acre. Standard deviation decreased 1 cent to $123.87 per acre. While 89 percent of the time no payments were made, indemnities were paid 10.4 percent of the time for one year out of five and 0.6 percent of the time for two of five (Table 3.25).

Net returns increased for 90 percent coverage under 75 percent risk. While they were still less than the returns made under no insurance, NPVRVC rose 3.3 percent over 80 percent coverage to $285.57 per acre, with NPVRTC increasing 17.8 percent to $53.77 per acre (Table 3.24). Standard deviation was at its lowest level for this risk category at $114.44 per acre, $9.44 per less than no insurance and $9.43 per acre less than 80 percent coverage. Indemnity payments were again the highest at the 90 percent level (Table 3.25). Exactly 33.7 percent of the time payments were made for one year out of five, 13.1 percent of the time for two years out of five, 3.5 percent for three of five years, and 0.5 percent for four years out of five.

Risk was increased to 100 percent for the final set of simulations under average production yields. Mean net returns over variable costs for those farmers who chose no insurance fell to $298.60 per acre, with returns over total costs totaling $66.80 per acre (Table 3.24). While net returns fell, standard deviation rose to $131.03 per acre.

No indemnity payments were generated under 70 percent coverage (Table 3.25). NPVRVC fell 8.5 percent to $273.36 per acre, with NPVRTC falling 37.8 percent to $41.56 per acre (Table 3.24). The presence of COP insurance had no effect on yield risk and remained $131.03 per acre.

Net returns continued to fall under 80 percent coverage, but yield risk began to minimize. Returns over variable costs declined to $271.49 per acre, a $1.87 per acre decrease from 70 percent coverage (Table 3.24). Returns over total costs dropped another $1.87 per acre to $39.69. Yield risk decreased in a greater increment for 100 percent risk than it did for previous risk levels, falling to $129.77 per acre. Indemnity payments were made 14.1 percent of the time for one year out of five and 0.8 percent of the time for two years out of five (Table 3.25).

Indemnity payments increased the most at the 90 percent level (Table 3.25). Only 37.6 percent of the time were no payments generated, with 39.8 percent of payments coming in one year out of five. As well, 15.9 percent of the time payments were made for two years out of five, 5.9 percent of the time for two of five, 0.7 percent of the time for four years, and 0.1 percent of the time for all five years. This marks the first time that rice farmers in Vermilion can expect indemnity payments to be generated for all five years. Yield risk was at its lowest level for 100 percent risk at $120.79 per acre, falling $8.98 per acre (Table 3.24). Net returns both increased $11.83 per acre from the previous coverage level.

For the previous simulations, yield was reduced by 5 percent and yield risk was varied from 25 to 100 percent. For the final set of data for Vermilion parish, the same historical yields were reduced again, this time by 10 percent. Tables 3.26 and 3.27 give a summary of the results from these simulations.

The base case contains those farmers whose yields held equivalent risk and chose not to purchase COP insurance; after reducing yields by 10 percent, it was discovered that mean NPVRVC were calculated at $256.90 per acre. NPVRTC were much lower, only totaling $25.10 per acre. Standard deviation, a measure of yield risk, was only $104.10 per acre. This value appears low compared to our previous simulations, but when compared to the actual net returns in this set of data, it is quite high.

Table 3.26 Net present value of net returns over five-year period, rice, Vermilion Parish, projected trend mean rice yields reduced 10 percent with greater yield risk.

Yield risk increase	Type of insurance			
	No insurance	70% COP	80% COP	90% COP
Base case:				
Mean NPVRVC[1]	256.90	231.66	228.19	239.98
Mean NPVRTC[2]	25.10	-0.14	-3.61	8.18
Std. Dev.[3]	104.10	104.10	103.94	91.40
25% greater risk:				
Mean NPVRVC[1]	251.83	226.59	223.48	236.14
Mean NPVRTC[2]	20.03	-5.21	-8.32	4.34
Std. Dev.[3]	107.26	107.26	106.82	94.71
50% greater risk:				
Mean NPVRVC[1]	246.76	221.52	219.05	232.94
Mean NPVRTC[2]	14.96	-10.28	-12.75	1.14
Std. Dev.[3]	111.95	111.95	111.03	99.35
75% greater risk:				
Mean NPVRVC[1]	241.69	216.46	214.88	230.94
Mean NPVRTC[2]	9.90	-15.34	-16.92	-0.86
Std. Dev.[3]	117.99	117.99	116.44	104.90
100% greater risk:				
Mean NPVRVC[1]	236.63	211.39	211.12	234.26
Mean NPVRTC[2]	4.83	-20.41	-20.68	2.46
Std. Dev.[3]	125.18	125.18	122.96	109.26

[1] NPVRVC = net present value of net returns above variable costs per acre.
[2] NPVRTC = net present value of net returns above total costs per acre.
[3] Std. Dev. = standard deviation of net returns above variable costs and total costs per acre.

