2015

Evaluating Commodity Farm Program Selection and Economic Return Variability on Representative Farms in the Mississippi River Delta Region Using a Risk Return Framework

Michael Anthony Deliberto
Louisiana State University and Agricultural and Mechanical College

EVALUATING COMMODITY FARM PROGRAM SELECTION AND ECONOMIC RETURN VARIABILITY ON REPRESENTATIVE FARMS IN THE MISSISSIPPI RIVER DELTA REGION USING A RISK RETURN FRAMEWORK

A Dissertation

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

in

The Department of Agricultural Economics and Agribusiness

by
Michael Anthony Deliberto Jr.
B.S.F., Louisiana State University, 2004
M.S., Louisiana State University, 2007
August 2015

This work is dedicated to my wife, Bianca Rodrigue Deliberto and to my parents, Michael and Debbie Deliberto of Hammond, Louisiana.

ACKNOWLEDGEMENTS

Several individuals provided insight into the modeling of agricultural production systems as well as aspects of farm level characteristics specific to each locale in the study area. Appreciation is extended to Dr. Lawrence Falconer of the Mississippi State University Extension Service located in Stoneville, Mississippi and to Dr. Kenton Bradley Watkins of the University of Arkansas Extension Service located in Stuttgart, Arkansas. Acknowledgement is also given to personnel at the Louisiana Farm Bureau Federation and to Mr. David Crigler of the Louisiana Cotton and Grain Association, whose professional opinions were valued in the selection and modeling of representative farms in the study. The author is particularly indebted to Dr. Michael E. Salassi for his mentorship throughout the author’s employment at the Louisiana State University Agricultural Center working in areas of farm management and commodity policy. Gratitude is expressed to Dr. John V. Westra, Dr. Jeffery M. Gillespie, and Dr. P. Lynn Kennedy for their support of this research project. Finally, this work honors the late Dr. Steven A. Henning, whose commitment to teaching and knowledge of agriculture and food policy will be remembered as shaping the author’s professional interest in analyzing policy proposals as well as teaching undergraduate students in the field of agricultural economics.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

The Agricultural Act of 2014, signed February 7, 2014, introduces a new era of federal support in the production of major agricultural commodities in the United States for the 2014 through 2018 crop years. The ultimate result of the Act was a 954-page piece of legislation that represented market-oriented policies such as the creation of an area-wide shallow loss revenue support program for covered commodities and a greater reliance on crop insurance products offered as a suite of risk management tools available to producers.

The impact that this law has on agricultural producers in the Mississippi River delta region of the Mid-south is not yet fully known. Moving forward, the elimination of the direct payment program is likely to have an impact on farm income, as these payments were made annually and were decoupled from actual market prices. Various combinations of federal farm programs, chosen irrevocable, paired with multiple crop insurance products, that are purchased annually, will act to mitigate the risks of production.

Simulation analysis provides a basis for evaluating the variability associated with production systems in the Mississippi River delta region. Three representative rice and soybean farms and six corn, cotton, and soybean farms were modeled as to determine the five year net returns resulting from price and yield risk as well as to evaluate alternative farm program and crop insurance selection. Financial performance of these farms is measured for varying levels of risk using a stochastic efficiency criteria. Results are presented for multiple combinations of the agriculture risk coverage and price loss coverage programs of the commodity title and revenue protection, supplemental coverage option endorsement, and the stacked income protection plan for producers of upland cotton contained in crop insurance title of the current farm law. For each farm at each location, an estimate to the net present value of the cumulative net returns above variable costs to the producer for the five year life of the farm bill is provided. Results from

different farming operations suggest the preferred pairing of farm programs and crop insurance policies does vary across locale and crops.

CHAPTER 1: INTRODUCTION

Agricultural production in the southern United States is centered on the major row crops of the Mississippi River delta region which include but are not limited to corn, cotton, rice, and soybeans. According to economic production summaries released in 2013, Louisiana agricultural enterprises contributed over $6.9 billion to the state's economy. Of that total, corn contributed $735,472,192 (10.6%); cotton $147,816,799 (2.1%); rice $494,415,302 (7.1%); and soybeans $773,443,391 (11.1%). Collectively, these four crops accounted for nearly 31% of the value of agricultural production in Louisiana (Louisiana State University Agricultural Center, 2013). In Arkansas, the total direct value of agricultural production and processing in 2013 was slightly over $9.0 billion. Of that total, corn contributed $859,785,000 (9.5%); cotton $420,710,000 (4.6%); rice $1,363,086,000 (15.1%); and soybeans $1,956,672,000 (21.7%). Collectively these four crops accounted for nearly 51% of the value of agricultural production in Arkansas in 2013 (University of Arkansas, 2013). Mississippi agricultural enterprises contributed $7.4 billion to the state's economy in 2013. Of that total, corn contributed $631,000,000 (8.5%); cotton $331,000,000 (4.5%); rice $141,000,000 (1.9%); and soybeans $993,000,000 (13.4%). These four crops accounted for approximately 28% of the value of agricultural production in Mississippi in 2013 (Mississippi State University, 2013).

1.1 Major Agricultural Production Systems of the Mississippi River Delta Region

Crop rotation has been a long-standing agronomic practice and can be defined as a more or less regular recurrent succession of producing different crops on the same land (Kipps, 1970). Some examples of typical crop rotation system include two-year rotations (e.g. corn/soybeans, rice/soybeans, and corn/cotton) and three-year rotations (e.g. corn/soybeans/wheat and rice/cotton/soybeans). Corn, cotton, rice and soybean crops are typically produced in a rotational-based production system in the Mid-south region of the U.S. Soybeans are also rotated with rice, although this rotation is limited to rice fields that are considered fallow- remaining idle after two or more consecutive years of rice. The introduction of soybeans and rice to the Mississippi River delta region of the Mid-south, however, took some of the heavier clay soils of the Delta out of cotton production and converted them to growing these two crops, usually in a rotational sequence (Burns, et al., 2007). Cotton, produced in a continuous production system, remained the primary crop on the loam soils and sandy-loam soils of the Delta region. Since the majority of crawfish in the U.S. are produced on over 100,000 farmed acres annually in Louisiana, rice and crawfish are commonly produced together in alternative crop rotation systems. Most of its production occurs in the southwestern part of the state (Salassi, et al., 2009). For crops being rotated, producers must determine what crop mix they wish to produce on their farming operation as to minimize production risk while maximizing economic returns. Multiple studies have been conducted in Arkansas, Louisiana, and Mississippi that denote the benefits to crop rotation resulting in yield increases, increased soil organic matter, avoidance of soil fertility depletion, reduced disease, insect and weed pressure, and farm profitability (Guidry, et al., 2001; Martin, et al., 2002; Bruns, et al., 2007; Salassi, et al., 2009; Hristovska, et al., 2011). One of the primary factors impacting crop production choices by agricultural producers is the expected market price of each commodity and the resulting expected net economic returns from the production of selected commodities, as well as the relative economic risk associated with production of potential commodities (Anderson and Griffiths, 1982; Huirne, et al., 2000). Crop rotation risk involves yield variability and net return benefits resulting from higher yields and reduced production costs (Helmers, et al., 2001).

The major components that characterize production systems in the Mississippi River delta region include proper selection of crop cultivar, pest control, cropping system, tillage method, nutrient management, and water management. Each component must be selected according to the individual farm and/or crop situation (Snipes, et al., 2005). Supplemental to the agronomic benefits, crop rotations are often considered for the economic benefits. The relative economic return risk from crop production varies across commodities due to differences in the historical variability of market prices and crop yields and production cost difference per locale. Market instability of commodities has precipitated the need for diversification of income, which can be considered an additional benefit to crop rotation. Rotations are generally thought to reduce yield variability and may result in higher yields as well as reduced production costs (Helmers, et al., 2001). By increasing the number of commodities produced per farm unit, producers can offset some of the risk associated with producing one particular commodity. Also, different cultural practices needed at different times for various crops provide for a more even distribution of labor (Kurtz, et al., 1990). The economic evaluation of the relative profitability of a particular crop rotation system generally includes the economic benefit of the production of one crop on the other crop or crops, in an indirect manner (Salassi, et al., 2009). In addition, crop rotation choices made by producers would be expected to vary based primarily upon their risk preferences (Salassi, et al., 2013).

Since the mid-2000s, shifts away from cotton and into corn and soybean crops can be observed in the Mississippi River delta region of the Mid-south that include the states of Arkansas, Louisiana, and Mississippi. Tables 1.1 to 1.3.