The rice farmer who chose not to protect his crop actually faired better economically than that of the rice farmer who chose 70 percent coverage. Net returns over variable costs fell $25.24 per acre, and net returns over total costs actually dropped into the negative at -$0.14 per acre (Table 3.26). The added costs associated with insurance premiums made it almost impossible for this particular farmer to cover his total costs. Losses were not enough to warrant indemnity payments, so none were paid out at this level (Table 3.27). Purchasing insurance did nothing to minimize this farmer's risk either. Standard deviation remained at $104.10 per acre.

Returns continued to dwindle as coverage level rose to 80 percent. NPVRTC dropped even further into the red, falling $3.47 per acre to -$3.61 per acre (Table 3.26). NPVRVC were

also $3.47 per acre lower than the previous coverage level. Costs from premiums did not hurt the farmer as badly this time, because indemnity payments kicked in and paid 4.5 percent of the time for one year and 0.1 percent of the time for two years (Table 3.27). The presence of crop insurance lowered yield risk as standard deviation decreased $0.16 to $103.94 per acre.

Total costs were finally pushed back into the black at 90 percent coverage, as they rose $11.79 per acre to $8.18 per acre (Table 3.26). Returns over variable costs also rebounded to $239.98 per acre. A much higher level of indemnity payments were made at this coverage level, leading to the increased returns. Payments were made 34.8 percent of the time for one year out of five, 18.5 percent of the time for two of five years, 6.1 percent for three years, 1 percent of the time for four of five years, and 0.1 percent for all five years (Table 3.27). Standard deviation for this scenario decreased 12 percent from 80 percent coverage to $91.40 per acre.

Yield risk was increased to 25 percent for those farmers with no insurance, and this dropped the NPVRVC by $5.07 per acre from the base case (Table 3.26). NPVRTC fell even further to $20.03 per acre. Standard deviation was the only variable that did not decrease; of course, when discussing yield risk, more is not necessarily a good thing. Yield risk increased to $107.26 per acre, a 2.9 percent increase from the base case with equivalent risk.

70 percent coverage was purchased within the higher risk scenario and this action brought net returns down. Since no indemnity payments were made at this level (Table 3.27), NPVRVC dropped to $226.59 per acre, and NPVRTC went into the negative again at -$5.21 per acre (Table 3.26). Standard deviation held firm at its previous value.

Returns over both variable and total costs fell $3.11 per acre under 80 percent coverage, with NPVRTC remaining negative. No indemnity payments were generated 91.5 percent of the time for this scenario; however, payments were made a scant 8 percent of the time for one year out of five and 0.5 percent of the time for two of five (Table 3.27). Standard deviation decreased

a little less than a dollar per acre to $106.82 per acre, thus slightly lessening the burden of yield risk for this farmer.

The premiums for 90 percent coverage proved to be worth their weight in gold, as net returns rebounded at this level. NPVRVC jumped $12.66 per acre to $236.14, with NPVRTC following suit at $4.34 per acre (Table 3.26). Indemnities were the highest at this level; only 39.2 percent of the time were no payments made (Table 3.27). Falling $12.11 per acre from 80 percent coverage, standard deviation was at its lowest value for 25 percent greater risk.

Yield risk was again increased to 50 percent, and for those farmers with no insurance NPVRVC fell by $5.07 per acre from 25 percent greater risk (Table 3.26). NPVRTC fell even further to $14.96 per acre. Standard deviation increased to $111.95 per acre, a 4.2 percent increase from the 25 percent greater risk case with no insurance.

Net return totals came down at the 70 percent coverage level. No indemnity payments have been made at 70 percent coverage for the span of Vermilion parish's simulations, and this statement continued to hold true in this scenario (Table 3.27). NPVRVC dropped to $221.52 per acre, and NPVRTC went into the negative at -$10.28 per acre (Table 3.26). Standard deviation held firm at its previous value.

Returns over both variable and total costs fell $2.47 per acre under 80 percent coverage, with NPVRTC remaining negative. No indemnity payments were generated 86.2 percent of the time for this scenario; however, payments were made a 13 percent of the time for one year out of five and 0.8 percent of the time for two of five (Table 3.27). Standard deviation decreased $0.92 per acre to $111.03 per acre.

Again, returns at 90 percent coverage took a step up from the down slide. NPVRVC jumped $13.89 per acre to $232.94, with NPVRTC still far behind at $1.14 per acre (Table 3.26). Indemnities were the highest at this level; only 39.9 percent of the time were no payments made

(Table 3.27). Falling $11.68 per acre from 80 percent coverage, standard deviation was at its lowest value for 50 percent greater risk.

The projected trends for returns over variable costs and returns over total costs continue to follow the same pattern time and time again. When the risk level reached 75 percent, it was very simple to predict the changes that these variables would make. Standard deviation for the no insurance category increased 5.1 percent from the previous risk category to $117.99 per acre (Table 3.26). NPVRVC and NPVRTC both declined $5.07 per acre, as they have done in the previous two cases.