Table 1.1 Arkansas production history of corn, cotton, rice, and soybeans, 1996-2013.

Year	Corn Acres	Cotton Acres	Rice (LG) Acres	Rice (MG) Acres	Soybean Acres
1996	240,000	1,000,000	918,000	260,000	3,550,000
1997	190,000	980,000	1,168,000	230,000	3,650,000
1998	235,000	920,000	1,293,000	205,000	3,550,000
1999	105,000	970,000	1,378,000	250,000	3,400,000
2000	180,000	960,000	1,138,000	280,000	3,350,000
2001	190,000	1,080,000	1,480,000	150,000	2,900,000
2002	265,000	960,000	1,350,000	165,000	2,950,000
2003	365,000	980,000	1,300,000	165,000	2,920,000
2004	320,000	910,000	1,405,000	155,000	3,200,000
2005	240,000	1,050,000	1,540,000	102,000	3,030,000
2006	190,000	1,170,000	1,300,000	105,000	3,110,000
2007	610,000	860,000	1,185,000	145,000	2,850,000
2008	440,000	620,000	1,300,000	100,000	3,300,000
2009	430,000	520,000	1,260,000	225,000	3,420,000
2010	390,000	545,000	1,595,000	195,000	3,190,000
2011	560,000	680,000	940,000	255,000	3,330,000
2012	710,000	595,000	1,175,000	115,000	3,200,000
2013	880,000	310,000	955,000	120,000	3,260,000

Source: USDA NASS, 2014. Where: (LG) represents long grain rice varieties and (MG) represents medium grain rice varieties.

Part of this acreage shift can be attributed to the increased demand for corn-based ethanol from production facilities located in the Midwestern United States coupled by a rise in price of foreign petroleum. Increased levels of corn-based ethanol resulted from a combination of not only rising gasoline prices but also a suite of Federal bioenergy policies that provides evidence that producers have altered their land-use decisions in response to increased demand for corn (Wallander, et al., 2011). An increasingly common crop rotation in the Mid-south is cotton rotated with corn and corn rotated with soybeans (Martin and Hanks, 2009; Reddy, et al., 2013). Rice is typically rotated with soybeans. Although rice is the more profitable crop than soybeans, the latter crop is generally rotated with rice as a means of controlling red rice, a close weed relative to rice (Hristovska, et al., 2011). Many producers in the Mid-south initially

Table 1.2. Louisiana production history of corn, cotton, rice, and soybeans, 1996-2013.

Year	Corn Acres	Cotton Acres	Rice (LG) Acres	Rice (MG) Acres	Soybean Acres
1996	535,000	890,000	465,000	70,000	1,100,000
1997	430,000	655,000	535,000	50,000	1,400,000
1998	700,000	535,000	595,000	30,000	1,200,000
1999	340,000	615,000	585,000	35,000	1,020,000
2000	380,000	710,000	460,000	25,000	930,000
2001	315,000	870,000	540,000	8,000	640,000
2002	580,000	520,000	530,000	10,000	800,000
2003	520,000	525,000	435,000	20,000	760,000
2004	420,000	500,000	525,000	13,000	1,100,000
2005	340,000	610,000	520,000	10,000	880,000
2006	300,000	635,000	340,000	10,000	870,000
2007	740,000	335,000	357,000	23,000	615,000
2008	520,000	300,000	455,000	15,000	1,050,000
2009	630,000	230,000	415,000	55,000	1,020,000
2010	510,000	255,000	500,000	40,000	1,030,000
2011	580,000	295,000	375,000	48,000	1,020,000
2012	540,000	230,000	375,000	27,000	1,130,000
2013	680,000	130,000	396,000	22,000	1,120,000

Source: USDA NASS, 2014. Where: (LG) represents long grain rice varieties and (MG) represents medium grain rice verities.

viewed corn as an alternative crop to cotton, and considering the fact that the market price for corn nearly doubled over the latter part of the decade, corn was solidified as a cornerstone of most farming operations in the region opposed to being an alternative crop choice.

Changes in government commodity support programs and increases to the price of feed grains in recent years has encouraged producers in the Delta region to shift cotton acreage to other crops, such as corn, to remain profitable. In recent years, soybean and corn acreage has increased with a continual decreases in cotton acreage (Reddy, et al., 2013). The increase in price for grain crops have acted as a stimulus for farm operators inside the region as well as across the country as producers respond to increased market demand for corn and soybean crops. The appeal of the corn market, increased global demand for oilseeds (e.g. soybeans), and the flat market price for cotton collectively lead to a reduction of cotton acres in favor of corn and soybeans- which could be produced with a lower management intensity- made these grain crops commercially attractive.

Table 1.3. Mississippi production history of corn, cotton, rice, and soybeans, 1996-2013.

Year	Corn Acres	Cotton Acres	Rice (LG) Acres	Soybean Acres
1996	630,000	1,120,000	210,000	1,800,000
1997	460,000	985,000	240,000	2,100,000
1998	550,000	950,000	270,000	2,050,000
1999	340,000	1,200,000	325,000	1,950,000
2000	390,000	1,300,000	220,000	1,700,000
2001	400,000	1,620,000	255,000	1,160,000
2002	550,000	1,170,000	255,000	1,440,000
2003	550,000	1,110,000	235,000	1,440,000
2004	460,000	1,110,000	235,000	1,670,000
2005	380,000	1,210,000	265,000	1,610,000
2006	340,000	1,230,000	190,000	1,670,000
2007	930,000	660,000	190,000	1,460,000
2008	720,000	365,000	230,000	2,000,000
2009	730,000	305,000	245,000	2,160,000
2010	750,000	420,000	305,000	2,000,000
2011	810,000	630,000	160,000	1,830,000
2012	820,000	475,000	130,000	1,970,000
2013	860,000	290,000	125,000	2,010,000

Source: USDA NASS, 2014. Where: (LG) represents long grain rice varieties.

National marketing year average (MYA) prices for these major row crops were obtained from USDA National Agricultural Statistics Service (NASS) and presented in Table 1.4. The trend in corn, cotton, and soybean acres that emerged in early 2000, suggests that producers are receptive to crop rotation systems (Guidry, et al., 2001). In the Mid-south region, planted acreage moving into the 2007/08 crop year witnessed corn prices near record levels for the decade ($4.20 per bushel), while cotton prices were near modern lows for the period ($0.478 per pound).

Table 1.4. National marketing year average prices per unit for major row crops produced in the Mississippi River delta region, 1996-2013.

Year	Corn (bu)	Cotton (lb)	Rice (LG) (cwt)	Rice (MG) (cwt)	Soybean (bu)
1996	$2.71	$0.693	$10.60	$8.37	$7.35
1997	$2.43	$0.652	$10.20	$8.52	$6.47
1998	$1.94	$0.602	$8.79	$9.18	$4.93
1999	$1.82	$0.450	$5.70	$6.62	$4.63
2000	$1.85	$0.498	$5.84	$5.15	$4.54
2001	$1.97	$0.298	$4.10	$4.82	$4.38
2002	$2.32	$0.445	$4.15	$5.90	$5.53
2003	$2.42	$0.618	$7.60	$9.94	$7.34
2004	$2.06	$0.416	$7.34	$7.29	$5.74
2005	$2.00	$0.477	$7.30	$9.49	$5.66
2006	$3.04	$0.465	$9.47	$12.10	$6.43
2007	$4.20	$0.593	$12.40	$14.60	$10.10
2008	$4.06	$0.478	$14.90	$24.80	$9.97
2009	$3.55	$0.629	$12.90	$18.40	$9.59
2010	$5.18	$0.815	$11.00	$18.80	$11.30
2011	$6.22	$0.883	$13.40	$17.10	$12.50
2012	$6.89	$0.725	$14.50	$17.40	$14.40
2013	$4.50	$0.764	$15.40	$18.50	$12.70

Source: USDA NASS, 2014. Where: (LG) represents long grain rice varieties and (MG) represents medium grain rice verities.

Given the price relationship between cotton and corn, producers elected to plant corn instead of cotton (Fannin, et al., 2008). Further highlighting this trend, national acreage shifted out of soybeans and into corn between 2006 and 2007, but soybean acreage rebounded between 2007 and 2008. Corn and soybean acres expanded over the short and long run, whereas most other crop acreage decreased over the long run (Wallander, et al., 2011). For example, Arkansas and Mississippi underwent large increases in corn acreage with Louisiana showing a significant increase in both corn and soybean acreage in this period. In the lower Mississippi River Valley states of Arkansas, Louisiana, and Mississippi, corn production has increased from nearly

600,000 acres in 1995 to about 1,000,000 acres in 2005 with a large portion of this corn production occurring in a rotation with cotton (Bruns, et al., 2007).