Table 3.27 Percent of time cost of production crop insurance indemnity payment is made over a five-year period, rice, Vermilion Parish, projected trend mean rice yields reduced 10 percent with greater yield risk.

Yield risk increase	Number of years indemnity payment is made over 5-year period					
	0	1	2	3	4	5
Base case:						
70% COP	100.0%	-	-	-	-	-
80% COP	95.4%	4.5%	0.1%	-	-	-
90% COP	39.5%	34.8%	18.5%	6.1%	1.0%	0.1%
25% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	91.5%	8.0%	0.5%	-	-	-
90% COP	39.2%	35.9%	17.3%	6.1%	1.5%	-
50% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	86.2%	13.0%	0.8%	-	-	-
90% COP	39.9%	35.1%	17.3%	6.2%	1.4%	0.1%
75% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	82.3%	16.1%	1.6%	-	-	-
90% COP	30.8%	40.0%	18.9%	8.6%	1.5%	0.2%
100% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	77.2%	20.3%	2.4%	0.1%	-	-
90% COP	16.5%	33.7%	29.8%	16.1%	3.6%	0.3%

Once net returns reached the 70 percent coverage level, they dropped another $24.54 per acre to $216.46 per acre for NPVRVC and -$15.34 per acre for NPVRTC (Table 3.26). As noted before, indemnity payments are not paid at 70 percent coverage (Table 3.27).

At 80 percent coverage, indemnity payments made a contribution as supplemental income to the rice farmer. Payments were made 16.1 percent of the time for one year out of five and a small 1.6 percent of the time for two years out of five (Table 3.27). Despite these payments, net returns continued to decrease. NPVRVC dropped $26.81 per acre from no insurance and $1.58 per acre from 70 percent coverage to $214.88 per acre (Table 3.26). NPVRTC declined $26.82 per acre from no insurance and $1.58 per acre from 70 percent coverage to -$16.92 per acre. Standard deviation decreased slightly to $116.44 per acre.

The highest amount of indemnity payments for 75 percent greater risk can be found at the 90 percent insurance level. Approximately 69.2 percent of the time indemnities were generated, with payments coming 40 percent of the time for one year out of five. The remaining payments were paid out 18.9 percent of the time for two years, 8.6 percent for three years out of five, 1.5 percent of the time for four years, and 0.2 percent for all five years (Table 3.27). Returns over variable costs made a strong comeback, but returns over total costs were not strong enough to make it back into the positive (Table 3.26). Standard deviation was also at it's lowest point for this risk level, dropping $13.09 per acre from the no insurance case.

The final risk category for Vermilion parish was 100 percent greater risk. All trends held steady for this scenario, as they have done throughout the study of the rice farms for this parish. Net income risk for no insurance was calculated to be 52.9 percent, as compared to 46.6 percent for the 90 percent coverage level with the same amount of risk. No indemnity payments were made for 70 percent coverage, but under 90 percent, payments were distributed 83.5 percent of the time over the five year period. Net returns under 70 percent and 80 percent levels decreased

significantly from the no insurance case, with returns over total costs being negative for the two. Despite these decreases, net returns under 90 percent increased from the previous levels to $234.26 per acre, with a standard deviation of $109.26 per acre.

Acadia Parish Rice Results

Cost of production crop insurance was also evaluated on a per acre basis for rice production in Acadia Parish. Acadia has been the highest rice producing parish in Louisiana for the last several years. In general, Acadia Parish has slightly lower rice production costs as compared with Vermilion Parish, due to the fact that more acreage is in a rotation with soybeans. As a result, the rice production costs estimated for Acadia Parish do not include the additional fallow year field operations which are more prevalent in the Vermilion Parish area. Furthermore, Acadia Parish has historically had slightly higher mean rice yields than Vermilion Parish. The combination of higher yields and lower production costs resulted in the analysis of cost of production crop insurance for Acadia Parish showing little positive impact on net returns, simply due to the fact that indemnity payments were not generated as often.

Table 3.28 shows the net present value of per acre net returns above variable and total costs at various coverage levels. The decrease in net returns with insurance coverage is due to the reduction in net returns from the addition of the insurance premium payment. Net present value of net returns above variable costs over a five-year period without insurance was $476.05 per acre. Cost of production crop insurance premiums paid reduced this net return level to a range of $451.94 to $445.15 depending upon coverage level. Net present value of net returns above total production costs were $286.44 per acre without coverage and decreased to a range of $262.32 to $255.53 per acre. Given the historical level of rice yield risk in Acadia Parish, cost of production crop insurance payments were only made at the 90 percent coverage level. At this

Table 3.28 Net present value of net returns over five-year period, rice, Acadia Parish, projected trend mean rice yields with equivalent risk.