Reasons that can be attributed to this acreage decline in cotton are the yield and price of competing crops– most noticeably corn and soybeans. Corn and soybean crops have lower management intensity when compared to cotton. A noticeable production cost difference exists in fertilizer, seed, insect control programs, as well as with harvesting costs when cotton is compared to corn and soybeans in the Mississippi delta region. In the latter part of the past decade, cotton acreage in Louisiana has shifted into more profitable alternatives – namely acreage expansion in corn, soybeans, and wheat. According to USDA NASS data from 2006, cotton acreage in Arkansas and Mississippi exceeded 1,100,000 acres in each state and 635,000 acres in Louisiana. By 2009, cotton acreage had declined to 520,000 (56%) and 305,000 (75%) in Arkansas and Mississippi and 230,000 (64%) acres in Louisiana- all record lows, respectively for each state. Over this same three-year period, corn acreage in each state nearly doubled. Arkansas corn acres increased from 190,000 acres in 2006 to 430,000 in 2009 (126%). Mississippi corn acreage increased from 340,000 to 730,000 acres (115%). Corn acres in Louisiana increased from 300,000 acres to 630,000 in 2009 (110%). Soybean acreage in the region also increased. From 2006 to 2009, soybean plantings increased by 310,000 (10%); 490,000 (29%); and 150,000 (17%) acres in Arkansas, Mississippi, and Louisiana respectively. This data support claims made by Wallander, et al., (2011) that referenced national average trends in short run expansion of corn and soybean acreage.

A suppressed cotton market price and rising input costs coupled with increased grain prices have caused cotton acres to reach historic lows. Ebelhar, et al., (2011) states that higher grain prices are lower cotton prices have eroded the cotton base while corn production has greatly increased in the last few years. Corn and soybean production are increasing while cotton acres are in decline in the Mississippi delta (Deliberto, et al., 2013). Paxton, et al., (2003) identifies a management strategy such that producers in northeast Louisiana are rotating crops in response to changing market signals and the ability of producers to practice crop rotation without jeopardizing benefits under federal farm programs. Guidry, et al., (2001) states that with the removal of acreage restrictions and government payments no longer tied to production, producers have the flexibility to select cropping systems based on market signals rather than policy provisions.

In response to increases in the market prices for corn and soybeans, producers in the Mississippi River delta region have expanded production of these grain crops on their farms. However, input price volatility, as witnessed throughout the second half of the past decade, has had a significant impact on agricultural producers in the Mid-south as well as across the country in terms of profitability. Aside from the economic benefit of crop rotation systems, production costs per acre and management intensity of one or more crop alternatives must be considered. Input price volatility has had a substantial impact on crop returns for operations in the Mid-south (Martin, et al., 2002; Hristovska, et al., 2011; Deliberto, et al., 2013; Salassi, et al., 2013). Energy-related farm inputs have increased significantly in recent years, driven primarily from large increases in costs associated with fertilizers, chemicals, and seed. Deliberto, et al., (2013) examines the ten year observation period from 2002-2011, in which fertilizer, chemical, seed, and fuel inputs composed two-thirds of total variable costs per acre for corn and soybeans and half of the variable costs per acre for cotton produced in the of northeastern Louisiana. For example, diesel fuel price per gallon has undergone nearly a three-fold increase, from $0.94 per gallon in 2002 to $2.75 per gallon in 2011, reaching its highest unit price in 2008 at $2.90 per gallon. Unit costs for phosphate and potash fertilizer have tripled, while nitrogen costs have increased to 2.5 times their unit cost level since 2002.

The yield per planted acre for corn, cotton, rice, and soybeans are presented for Arkansas, Louisiana, and Mississippi from 1996 to 2013 as obtained from USDA NASS and presented in Tables 1.5 to 1.8.

Table 1.5. Corn yield per planted acre (bushels) for selected states.

Year	Arkansas	Louisiana	Mississippi
1996	119.79	116.46	96.33
1997	121.71	113.46	100.72
1998	91.49	62.49	78.18
1999	123.81	117.44	106.65
2000	126.39	112.95	93.59
2001	141.18	144.24	125.13
2002	128.94	112.66	115.64
2003	134.25	128.85	128.16
2004	133.44	131.79	127.22
2005	125.54	132.00	121.03
2006	138.32	135.33	102.28
2007	163.46	160.80	144.82
2008	151.48	141.23	136.11
2009	141.12	127.81	119.96
2010	146.15	137.25	121.49
2011	131.86	132.67	116.94
2012	174.24	169.80	159.97
2013	184.88	170.46	169.86

Source: USDA NASS, 2014.

1.2 Commodity Production Costs within the Region

Farm management decisions are on-going and range from deciding on the appropriate crop mix model, variety selection, input application timing, harvest optimization, marketing, and reinvestment in farm capital. Each decision requires an understanding in crop physiology, management science, economics, and, in particularly, risk management. Producers are able to

Table 1.6. Cotton yield per planted acre (pounds) for selected states.

Year	Arkansas	Louisiana	Mississippi
1996	785.28	693.57	804.00
1997	824.33	722.56	887.39
1998	630.78	575.10	729.60
1999	706.64	703.22	692.40
2000	712.50	615.89	631.75
2001	814.67	570.48	709.93
2002	834.50	682.15	793.85
2003	883.59	938.97	916.76
2004	1,101.89	849.60	1,014.49
2005	1,006.63	864.00	851.70
2006	1,035.90	938.08	822.24
2007	1,058.23	1,001.55	958.55
2008	1,003.35	449.60	898.19
2009	786.46	728.35	653.11
2010	1,035.74	822.59	969.14
2011	901.41	831.46	914.29
2012	1,046.32	997.57	1,003.45
2013	1,114.84	1,203.69	1,190.07

Source: USDA NASS, 2014.

participate in on-farm variety trials conducted by universities, structured bank loans based on historical land production, off-set yield risk with the purchase of crop insurances policies, and manage income risk by participation in commodity-based revenue programs established through federal agricultural legislation. However, forecasting the input markets (e.g. fertilizer, fuel, seed, chemicals, etc.) from one crop year to the next can become complex when trying to predict the relationship of multiple variables into an economic model to forecast farm profitability. Variables are often dependent and correlated in price movements over a particular time period. Enterprise budgeting and whole farm budgeting are tools used by farm managers to aid in decision making. The information derived from budgeting includes estimates of income, expenses, and net returns for a specific enterprise or a whole farm management plan. Budgeting allows the decision maker to systematically evaluate alternative plans to determine the plan

Table 1.7. Long and medium-grain rice yield per planted acre (hundredweight) for selected states.

Year	Arkansas		Louisiana		Mississippi
	LG	MG	LG	MG	LG
1996	59.97	64.50	48.79	47.00	59.43
1997	55.82	60.47	46.23	45.00	57.52
1998	56.96	60.49	44.92	46.00	57.57
1999	57.63	62.05	49.66	50.71	56.15
2000	60.17	62.55	50.25	51.52	58.46
2001	62.96	64.13	54.80	53.00	65.48
2002	63.82	63.82	54.48	52.50	63.50
2003	65.49	66.59	58.03	57.80	67.71
2004	69.55	69.55	53.49	50.00	68.71
2005	66.20	66.54	58.43	59.80	63.52
2006	68.83	66.86	57.94	59.60	69.63
2007	71.99	72.00	61.16	60.39	73.12
2008	66.14	68.90	57.56	56.47	68.20
2009	66.80	69.79	62.44	60.09	66.45
2010	64.40	66.16	60.49	59.50	68.05
2011	65.44	64.80	62.16	65.00	67.22
2012	74.58	72.17	63.54	63.41	71.45
2013	75.20	75.07	72.56	63.68	73.41

Source: USDA NASS, 2014. LG represents long-grain rice and MG represents medium-grain varieties.

which maximizes profits (Mississippi State University, 2014). Production cost data per acre for corn, cotton, rice, and soybeans were obtained for Arkansas, Louisiana, and Mississippi relative to common production systems across each crop in each state. In order to obtain cost estimates over an entire crop, input cost data were recorded for the selected production systems employed for the 2014 crop year: Roundup Ready® (RR) corn, Bollgard II® Roundup Ready® Flex (B2RF) cotton, conventional variety rice, CLEARFIELD® (CL) variety rice, CLEARFIELD® hybrid variety rice, Roundup Ready® (RR) soybeans, and Liberty Link® (LL) soybeans. In providing a brief background into the characteristics of these production systems, Roundup

Table 1.8. Soybean yield per planted acre (bushels) for selected states.

Year	Arkansas	Louisiana	Mississippi
1996	31.55	32.40	30.14
1997	30.08	27.96	30.56
1998	23.94	18.73	23.41
1999	27.18	26.21	22.90
2000	23.98	21.94	20.45
2001	31.45	31.45	31.86
2002	32.71	26.40	30.44
2003	38.10	33.11	38.73
2004	38.59	29.70	36.83
2005	33.66	32.84	36.05
2006	34.55	34.76	25.69
2007	35.62	41.95	39.95
2008	37.42	29.86	39.20
2009	35.86	35.94	35.71
2010	34.56	40.60	38.12
2011	37.92	34.59	38.36
2012	42.46	45.39	44.54
2013	43.10	47.57	44.55

Source: USDA NASS, 2014.

Ready® refers to corn and soybean seeds that possess genetic traits that convey resistance to glyphosate, an active ingredient in Roundup® herbicide (Pioneer, 2015). The Bollgard II® with Roundup Ready® Flex trait in cotton offers the combination of broad-spectrum weed control that targets grass and broadleaf weeds, while offering protection against worm damage (Monsanto, 2015.) CLEARFIELD® rice seed is a nongenetically modified technology developed to provide broad-spectrum weed control while being tolerant to Newpath®, Clearpath®, and Beyond® herbicides (BASF, 2015). The Liberty Link® gene provides resistant to Liberty® herbicide (Pioneer, 2015). Appendix A contains a complete list of enterprise budgets per crop that were released per state for the 2014 crop year. Irrigation delivery system is also listed, based on the enterprise description provided by each state for corn, cotton, rice, and soybean crops.

Variable production costs per acre included the categories of: custom field operations (e.g. aerial application, fertilizer application, planting, spraying, harvesting, hauling, and drying), fertilizers, herbicides, insecticides, fungicides, growth regulators, defoliants, seed (and associated technology fees), irrigation supplies, labor, diesel fuel, repair and maintenance, and interest on operating capital. Tables 1.9 denote the total variable costs per acre to produce corn, cotton, rice, and soybeans relative to typical production systems in Arkansas for the 2014 crop year.

Table 1.9. Variable production costs per acre for selected crops and production systems in Arkansas, 2014.

Enterprise	Seed Technology	Production System	Variable Cost per acre
Corn	Stacked gene	Furrow Irrigation	$575
	Stacked gene	Center Pivot Irrigation	$597
	Stacked gene	No Irrigation	$430
Cotton	B2RF	Furrow Irrigation	$485
	B2RF	Center Pivot Irrigation	$507
	B2RF	No Irrigation	$390
	B2LL®	Furrow Irrigation	$518
	B2LL®	Center Pivot Irrigation	$541
	B2LL®	No Irrigation	$423
	Conventional	No Irrigation	$444
Rice	Conventional	Drill Planted	$610
	CLEARFIELD®	Drill Planted	$639
	Conventional hybrid	Drill Planted	$658
	CLEARFIELD® hybrid	Drill Planted	$669
	Conventional	Water Planted	$515
Soybeans	Roundup Ready®	Furrow Irrigation	$297
	Roundup Ready®	Center Pivot Irrigation	$314
	Roundup Ready®	No Irrigation	$242
	Roundup Ready®	Flood Irrigation	$295
	Liberty Link®	Furrow Irrigation	$318
	Liberty Link®	Center Pivot Irrigation	$335
	Liberty Link®	No Irrigation	$263
	Liberty Link®	Flood Irrigation	$317
	Conventional	Furrow Irrigation	$272

Source: University of Arkansas Division of Agriculture, 2014.

According to the University of Arkansas' Division of Agriculture, current input unit prices for nitrogen (N), phosphate (P), potash (K), and sulfur fertilizer for 2014 were: $0.45 to $0.55; $0.52; $0.39; and $0.29 per pound of active ingredient, respectively. Boron fertilizer was applied at a rate of $4.00 per acre. The price of farm-grade diesel fuel was $3.17 per gallon. Furrow and flood irrigation costs, contained in irrigated enterprise budgets, were estimated at $3.74 per acre-inch of applied water while center pivot irrigation costs were $5.69 per acre-inch applied.

Variable production costs for stacked gene corn produced in Arkansas in 2014, ranged from $430.44 to $597.49 per acre, depending on whether or not the crop received irrigation. Energy related inputs, e.g. fertilizer and diesel fuel, compose nearly 52% of the total variable cost per acre for corn produced in Arkansas. Across three production systems in corn, the total acre expenditure for nitrogen, phosphate, potash, sulfur, and boron fertilizers ranged from $198.65 for dryland production to $226.58 for irrigated systems. Diesel fuel charges for tractors, harvesters, and irrigation delivery systems varied from $21.58 (dryland production) to $69.07 and $89.83 (furrow and pivot irrigated systems, respectively). Due to the fact that over half of the variable costs per acre for Arkansas corn is attributed to energy-related inputs, substantial increases in the unit price for one or both of these units will have a significant impact on production costs and ultimately net returns.

For cotton produced in Arkansas, variable production costs ranged from $390.15 to $540.53 per acre, depending on irrigation practice. Fertilizer averaged $71.06 on dryland production to $97.60 per acre for irrigated systems. Diesel fuel for tractors, harvesters, and irrigation delivery systems averaged $36.97 to $84.88 and $105.63 for furrow and pivot irrigation fields. On average, the energy-related expenditures represented 26% to 41% of variable production expenses per acre for the Bollgard® Roundup Ready® Flex (B2RF) and Bollgard® Liberty Link® (B2LL) seed varieties.

A significant portion of rice in Arkansas is planted using a grain drill; however, some of the acreage is water-seeded. Total variable costs ranged from $515.30 to $668.65 per acre depending on the rice variety planted. Differences in production costs arise from the planting method and variety (conventional or CLEARFIELD® seed) since all rice in the state receives irrigation. Fertilizer cost ranges from $68.40 to $112.60 per acre. Irrigation costs compose a majority of production costs per acre at $108.32 for a water-seeded system to $145.30 per acre for a drill seed planting method. Together, energy-related inputs compose between 34% and 42% of current total variable production costs per acre.

Roundup Ready® (RR) and Liberty Link® (LL) production systems are typical in the Arkansas soybean sector. Phosphate and potash fertilizer components of both production systems are consistent at $44.20 per acre. Diesel fuel for ranges from $18.83 per acre for dryland production to $58.84 and $75.70 for furrow and pivot irrigation systems. Fertilizer and fuel expenditures represent 24% and 38% of variable production expenses per acre.

For Louisiana, production practices for major row crops such as corn, cotton, rice, and soybeans are presented by geographic region- northeast and southwest. Input unit prices, published by the Louisiana State University Agricultural Center, for nitrogen, phosphate, and potash fertilizer in 2014 were $0.50; $0.50; and $0.37 per pound, respectively. The price of farm-grade diesel fuel for tractors, harvesters, and irrigation pumps (poly-pipe and center pivot systems) was $3.30 per gallon. Across a representative sample of northeastern Louisiana feed grain farms, the irrigation budgets for grain crops produced employ a poly-pipe irrigation delivery system.

The two types of corn seed planted in northeastern Louisiana are of Roundup Ready® (RR) and Bt-stacked gene (BtRR) technologies. Corn is typically produced using eight-row farm equipment in a dryland and irrigation production system. Variable production costs for corn ranged from $438.07 (dryland) to $535.12 and $536.41 for RR and BtRR irrigated systems, respectively. Fertilizer composed the largest budget share at $127.20 (dryland) and $142.50 (irrigated) per acre, respectively. Tables 1.10 denote the total variable costs per acre to produce corn, cotton, rice, and soybeans relative to typical production systems in Louisiana for the 2014 crop year.

Table 1.10. Variable production costs per acre for selected crops and production systems in Louisiana, 2014.