Type of insurance	NPV[1] of net returns above variable costs		NPV[1] of net returns above total costs	
	Mean	Std. Dev.	Mean	Std. Dev.
No insurance	476.05	118.26	286.44	118.26
70% COP	451.94	118.26	262.32	118.26
75% COP	450.21	118.26	260.60	118.26
80% COP	448.49	118.26	258.87	118.26
85% COP	446.77	118.26	257.15	118.26
90% COP	445.15	118.10	255.53	118.10

[1]NPV = net present value

level, indemnity payments were generated in one year out of five only 2.3 percent of the time (Table 3.29). In the majority of years simulated, gross rice returns per acre were high enough to cover the majority of rice production costs.

Table 3.29 Percent of time cost of production crop insurance indemnity payment is made over a five-year period, rice, Acadia Parish, projected trend mean rice yields with equivalent risk.

Type of insurance	Number of years indemnity payment is made over 5-year period					
	0	1	2	3	4	5
70% COP	100.0%	-	-	-	-	-
75% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
85% COP	100.0%	-	-	-	-	-
90% COP	97.7%	2.3%	-	-	-	-

Table 3.30 presents simulation results showing the number of years out of five during which net returns above variable and total production costs were negative. In approximately 95 percent or more of the time, rice gross returns were enough to cover variable costs per acre. Gross returns were insufficient to cover variable costs only about 4 percent or less of the time in one year out of five. Gross returns from rice production were sufficient to cover total production costs only about 45 to 55 percent of the time. Net returns above total costs were negative about

30 to 33 percent of the time in one year out of five and about 15 percent of the time in two years out of five. Although these percentages seem high, crop insurance indemnity payments were not generated because although net returns were negative, most of the production costs were being covered. The magnitude of negative net returns was relatively small.

Table 3.30 Percent of time net returns are negative over a five-year period, rice, Acadia Parish, projected trend mean rice yields with equivalent risk.

Type of insurance	Number of years with negative net returns over 5-year period					
	0	1	2	3	4	5
	Net returns above variable costs					
No insurance	98.5%	1.5%	-	-	-	-
70% COP	96.6%	3.3%	0.1%	-	-	-
75% COP	96.3%	3.5%	0.2%	-	-	-
80% COP	95.9%	3.9%	0.2%	-	-	-
85% COP	95.8%	4.0%	0.2%	-	-	-
90% COP	95.3%	4.5%	0.2%	-	-	-
	Net returns above total costs					
No insurance	54.1%	30.2%	12.3%	3.0%	0.4%	-
70% COP	47.4%	32.7%	15.2%	4.2%	0.4%	0.1%
75% COP	47.1%	32.6%	15.5%	4.3%	0.4%	0.1%
80% COP	46.5%	33.0%	15.5%	4.5%	0.4%	0.1%
85% COP	46.0%	33.4%	15.6%	4.5%	0.4%	0.1%
90% COP	45.7%	33.6%	15.6%	4.6%	0.4%	0.1%

The base case situation for Acadia Parish was evaluated with greater levels of yield risk with the same mean yield level (Table 3.31) with the same general results being observed. Net present value of net returns were decreased with cost of production crop insurance, compared to the no insurance case, due to the additional cost of the insurance premium. Although net returns were reduced with insurance coverage, having cost of production crop insurance did seem to provide somewhat more benefit to rice growers with higher levels of yield risk. The decline in net returns at higher levels of coverage was minimized as more indemnity payments were generated. This is evidenced by data in Table 3.32 showing that, at the 90 coverage level for example, the percent of time an indemnity payment was made increased from 2.3 percent in the

base case to 19.2 percent in cases with 100 percent greater yield risk. In this situation, indemnity were offsetting premium payments a larger percent of the time.

Table 3.31 Net present value of net returns over five-year period, rice, Acadia Parish, projected trend mean rice yields with greater yield risk.

Yield risk increase	Type of insurance			
	No insurance	70% COP	80% COP	90% COP
Base case:				
Mean NPVRVC[1]	476.06	451.94	448.49	445.15
Mean NPVRTC[2]	286.44	262.32	258.87	255.53
Std. Dev.[3]	118.26	118.26	118.26	118.10
25% greater risk:				
Mean NPVRVC[1]	474.67	450.54	447.10	443.86
Mean NPVRTC[2]	285.05	260.93	257.48	254.24
Std. Dev.[3]	120.87	120.87	120.87	120.59
50% greater risk:				
Mean NPVRVC[1]	473.28	449.15	445.71	442.73
Mean NPVRTC[2]	283.66	259.54	256.09	253.11
Std. Dev.[3]	125.12	125.12	125.12	124.59
75% greater risk:				
Mean NPVRVC[1]	471.88	447.76	444.32	441.85
Mean NPVRTC[2]	282.27	258.15	254.70	252.23
Std. Dev.[3]	130.85	130.85	130.85	129.86
100% greater risk:				
Mean NPVRVC[1]	470.49	446.37	442.92	441.30
Mean NPVRTC[2]	280.88	256.75	253.31	251.68
Std. Dev.[3]	137.88	137.88	137.88	136.23

[1] NPVRVC = net present value of net returns above variable costs per acre.
[2] NPVRTC = net present value of net returns above total costs per acre.
[3] Std. Dev. = standard deviation of net returns above variable costs and total costs per acre.