Enterprise	Seed Technology	Production System	Variable Cost per acre
Corn	Roundup Ready®	No Irrigation (8 row)	$450
	Roundup Ready®	Poly-pipe Irrigation (8 row)	$536
	BtRR®	No Irrigation (8 row)	$438
	BtRR®	Poly-pipe Irrigation (8 row)	$535
Cotton	B2RF	No Irrigation (8 row)	$520
	B2RF	Poly-pipe Irrigation (8 row)	$583
	B2RF	Poly-pipe Irrigation (12 row)	$560
Rice	Conventional	Water Planted (C. Tillage)	$670
	Conventional	Water Planted (Stale seedbed)	$649
	CLEARFIELD®	Water Planted (C. Tillage)	$721
	CLEARFIELD®	Water Planted (Stale seedbed)	$710
	Conventional	Drill Planted (C. Tillage)	$635
	Conventional	Drill Planted (Stale seedbed)	$646
	CLEARFIELD®	Drill Planted (C. Tillage)	$690
	CLEARFIELD®	Drill Planted (Stale seedbed)	$700
	CLEARFIELD® hybrid	Drill Planted	$791
Soybeans	Roundup Ready®	No Irrigation (8 row)	$304
	Roundup Ready®	Poly-pipe Irrigation (8 row)	$351
	Roundup Ready®	No Irrigation (12 row)	$301
	Roundup Ready ®	Poly-pipe Irrigation (12 row)	$350

Source: Louisiana State University Agricultural Center, 2014. Where: 8 or 12 represent the row capabilities of the implements used and C.Tillage represents conventional tillage was employed in the field.

Diesel fuel costs were $23.08 to $60.84 per production system. On average, the fertilizer and fuel expenditure ranged from 33% to 38% of total variable production costs per acre for the 2014 crop year.

The predominant enterprise budget for cotton production in Louisiana was of Bollgard II® Roundup Ready® Flex (B2RF) technology. Budget data is presented for eight and twelve-row farm equipment. Total variable production costs for cotton ranged from $519.99 on dryland fields to $582.89 for irrigated fields. Fertilizer costs per acre were consistent at $97.20 per acre. Diesel fuel cost per acre was $46.26 and $78.76 to $83.32 (dryland and irrigated eight and 12-row equipment). The energy-related budget share for Louisiana cotton was 28% to 31% of total variable cost per acre.

Rice is produced predominately in the southwestern region of Louisiana. However, production acreage fluctuates in the northeastern portion of the state. Production of rice in the northeast region can represent as much as 30% of the state's acreage. Given the fact that rice is an irrigated crop, it is expected that fertilizer and fuel will comprise a large share of total variable production expenditures. Variable production expenses per acre for rice ranged from $634.78 for conventional varieties to $790.93 for CLEARFIELD® hybrid varieties. In the southwestern region, fertilizer expenditures for rice were consistent across conventional and CLEARFIELD® varieties at $107.20 per acre. Fuel costs were also comparable across varieties and planting methods between $206.81 and $225.84 per acre. The energy-related input budget share for the region was between 43% and 53% of total variable costs per acre. Rice produced in northeastern Louisiana received less fertilizer, a reduction in chemicals (and subsequent application costs) resulting from reduced weed and disease pressure, as well as reduced pumping costs.

Conventional variety rice had a variable cost of $485.42 and CLEARFIELD® variety had a cost of $536.38 per acre, respectively. Fertilizer costs were $85.00 per acre and fuel was also similar at $96.56 to $100.34 per acre, accounting for an energy-related budget share of 33% to 38% for northeastern Louisiana rice production in 2014.

Roundup Ready® soybean enterprise budgets indicate that variable costs equate to $304.00 (dryland) to $350.87 (irrigated) per acre for 2014. Fertilizer cost per acre is consistent for each of the production systems at $43.50 per acre. Diesel fuel ranges from $15.33 on dryland production to $40.80 to $42.85 on irrigated eight-row and twelve-row operations. The energy-related expenditure for soybeans produced in northeastern Louisiana is 20% to 25% of total variable production costs per acre. Soybeans are also produced in southwestern Louisiana, primarily as a rotational crop with rice. Production costs for this region were estimated at $278.35 per acre. In the southwestern region of the state, fertilizer accounts for $43.50 (16%) of the $278.35 total variable production expenses. Soybeans enterprise budgets do not consider irrigation, so the fuel expenditure of $16.01 (6%) includes tractor and harvester usage. The total energy-related component to this production system in southwest Louisiana, is $59.51 per acre (21% of total variable costs per acre) in 2014.

Enterprise commodity budgets for corn, cotton, rice, and soybeans crops produced in Mississippi contain nine fertilizer chemicals. Tables 1.11 denote the total variable costs per acre to produce corn, cotton, rice, and soybeans relative to typical production systems in Mississippi for the 2014 crop year. The prices for ammonium sulfate, di-ammonium phosphate, phosphorous, potash, 10-34-0 fertilizer N-P-K mix, urea, urea plus sulfur, UAN, and ammonium nitrate were estimated at $17.75; $25.75; $23.75; $28.25; $22.60; $19.50; $19.50; and $22.50 per hundredweight (cwt) unit, respectively. Farm grade diesel fuel was estimated at $3.30 per gallon for the 2014 crop year.

Table 1.11. Variable production costs per acre for selected crops and production systems in Mississippi, 2014.

Enterprise	Seed Technology	Production System	Variable Cost per acre
Corn	BtRR®	Furrow Irrigation	$588
	BtRR®	No Irrigation	$422
	Roundup Ready®	Furrow Irrigation	$587
	Roundup Ready®	No Irrigation	$418
Cotton	B2RF	C. Tillage (8 row)	$674
	B2RF	No Tillage (8 Row)	$666
	B2RF	C. Tillage Skip Row	$568
	B2LL®	C. Tillage (8 row)	$693
	B2RF	C. Tillage (12 row)	$644
	B2RF	Furrow Irrigation, CT (12 row)	$760
	B2RF	Center Pivot Irrigation CT (12 row)	$766
	B2RF	No Tillage (12 row)	$639
	B2LL®	C. Tillage (12 row)	$663
Rice	Conventional	Contour Levee	$652
	Conventional	Straight Levee	$616
	Conventional	Multi-inlet Straight Levee	$603
	Conventional	Straight Levee, Precision Grade	$572
	CLEARFIELD®	Contour Levee	$699
	CLEARFIELD®	Straight Levee	$670
	CLEARFIELD®	Multi-inlet Straight Levee	$664
	CLEARFIELD®	Straight Levee, Precision Grade	$635
	CLEARFIELD® hybrid	Straight Levee	$742
Soybeans	Roundup Ready®	No Irrigation (12 row)	$270
	Roundup Ready®	Furrow Irrigation (12 row)	$329
	Roundup Ready®	Flood Irrigation (12 row)	$346
	Roundup Ready®	Center Pivot Irrigation (12 row)	$323

Source: Mississippi State University. Where: 8 or 12 represent the row capabilities of the implements used and C.Tillage represents conventional tillage was employed in the field and CT represent conservation tillage.

Mississippi corn is produced in both a dryland and furrow irrigated system using BtRR and RR seed technologies. Total variable cost per acre in 2014 ranged from $418.22 to $588.00. Fertilizer expenses ranged from $153.48 for dryland RR corn to $167.61 per acre for dryland

BtRR corn. Furrow irrigation fuel expenses ranged $55.88 to $64.53 for BtRR and RR corn varieties, while fuel expenditures for dryland production was $17.77 to $25.07 per acre. On average, the fertilizer and fuel budget share for dryland corn in Mississippi was 43% to 44%; while irrigated corn commanded a slightly higher budget share at 51% of total variable costs per acre.

Cotton is produced in a variety of production systems in the state using eight and twelve-row equipment. B2RF and B2LL cotton is produced in dryland systems using no tillage, conservation tillage, or conservation tillage-skip row. Irrigation production systems are estimated for furrow and center pivot water delivery systems with twelve-row farm equipment. Fertilizer costs per acre ranged from $102.26 to $119.63 for dryland production. The cost of the recommended fertilizer requirement for irrigated cotton is $125.33 per acre. Diesel fuel expenditures for dryland production systems ranged from $36.88 to $54.13 per acre, and $74.76 to $80.43 per acre for irrigated cotton. The energy-related inputs for dryland cotton accounted for a 23% to 25% budget share. Fertilizer and fuel comprised approximately 27% of the budget share for irrigated cotton.

Rice is produced in Mississippi using either a contour or straight levee control structure. Conventional, CLEARFIELD® and CLEARFIELD® hybrid rice varieties were produced in the state in 2014. Total variable costs per acre will vary depending upon the irrigation practice and most importantly, seed technology selected. Variable production costs were $572.08 to $651.76 for conventional varieties, $634.57 to $699.04 for CLEARFIELD® varieties, and $741.61 for CLEARFIELD® hybrid varieties. However, fertilizer expense per acre for all seed-types produced in 2014 equated to $106.72 per acre, with the CLEARFIELD® hybrid variety receiving $99.26 per acre. Diesel fuel also varied by irrigation system. Contour levee systems had a fuel expense of $117.78; straight levee systems $98.88; multi-inlet straight levee systems $88.75; and straight levee that received a zero-grade field slope $75.35 per acre. The energy-related budget share for conventional rice was 32% to 34% compared to 27% to 32% for CLEARFIELD® rice varieties.