Simulation analysis was also conducted for rice in Acadia Parish with mean rice yield levels at 5 percent and 10 percent below trend yields. Results from these simulations indicated that cost of production crop insurance generated indemnity payments more often as mean yield level decreased and yield risk increased. With mean rice yields at 5 percent below trend yield levels, net returns in general were lower with insurance than without, except in cases were yield risk was very high and insurance coverage level was at 90 percent (Table 3.33). In this situation,

cost of production crop insurance actually increased the net present value of net returns. Insurance indemnity payments were estimated to be made 25 to 30 percent of the time (Table 3.34).

Table 3.32 Percent of time cost of production crop insurance indemnity payment is made over a five-year period, rice, Acadia Parish, projected trend mean rice yields with greater yield risk.

Yield risk increase	Number of years indemnity payment is made over 5-year period					
	0	1	2	3	4	5
Base case:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	97.7%	2.3%	-	-	-	-
25% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	94.9%	4.9%	0.2%	-	-	-
50% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	92.3%	7.1%	0.6%	-	-	-
75% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	87.0%	11.9%	1.0%	0.1%	-	-
100% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	80.8%	17.4%	1.7%	0.1%	-	-

In the situation where mean rice yields were 10 percent below the parish average, cost of production crop insurance supported net cash income to a much greater degree. Mean net present value of net returns with insurance actually started to increase at yield risk levels of 50 percent higher than the parish average at the 90 percent coverage level (Table 3.35). These results were obtained because at these lower yield levels, gross returns covered production costs

a much smaller percent of the time. As a result, cost of production crop insurance indemnity payments were generated more often. For example, in the base case at the 90 percent coverage level, indemnity payments were generated 22.0 percent of the time (Table 3.36). With greater yield risk, for example at 100 percent greater than the parish average, insurance indemnity payments were generated 42.4 percent of the time. These types of results are not surprising since this type of basic insurance coverage would be expected to better support income on farms where yields are not sufficient to cover costs a majority of the time.

Table 3.33 Net present value of net returns over five-year period, rice, Acadia Parish, projected trend mean rice yields reduced 5 percent with greater yield risk.

Yield risk increase	Type of insurance			
	No insurance	70% COP	80% COP	90% COP
Base case:				
Mean NPVRVC[1]	408.98	384.86	381.41	378.42
Mean NPVRTC[2]	219.37	195.24	191.80	188.80
Std. Dev.[3]	111.55	111.55	111.55	110.99
25% greater risk:				
Mean NPVRVC[1]	407.66	383.54	380.09	377.52
Mean NPVRTC[2]	218.04	193.92	190.48	187.91
Std. Dev.[3]	114.37	114.37	114.37	113.40
50% greater risk:				
Mean NPVRVC[1]	406.34	382.22	378.77	376.93
Mean NPVRTC[2]	216.72	192.60	189.16	187.31
Std. Dev.[3]	118.73	118.73	118.73	117.15
75% greater risk:				
Mean NPVRVC[1]	405.02	380.90	377.45	376.68
Mean NPVRTC[2]	215.40	191.28	187.83	187.07
Std. Dev.[3]	124.48	124.48	124.48	122.08
100% greater risk:				
Mean NPVRVC[1]	403.70	379.57	376.13	376.82
Mean NPVRTC[2]	214.08	189.96	186.51	187.20
Std. Dev.[3]	131.42	131.42	131.42	128.11

[1] NPVRVC = net present value of net returns above variable costs per acre.
[2] NPVRTC = net present value of net returns above total costs per acre.
[3] Std. Dev. = standard deviation of net returns above variable costs and total costs per acre.

Table 3.34 Percent of time cost of production crop insurance indemnity payment is made over a five-year period, rice, Acadia Parish, projected trend mean rice yields reduced 5 percent with greater yield risk.

Yield risk increase	Number of years indemnity payment is made over 5-year period					
	0	1	2	3	4	5
Base case:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	91.4%	8.1%	0.5%	-	-	-
25% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	86.8%	11.9%	1.2%	0.1%	-	-
50% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	81.6%	16.2%	2.1%	0.1%	-	-
75% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	75.9%	20.3%	3.6%	0.2%	-	-
100% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	71.4%	23.3%	4.8%	0.5%	-	-

Table 3.35 Net present value of net returns over five-year period, rice, Acadia Parish, projected trend mean rice yields reduced 10 percent with greater yield risk.