Roundup Ready® soybeans are produced in a dryland, furrow, flood, or center pivot irrigation system. Total variable costs per acre were estimated at $269.70 for dryland soybeans and $323.36 to $346.03 for irrigated soybeans. Fertilizer costs per acre were consistent at $52.50 per acre across production systems. The cost of diesel fuel was $16.62 for dryland and $44.94 to $64.34 per acre for irrigated systems. The energy-related budget share was 26% for dryland soybeans and 30% to 36% for irrigated soybeans.

Traditionally, fuel and fertilizer expenditures per acre have accounted for a significant portion of the production costs associated with rice, soybean, corn, and cotton production in the Mississippi River delta region. On average, production costs from 2014 indicated that rice has a fuel budget share of 24%, 36%, and 18% for Arkansas, Louisiana, and Mississippi. This can be attributed to the fact that rice is an irrigated crop, although water delivery systems do vary across farms and topology in the region. Corn fertilization expenses comprise 47%, 29%, and 42% of total variable production per acre for Arkansas, Louisiana, and Mississippi. Cotton and soybeans produced in irrigated production systems exhibited an equitable split in the fertilizer and fuel-related budget share relative to total variable costs between 15% and 20% in Arkansas, Louisiana, and Mississippi.

Economic returns from corn, cotton, rice, and soybean crops produced in the Mid-south region are obtained by using state average yield per planted acre and average prices received in each state, respectively. Using these yields and market prices, Tables 1.12 to 1.14 represent the gross returns from crops captured while considering no production expenses.

Table 1.12. Historic gross economic returns (per acre) for selected crops produced in Arkansas.

Year	Corn	Cotton	Rice (LG)	Rice (MG)	Soybeans
1996	$317	$555	$612	$658	$233
1997	$305	$542	$551	$597	$207
1998	$169	$401	$505	$537	$129
1999	$215	$334	$329	$354	$130
2000	$221	$391	$337	$350	$113
2001	$285	$228	$247	$252	$137
2002	$313	$372	$266	$265	$185
2003	$318	$552	$504	$513	$271
2004	$319	$453	$496	$496	$226
2005	$270	$473	$481	$484	$199
2006	$378	$482	$649	$631	$222
2007	$621	$612	$871	$871	$321
2008	$670	$481	$992	$1,034	$361
2009	$535	$495	$895	$935	$346
2010	$665	$761	$728	$748	$377
2011	$827	$854	$877	$868	$466
2012	$1,187	$748	$1,069	$1,032	$607
2013	$961	$893	$1,166	$1,164	$565

Source: USDA NASS, 2014. Where (LG) represents long grain rice varieties and (MG) represents medium grain rice varieties. Note that return levels are rounded to the nearest whole dollar.

Risk in cropping systems can result from variability in returns across time and from year-to-year changes in yields, crop prices, and input costs (Helmers, et al., 2001). The degree of variability in production costs (per acre) for major row crops in the Mississippi River delta region impacts net returns, and ultimately profitability to the producer. Relative to the energy-related inputs such as fuel and/or fertilizer, volatility in the input market significantly affects crop rotation choices especially when combined with market expectations. In efforts to illustrate the effect that production cost volatility has on net returns, a comparison of the production costs per acre were extracted from enterprise budgets in Louisiana over the past ten years (2004-2013). Louisiana production cost data is presented in Table 1.15 to serve as an illustration. Information for Arkansas and Mississippi is also complied but are not included in tabular format. Due to the

Table 1.13. Historic gross economic returns (per acre) for selected crops produced in Louisiana.

Year	Corn	Cotton	Rice (LG)	Rice (MG)	Soybeans
1996	$415	$455	$517	$498	$241
1997	$306	$469	$472	$459	$195
1998	$328	$329	$398	$408	$105
1999	$241	$312	$297	$304	$133
2000	$198	$318	$292	$300	$107
2001	$317	$360	$245	$237	$138
2002	$270	$300	$226	$217	$146
2003	$309	$572	$446	$444	$225
2004	$323	$352	$416	$389	$187
2005	$297	$406	$436	$447	$196
2006	$379	$432	$570	$586	$206
2007	$611	$571	$777	$767	$354
2008	$628	$236	$886	$870	$284
2009	$454	$457	$812	$781	$347
2010	$673	$666	$720	$708	$426
2011	$809	$773	$633	$871	$415
2012	$1,172	$691	$915	$913	$667
2013	$869	$892	$1,154	$1,013	$633

Source: USDA NASS, 2014. Where (LG) represents long grain rice varieties and (MG) represents medium grain rice varieties. Note that return levels are rounded to the nearest whole dollar.

fact that many different production systems are employed in the production of a single crop, assumptions were made to identify a representative production system for each major row crop. Conventional corn enterprise budgets were compiled prior to the widespread adoption of Roundup Ready® corn seed in 2009 to present. Bollgard® Roundup Ready® cotton seed systems are presented from 2004 to 2009. To date, Bollgard II® Roundup Ready® Flex cotton seed is the assumed predominant cotton seed technology employed in the state. CLEARFIELD® long-grain rice was assumed to be produced in Louisiana under a drill planting method for southwest region production. Roundup Ready® soybeans are modeled for production in the northeast region of the state.

Table 1.14. Historic gross economic returns (per acre) for selected crops produced in Mississippi.

Year	Corn	Cotton	Rice (LG)	Soybeans
1996	$318	$547	$624	$221
1997	$267	$576	$598	$211
1998	$160	$441	$518	$132
1999	$213	$312	$308	$112
2000	$179	$319	$332	$96
2001	$249	$186	$272	$149
2002	$269	$349	$314	$168
2003	$292	$554	$497	$256
2004	$309	$416	$514	$228
2005	$269	$393	$467	$213
2006	$290	$370	$653	$160
2007	$533	$552	$921	$334
2008	$630	$432	$1,050	$364
2009	$446	$428	$857	$330
2010	$531	$767	$715	$396
2011	$729	$893	$894	$460
2012	$1,110	$764	$1,043	$646
2013	$909	$921	$1,160	$584

Source: USDA NASS, 2014. Where (LG) represents long grain rice varieties. Note that return levels are rounded to the nearest whole dollar.

Table 1.15. Variable production costs per acre for selected crops in Louisiana, a ten-year historical data set.

Year	Corn	Cotton	Rice (LG)	Soybeans
2004	$213	$447	$415	$115
2005	$253	$445	$437	$120
2006	$290	$466	$520	$114
2007	$280	$487	$502	$134
2008	$343	$460	$599	$144
2009	$495	$530	$606	$215
2010	$446	$538	$596	$326
2011	$441	$532	$647	$305
2012	$475	$548	$725	$311
2013	$488	$560	$703	$327

Source: Louisiana State University Agricultural Center, 2014.

1.3 Federal Farm Program Policy

Since the implementation of the Federal Agriculture Improvement and Reform Act of 1996 (1996 FAIR Act), producers have had flexibility in planting decisions because program payments have been decoupled from planting decisions (Fannin, et al., 2008). Prior to the 1996 farm bill, farm program provisions encouraged year-after-year planting of a single commodity, which prevailed as a primary cropping system used by producers. Price support systems in the legislation allowed producers to establish continuous or monoculture cropping systems with less concern for market signals (Guidry, et al., 2001). A number of significant changes in commodity programs resulted from provisions contained in the 1996 FAIR Act, including a complete revision and simplification of a direct payment program and the elimination of most supply control programs. During the mid-1990s, the setting for agricultural commodity policy changed since many producers and policymakers felt planting restrictions during the 1980s were limiting in regards to the ability of a producer to plant crops of his choosing. The 1995/96 marketing year also contributed to the reform effort. High commodity prices weakened the case for continued price and income support programs. Program bases and deficiency payments were based on historical plantings, which created an incentive for farms to maintain historical production systems. This was in contrast to the viewpoint of some producers who wanted to change their cropping mix in order to respond to changing market conditions (Young and Westcott, 1996). The 1996 FAIR Act replaced price-sensitive deficiency payments, based on the difference between congressionally-set target prices and the final reported marketing year price, with a system of fixed production flexibility contract (PFC) payments built as predetermined seven-year payments to producers (Young and Westcott, 1996; Nelson and Schertz, 1996). PFC payments are decoupled, meaning there is no link between payments and current plantings. A series of predetermined annual contract payments were made to producers who participated in any of the 1991 to 1995 programs afforded to wheat, feed grains, cotton, or rice under the previous law, and who agree to implement a PFC for the 1996 through 2002 crop years. The share of total payments for each commodity is stated in the FAIR Act. Each participant's share of total annual commodity payment is equal to the product of their given contract acreage, individual farm program yield, and the national payment rate. This payment rate is represented by the total amount made available for a commodity in a given fiscal year, divided by the sum of all payment production in the country. Payments did not depend on the level of current production or market prices (Nelson and Westcott, 1996). The FAIR Act eliminated target prices, deficiency payments, and production adjustment programs (Nelson and Schertz, 1996). The 1996 Act did continue the nonrecourse marketing assistance loan (MAL) program. Minimum loan rates for all eligible commodities, except rice, were initially calculated as 85% of the preceding five-year Olympic average. These loan rates were then subject to established minimums, maximums, and conditional adjustments. It is noted that the loan rate for rice was fixed (Nelson and Westcott, 1996).