Yield risk increase	Type of insurance			
	No insurance	70% COP	80% COP	90% COP
Base case:				
Mean NPVRVC[1]	342.43	318.31	314.86	313.18
Mean NPVRTC[2]	152.82	128.69	125.25	123.56
Std. Dev.[3]	105.20	105.20	105.20	103.37
25% greater risk:				
Mean NPVRVC[1]	341.18	317.06	313.61	312.88
Mean NPVRTC[2]	151.56	127.44	123.99	123.27
Std. Dev.[3]	108.22	108.22	108.22	105.64
50% greater risk:				
Mean NPVRVC[1]	339.93	315.80	312.36	312.99
Mean NPVRTC[2]	150.31	126.19	122.74	123.38
Std. Dev.[3]	112.69	112.69	112.69	109.15
75% greater risk:				
Mean NPVRVC[1]	338.67	314.55	311.11	313.45
Mean NPVRTC[2]	149.06	124.94	121.49	123.84
Std. Dev.[3]	118.44	118.44	118.44	113.87
100% greater risk:				
Mean NPVRVC[1]	337.42	313.30	309.85	314.48
Mean NPVRTC[2]	147.81	123.68	120.24	124.86
Std. Dev.[3]	125.29	125.29	125.29	119.50

[1] NPVRVC = net present value of net returns above variable costs per acre.
[2] NPVRTC = net present value of net returns above total costs per acre.
[3] Std. Dev. = standard deviation of net returns above variable costs and total costs per acre.

Table 3.36 Percent of time cost of production crop insurance indemnity payment is made over a five-year period, rice, Acadia Parish, projected trend mean rice yields reduced 10 percent with greater yield risk.

Yield risk increase	Number of years indemnity payment is made over 5-year period					
	0	1	2	3	4	5
Base case:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	78.0%	18.1%	3.4%	0.5%	-	-
25% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	73.5%	21.9%	4.1%	0.5%	-	-
50% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	69.5%	24.6%	5.2%	0.7%	-	-
75% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	64.8%	27.3%	7.0%	0.8%	0.1%	-
100% greater risk:						
70% COP	100.0%	-	-	-	-	-
80% COP	100.0%	-	-	-	-	-
90% COP	57.6%	31.6%	9.4%	1.1%	0.3%	-

CHAPTER 4 – SUMMARY AND CONCLUSIONS

Four parishes were chosen, based upon their historical yields, to use in the simulation models for evaluating cost of production crop insurance. The rice simulations were conducted using data from Acadia and Vermilion, based on the fact that they were the two highest rice producing parishes in the state for the past five years. Tensas and Franklin were used in the cotton simulations because they were also found to be the two of the highest producing parishes in that particular commodity. Rice and cotton budgets from the LSU AgCenter were used to determine production costs for the representative commodities, and the results were presented in the various tables in previous chapters. After evaluating the results of the various simulations conducted using historical prices and yields for the four parishes, certain statistics pushed to the forefront.

Variable and total costs for Franklin parish tended to fall $300 per acre less than the same costs for Tensas parish, when equivalent risk was assumed. Although these are two of the top five cotton producing parishes in the state, there was still a wide margin between the two in terms of harvested acres, with Tensas parish leading the pack by a wide margin. This factor also accounts for the fact that a large portion of the time, Franklin parish had negative returns over total costs, even after indemnity payments were made. This difference can most clearly be seen in Table 3 of the cotton simulation.

Net returns over variable costs for Tensas were positive 100 percent of the time for all five years of the projection, regardless of coverage. The same category for Franklin was only 100% positive at 85 and 90 percent coverage levels. Indemnity payments for Franklin parish were always paid for at least one year out of five. Still assuming equivalent risk, indemnity payments for Tensas parish did not kick in until the 90 percent coverage level was reached. As

risk levels increased, the amount of indemnities increased for both parishes as well, but Tensas still possessed, on average, the lowest amount.

Despite the generally higher production yields, Tensas parish did possess a higher level of risk as standard deviations were averaging $5.00 more per acre than the same variable for Franklin parish. While yields for Franklin were lower, they did not fluctuate as widely as those for Tensas, making this particular parish a slightly higher yield risk.

Varying the levels of yield risk seemed to have a greater effect on Franklin parish than it did on Tensas. The fluctuation in net returns was seen at a higher level when yields tended to be lower. Even the smallest change showed a large influence on prices. This change was basically the same, even when yields were reduced by 5 and then 10 percent.

Net returns for the two cotton parishes were, on average, higher than that of the two rice parishes. This is largely due to the fact that production costs for rice farmers tend to be higher than the same for cotton farmers. Acadia parish generally had net returns that averaged $100 per acre more than Vermilion parish. This phenomenon is again accredited to higher average yields in Acadia. Returns over total costs for Acadia remained positive throughout the duration of the simulation; however, the same category for Vermilion only stretched into the negative once yields were reduced by 10 percent.

Under conditions of normal risk, there was very little difference in the necessity for indemnity payments. No indemnity payments were generated for Acadia until the 90 percent COP coverage level was reached. Vermilion did not see any payments until 85 percent coverage was obtained. Despite reducing yields by up to 10 percent and increasing yield risk by up to 100 percent, Acadia parish never had indemnities paid until the 90 percent level. Under the same conditions, Vermilion parish never saw indemnities until at least 80 percent coverage was established.

Standard deviation measures remained very close for the two rice parishes, with Acadia only a few dollars or so lower, on average, than Vermilion. However, standard deviation for Acadia parish falls at a slightly higher rate as coverage levels increased.

The increasing levels of coverage did little to minimize yield risk for Acadia and Vermilion. Standard deviation generally remained stationary for these parishes until 90 percent coverage was reached, and even then, it fell very little. As risk increased, the coverage began to affect standard deviation at the 80 percent level, but this was only by a few cents per acre.

Risk had a much greater effect in cotton. The varying levels of risk would be downsized by increasing levels of COP protection in Tensas and Franklin parishes. Standard deviation began taking a hit even at 70 percent coverage, and only continued to decline as levels rose.

One important conclusion of this research is related to the relative net income risk as coverage level changes. In general, at lower levels of insurance coverage, the reduction in net returns caused by the payment of a crop insurance premium with little or no indemnity payments generated, actually causes net income risk, as measured by the coefficient of variation, to actually increase. Net income risk continues to increase until enough indemnity payments are generated, at higher levels of coverage, to eventually offset premium payments and start to increase net returns, thereby reducing net income risk (Table 4.1). Although cost of production crop insurance is intended to be a safety net type of coverage, results from this research would suggest that higher levels of coverage (80 percent or greater) contribute the most toward supporting net farm income.

When evaluating the need for COP coverage, the two cotton parishes would benefit more from this type of insurance. The fluctuation in returns was more widespread and unpredictable for Tensas and Franklin than for Acadia and Vermilion. As increasing levels of COP coverage were purchased, net returns over both variable and total costs continued to decrease for the rice

parishes. Net returns for the cotton parishes decreased initially, but at 80 percent coverage, they began to steadily increase. The rise and fall of these returns was very symmetric for the rice

Table 4.1 Relative net return risk for alternative levels of COP insurance coverage

	Franklin Parish Cotton		Tensas Parish Cotton	
	Mean NPVRVC[1]	C. V.[2]	Mean NPVRVC[1]	C. V.[2]
No insurance	301.79	43.33	679.78	19.92
70% COP	271.02	48.23	648.94	20.86
80% COP	276.46	45.08	644.54	21.01
90% COP	329.43	29.99	642.54	20.80
	Acadia Parish Rice		Vermilion Parish Rice	
	Mean NPVRVC[1]	C. V.[2]	Mean NPVRVC[1]	C. V.[2]
No insurance	476.05	24.84	382.71	30.82
70% COP	451.94	26.17	357.47	33.00
80% COP	448.49	26.37	353.87	33.34
90% COP	445.15	26.53	355.33	31.80

[1] Mean net present value of net returns above variable costs per acre over a five-year period.
[2] Coefficient of variation.

parishes. No matter the yield level or risk, both variable and total costs would continue to increase and decrease by the same dollar amounts, and that symmetry would continue throughout the individual simulations. Paying premiums for cotton policies proved beneficial in the long run, but only seemed to minimize profits for rice.

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APPENDIX

SUPPLEMENTAL DATA

Table A.1 Estimated cotton costs per acre, silty soil, 8-row equipment, reduced tillage, tenant-operators, Macon Ridge Area, Louisiana, 2004[1]

Item	Amount
	(dollars)
Direct Expenses	
Custom	19.45
Defoliant	13.27
Fertilizer	52.08
Fungicides	22.00
Herbicides	48.03
Other Labor	3.75
Insecticides	38.34
Other	103.80
Seed	13.50
Operator Labor	4.42
Hired Labor	16.08
Diesel Fuel	15.65
Repair and Maintenance	27.69
Interest on Operating Capital	14.29
Total Direct Expenses	392.35
Fixed Expenses	
Implements	12.69
Tractors	27.25
Self-Propelled Machines	26.13
Total Fixed Expenses	66.07
Total Specified Expenses	458.42

[1] Production cost estimates used for analysis of cotton cost of production crop insurance in Franklin Parish, Louisiana.

Source: Paxton, Kenneth W., *Projected Costs and Returns – Cotton, Soybeans, Corn, Milo and Wheat, Northeast Louisiana, 2004*, Department of Agricultural Economics and Agribusiness, Louisiana State University Agricultural Center, A.E.A. Information Series No. 217, January 2004.

Table A.2 Estimated cotton costs per acre, alluvial soil, 8-row equipment, solid planted, tenant-operators, Northeast Louisiana, 2004[1]

Item	Amount
	(dollars)
Direct Expenses	
Custom	11.60
Defoliant	20.68
Fertilizer	25.20
Fungicides	22.00
Herbicides	48.43
Other Labor	4.65
Insecticides	47.74
Other	115.17
Seed	13.50
Operator Labor	4.42
Hired Labor	21.75
Diesel Fuel	21.73
Repair and Maintenance	31.66
Interest on Operating Capital	13.72
Total Direct Expenses	402.25
Fixed Expenses	
Implements	15.88
Tractors	40.73
Self-Propelled Machines	26.13
Total Fixed Expenses	82.74
Total Specified Expenses	484.99

[1] Production cost estimates used for analysis of cotton cost of production crop insurance in Tensas Parish, Louisiana.