In summary, the 1996 FAIR Act fundamentally changed U.S. agriculture support programs by eliminating supply management, increasing planting flexibility, and changed income support for contract crops. Planting flexibility increased to a 15% limit without affecting deficiency payments. Authority for the acreage reduction program expired. The 1996 Act accelerated the market orientation of the previous two major farm Acts, which gradually reduced the government's influence in the agriculture sector through commodity programs (Young and Westcott, 1996).

Under the 2002 and 2008 farm bills, commodity support was tied to farm production history, allowing producers enrolled in the direct payment program to have complete planting flexibility in the production of desired crops that fit their management plan. Direct payments were made to the historical yield per base acre of eligible enrolled commodities that were dispersed by USDA Farm Service Agency (FSA) regardless of market prices and planting frequency. These payments were often shared between the landowner and grower in exchange for rental privileges or other production costs sharing arrangements.

The 2002 farm bill included income support for wheat, feed grains, cotton, rice, and oilseeds provided through three main programs: direct payments, countercyclical (CC) payments, and marketing loans (Young, 2002). This bill also made direct payments available for soybeans. Highlights of the bill included the introduction countercyclical farm income support. Under the 1996 FAIR Act, producers could enroll into seven-year contracts. To receive a direct payment, producers must enroll into an annual agreement. The direct payment (DP) rates is specified by language of the farm law. The 2002 bill make countercyclical (CC) program payments to covered commodities whenever the effective price is less than the target price. The target prices for each covered commodity are specified in the 2002 bill-a similarity to the 1996 bill. Under the 1996 Act, market loss assistance payments were authorized through supplemental legislation. These payments were proportional to PFC payments (Young, 2008).

Acreage bases and payment acres for calculating direct and countercyclical payments (DCP) were adjusted/updated. Under the 1996 Act, land eligible for contract acreage was equal to a farm's base acreage for 1996, as calculated under the previous farm program, plus expired conservation reserve program (CRP) base. In the 2002 bill, producers have the option to select one of two methods for base acres for all covered commodities for the farm: (1) update base to reflect four-year average of planted acres during the 1998 to 2001 crop years or (2) use 2002 PFC contract acres as new base and oilseed base as the default option. Payment acres that were made on 85% of contract acres are now equal to 85% of base acres. Under the 1996 Act, program yields were frozen at 1995 levels. With the 2002 bill, payment yields for direct payments remained unchanged. Payment yields for CC program could be the same as those for the DP or may be updated using either: (a) adding 70% of the difference between program yields for 2002 crops and the farm's average for 1998 to 2001 yields; or (b) use 93.5% of the 1998 to 2001 average yields.

Planting flexibility was the same for 2002 as contained in the 1996 Act- meaning that producers could plant 100% of contract acreage to any crop. Marketing assistance loans are extended in the 2002 bill, with loan rates fixed by the legislation. The requirement that producers enter into an agreement for DP to be eligible for loan program benefits was eliminated.

The Food, Conservation, and Energy Act of 2008 (P.L. 110-246) contains three primary types of payments: (1) direct payments that are unrelated to production or process; (2) countercyclical payments for a commodity that are triggered when (a) prices are blow statutorily-determined target prices, or (b) revenue falls below a historical guaranteed level; and (3) marketing assistance loans that offer interim financing and, if price fall below loan prices set in statute, additional income support (Monke, 2008). The Food, Conservation, and Energy Act of 2008, also referred to as the 2008 farm bill, continued the price and income support provisions framework established under the 2002 farm bill, with some modifications. One such modification is the creation of the average crop revenue election (ACRE) program. Under the 2008 bill, rice was categorized as long-grain or medium-grain variety for the purpose of program administration.

Direct payments are available to producers with eligible historical production of wheat, corn, grain sorghum, barley, oats, upland cotton, rice, soybeans, other oilseeds, and peanuts (USDA ERS, 2011). Direct payments are one of many farm income support payments. They are considered decoupled farm assistance, as they are not tied directly to current production or market prices. For the past 10 years, direct payments have been paid to producers who operate land that historically has been used to produce major agricultural commodities on base acres. Unlike most other farm program payments, direct payments transfer income to eligible producers and largely are paid without regard to the producer's current production decisions or commodity market conditions. Direct payments, administered by USDA FSA are calculated as the payment rate multiplied by the payment yield and the payment acres. Payment acres are equal to 85% of the base acres enrolled in each of the eligible program crop. Due to Federal budget issues, the payment acre percentage was reduced to 83.3% of base for crop years 2009 to 2011.

The major economic implication of the direct payment program is such that the payments are fixed and not tied to current production or market prices but are based on historical cropping patterns of major commodities, or base acres, with per-acre rates fixed in legislation. Specific commodity production is not required on the land. Planting flexibility allows producers to not be restricted to growing the historically produced crops for which they are receiving direct payments (USDA ERS, 2011). On a per acre basis, the value of the direct payment varies by the commodity associated with the historic base and by payment yields, which vary by geographic location. For example, Table 1.16 contains direct payment amounts for producers of corn, cotton, rice, and soybeans in Louisiana. Average payment yields per program crop were obtained from USDA FSA and vetted through personal communication with the Louisiana Farm Bureau Federation.

Table 1.16. Estimated direct payment rates per acre for selected crops produced in Louisiana, 2008-2012.

Program Crop	Unit of Measure	Payment Rate	Average Payment Yield	Direct Payment Amount
Corn	bushel	$0.28	70.70	$19.80
Cotton	pound	$0.0667	732.60	$48.86
Rice	hundredweight	$2.35	41.12	$96.63
Soybeans	bushel	$0.44	20.00	$8.80

Source: USDA FSA and the Louisiana Farm Bureau Federation, 2013.

From a national perspective, rice and peanuts received the largest direct payment per acre at $96.25 and $45.85, respectively, but combined they only account for about 2% of total base acres (Ifft, et al., 2012). Corn, wheat, and soybeans accounted for more than 80% of total base acres in 2008, but received lower direct payments per acre ($24.39, $15.21, and $11.54 per acre respectively). The direct payment program makes fixed annual payments to producers which are tied to base acreage and program yields determined by production on a farm in the distant past, and are generally unaffected by current planting decisions or production levels (FAPRI, 2012). Countercyclical program (CCP) payments provide support counter to the cycle of market prices as part of a 'safety net' in the event of low crop prices (USDA FSA, 2008). Countercyclical payments are issued if the effective price for a program commodity is below the target price for the commodity. The target price for each program commodity is set legislatively by the 2008 bill. The CCP rate is the amount by which the target price of each commodity exceeds its effective price. Target prices are set at: $10.50 per hundredweight for long and medium-grain rice; $0.7125 per pound for cotton; $2.63 per bushel for corn, and $5.80 per bushel for soybeans for the 2008 and 2009 crop years and then increased to $6.00 per bushel through the 2012 crop year. The effective price for a covered commodity equals the direct payment rate for the program crop plus the higher of the national MYA price for the commodity or the loan rate for the commodity. Total CCP payment is determined by multiplying the base acre by the CCP rate and the CCP payment yield. The payment amount for covered commodities equals the product of the payment rate, a producer's historical payment acres (85% of base acres), and a producer's historical countercyclical payment yield, which may differ from the direct payment yield. If the loan rate plus the direct payment rate for the period (which equals the effective price) is equal to or exceeds the target price for that particular commodity, the payment rate will equate to zero. In recent years, market prices for most grains and oilseeds have been above levels that would result in countercyclical payments, although large payments can occur when prices are low (FAPRI, 2012). The economic implications of the CCP are such that these payments are designed to support and stabilize farm income in years when current prices for historically produced commodities are less than target prices (USDA ERS, 2009). Thus, when market prices deteriorate, the payment level is increased. CCP payments constitute a risk management instrument for producers to guard against price-related revenue risks. Because program payments vary based on the relationship between the target price and current commodity price, payments will vary across commodity base acres from year-to-year. The distribution of program payments across crop base acres will continue to be dependent upon the relationship between the CCP target price and current market price (USDA ERS, 2009).