Source: Paxton, Kenneth W., *Projected Costs and Returns – Cotton, Soybeans, Corn, Milo and Wheat, Northeast Louisiana, 2004*, Department of Agricultural Economics and Agribusiness, Louisiana State University Agricultural Center, A.E.A. Information Series No. 217, January 2004.

Table A.3 Estimated rice costs per acre, Clearfield variety, water planted, stale seedbed, (in rotation) tenant-operators, Southwest Louisiana, 2004[1]

Item	Amount
	(dollars)
Direct Expenses	
Custom	100.83
Fertilizer	53.40
Fungicides	21.00
Herbicides	54.55
Insecticides	12.00
Seed	48.00
Irrigation Supplies	1.20
Operator Labor	5.05
Hired Labor	6.02
Irrigation Labor	2.88
Diesel Fuel	11.13
Repair and Maintenance	17.86
Interest on Operating Capital	10.46
Total Direct Expenses	344.39
Fixed Expenses	
Implements	4.00
Tractors	15.33
Self-Propelled Machines	21.62
Total Fixed Expenses	40.95
Total Specified Expenses	385.34

[1] Production cost estimates used for analysis of rice cost of production crop insurance in Acadia Parish, Louisiana.

Source: Salassi, Michael E., and Janis B. Breaux, *Projected Costs and Returns – Rice, Louisiana, Soybeans, Wheat, Sorghum, Southwest Louisiana 2004*, Department of Agricultural Economics and Agribusiness, Louisiana State University Agricultural Center, A.E.A. Information Series No. 219, January 2004.

Table A.4 Estimated rice costs per acre, Clearfield variety, water planted, stale seedbed, (fallow land) tenant-operators, Southwest Louisiana, 2004[1]

Item	Amount
	(dollars)
Direct Expenses	
Custom	100.83
Fertilizer	53.40
Fungicides	21.00
Herbicides	54.55
Insecticides	12.00
Seed	48.00
Irrigation Supplies	1.20
Operator Labor	5.05
Hired Labor	8.03
Irrigation Labor	2.88
Diesel Fuel	14.41
Repair and Maintenance	20.89
Interest on Operating Capital	10.56
Total Direct Expenses	352.81
Fixed Expenses	
Implements	7.27
Tractors	21.17
Self-Propelled Machines	21.62
Total Fixed Expenses	50.06
Total Specified Expenses	402.87

[1] Production cost estimates used for analysis of rice cost of production crop insurance in Vermilion Parish, Louisiana.

Source: Salassi, Michael E., and Janis B. Breaux, *Projected Costs and Returns – Rice, Louisiana, Soybeans, Wheat, Sorghum, Southwest Louisiana 2004*, Department of Agricultural Economics and Agribusiness, Louisiana State University Agricultural Center, A.E.A. Information Series No. 219, January 2004.

Table A.5 Historical cotton and rice price and yield data, 1993-2002

Year	Franklin Parish Cotton Yield per Acre (lbs / acre)	Tensas Parish Cotton Yield per Acre (lbs / acre)	Acadia Parish Rice Yield per Acre (cwt / acre)	Vermilion Parish Rice Yield per Acre (cwt / acre)	Annual Louisiana Cotton Price ($ / lb)	Annual Louisiana Rice Price ($ / cwt)
1993	572.0	614.0	47.3	40.0	0.577	7.65
1994	810.0	820.0	48.4	44.2	0.685	6.71
1995	594.0	626.0	47.1	46.1	0.732	9.09
1996	663.0	762.0	49.0	48.5	0.655	10.60
1997	669.0	806.0	45.9	44.7	0.649	10.20
1998	512.0	851.0	44.6	43.0	0.572	8.87
1999	701.0	781.0	52.4	49.5	0.444	5.99
2000	616.0	615.0	52.5	47.7	0.516	5.82
2001	590.0	675.0	56.2	51.8	0.281	4.47
2002	623.0	854.0	57.0	54.0	0.411	3.90
Mean	635.0	740.4	50.0	46.9	0.552	7.33
Std. Dev.	81.8	98.3	4.3	4.2	0.140	2.33
Coef. Var.	12.9	13.3	8.5	9.0	25.4	31.8

Source: ERS and NASS, USDA

VITA

Erica L. Harding was born on January 20, 1980 to Chris and Becky Loupe of Zwolle, Louisiana. She graduated as valedictorian of her senior class at Zwolle High School on May 18, 1998, and began attending Louisiana State University in the Fall semester of that same year.

Erica graduated with a Bachelor of Science degree in animal science with a minor in agribusiness in May 2002. After spending her four undergraduate years as a student worker in the Department of Agricultural Economics, she decided to pursue a master's degree in that field. She began her program of study in the summer of 2002, immediately after graduation.

Erica and her husband Jeremy currently reside in Cottonport, Louisiana. While finishing her thesis, she began a career in marketing and sales for Roy O. Martin Lumber Co. LLC, where she is in charge of lumber exports.