Marketing assistance loans (MAL) and loan deficiency payments (LDP) were reauthorized under the 2008 bill and are made available to eligible producers for the 2008 through 2012 crop years. MALs and LDPs are marketing tools available to producers beginning upon harvest of the crop(s) (USDA FSA, 2011). The MAL program is designed to provide short-term financing in all price environments, as well as to assist producers when market prices are low. MALs provide payment to producers when market prices are typically at their lowest during the harvest season.

This allows the producer to delay the sale of the commodity until more favorable market conditions emerge. Allowing producers to store their commodity at harvest provides for a more orderly marketing of commodities throughout the year (USDA FSA, 2011). These types of loans are considered nonrecourse when the loan can either be redeemed by repayment or by delivering the pledged collateral (the crop) to the Commodity Credit Corporation (CCC) as full payment for the marketing assistance loan at maturity (USDA FSA, 2011). To avoid forfeitures, the marketing loan provision allows producers to repay loans at a rate less than the original loan rate plus accrued interest and storage when the adjusted world price (AWP) is below the loan rate plus accrued interest and storage (USDA ERS, 2011). For example, producers that hold a marketing loan provision may repay a MAL at the lower of the loan rate plus accrued interest or the AWP. (It is noted that marketing loan repayment for rice and upland cotton are based on prevailing world prices. The world market price for rice is determined by a formula adjusted for U.S. quality and location. A quality adjustment for upland cotton is made based on cotton of comparable quality delivered to a definable and significant international market). If the AWP is lower that the loan rate, the amount by which the loan rate exceeds the AWP is the marketing loan gain (MLG) rate resulting from producers repaying their nonrecourse loans to the CCC. MLG represents a program benefit to producers. Producers also are eligible for a LDP in lieu of obtaining a marketing assistance loan. The LDP is the amount by which the loan rate exceeds the adjusted world price (AWP) which is the same as the MLG rate.

Nonrecourse marketing assistance loans carry a rate that is established statutorily within the 2008 farm bill. The national average loan rates for 2008 through 2012 crop years are: $6.50 per hundredweight for medium and long-grain rice, $5.00 per bushel for soybeans, $0.52 per pound for upland cotton, and $1.95 per bushel for corn. The economic implication of MALs and LDPs are such that when commodity prices are below commodity loan rates, loan benefits augment market receipts. The impact of marketing loans vary year-to-year, depending on the absolute and relative magnitudes of expected crop-specific marketing loan benefits (USDA ERS, 2009).

One distinct difference in the 2008 farm bill, compared to the 2002 bill, is the creation of the average crop revenue election program (ACRE). Farm commodity programs over the past decade have focused on protecting producers against declines in farm prices and not declines in revenue, calculated by obtaining the product of price and production (Shields, 2010). Traditional programs for field crops provide benefits to producers when farm prices drop below specified levels. To help producers manage revenue risk, Congress included ACRE as a revenue-based program option for producers who enroll in traditional farm commodity programs (Shields, 2010). Under the ACRE program, producers may receive revenue-based payments as an alternative to receiving price-based countercyclical payments (USDA FSA, 2009).

The ACRE program provides participating producers a revenue guarantee each year based on market prices and average yields for the respective commodities. The program guarantee is based on state-level planted yields and national market prices, but payments are dependent upon state- and farm-level planted yields and national market prices (USDA ERS, 2009). Producers that elect to participate in ACRE must agree to receive a 20% reduction in the direct payment rate for all commodities produced on the farm and cannot receive counter-cyclical payments. ACRE payments are revenue-based and are not tied to crop production and the national average market price for planted covered commodity crops on the farm. ACRE payment acreage is limited to the total amount of base acres on the farm, and can only be issued for a crop if two triggers are met for the covered commodity (USDA FSA, 2009). In order for the ACRE state trigger to be met, the state ACRE guarantee must exceed the actual state revenue. The state ACRE guarantee cannot change by more than 10% from the previous year's guarantee. In order for the ACRE farm trigger to be met, the farm ACRE benchmark must exceed the actual farm revenue. If both triggers are met for a planted or considered planted commodity crop, then an ACRE payment is calculated for the eligible crop through the planted acres multiplied by 83.3% multiplied by the benchmark farm yield. This figure is then multiplied by the lesser of the state ACRE guarantee minus the actual state revenue for the commodity or 25% of the ACRE guarantee.

The economic implications of the ACRE program are that producers have a one-time opportunity to enroll all of their covered commodities in the ACRE program any year during the 2008 through 2012 crop years. When electing to participate in ACRE, producers will trade-off the loss of CCP payments and the reductions in DP and marketing loan benefits for ACRE revenue protection. Producers will base their participation decisions in-part on the historic variability in state-level yields and the expected variability of national prices (USDA ERS, 2009). A producer's gross revenue is a function of the market price times output for each crop that is produced on the farm. Gross revenue will vary with changes in prices and yield. Traditional commodity support, in the form of the CCP and marketing loan benefits (MLB), pays producers when prices fall below specified levels, but does not compensate for yield losses (Cooper, 2009). Traditional USDA disaster assistance programs do assist producers, but in ad hoc fashion, and does not necessarily compensate for low market prices. Marketing loss assistance payments addressed market losses associated with low prices, also in ad-hoc fashion. Congress provides disaster assistance constituent only by request for aid and is contingent on the Federal budget. In contrast, CCP and MLB apply whenever market prices fall enough to trigger payments, as determined by the operational parameters of the programs (Cooper, 2009).

Participating producers get an ACRE payment when state and farm-level revenues for a particular crop fall below triggers determined by past prices and yields (FAPRI, 2012). A comparison of current to previous DP and CCP farm programs to that of the ACRE program are contained in Zulauf and Orden, 2010. Income support via fixed direct payments, countercyclical payments, and marketing loan payments are provided to eligible producers under current farm programs. Direct payments are a specific dollar amount per historical base acre and the amount does not change with prices or with the level of production. The policy objectives of the countercyclical and marketing loan programs is to assist farmers with managing the systemic (i.e. market) risk of low prices that can last from one year to an extended period of years. Payments occur if market price drops below the support rate, which becomes a floor on the per unit value of a crop. Marketing loan payments are based on current production and prices, and thus are coupled under World Trade Organization (WTO) rules. Countercyclical payments are based on current prices but historical production. Zulauf and Orden, 2010, state that the policy objective of the ACRE revenue program is to assist farmers with managing the systemic risk of a decline in crop revenue that can extend from one to a short period of years, but to avoid creating a floor. Risk assistance level of the ACRE program is calculated using moving averages of lagged national prices and state yields, where its risk assistance level increases (decreases) over consecutive year as market revenue increases (decreases). Thus, no floor exists on revenue. However, ACRE can provide assistance when revenue declines but prices remain above the fixed marketing loan and countercyclical support prices.

Since DCP payments are tied to base acreage, many producers are currently receiving DCP payments tied to a historical mix of crops on a farm that no longer matches current production patterns. Alternatively stated, soybean producers may receive DCP payments associated with other corps that may or may not be in production in a given year. Likewise, many producers receiving cotton and rice DCP payments are actually planting other crops or devoting their land to other uses (FARPI, 2012; USDA FSA, 2012).

To extrapolate commodity program selection to a regional view, USDA FSA data from 2009 through 2013 indicates that a large portion of base acreage overwhelmingly favors the direct and countercyclical (DCP) style of farm program protection compared to the ACRE program in the Mississippi River delta region. The data, obtained from USDA FSA, and presented in Table 1.17, indicates that corn, cotton, rice, and soybean base enrolled in the DCP programs represented shares of 1.6%; 16.7%; 26.8%; and 33.6% of total base in Arkansas. In Louisiana, DCP base represented a 9.1%; 34.6%; 30%; and 17.1% of total base acreage for corn, cotton, rice, and soybeans. DCP base in Mississippi for corn, cotton, rice, and soybean crops comprised a 6.5%; 44.2%; 10.5%; and 24.9% of total base acres, respectively. Overwhelmingly, the direct and countercyclical programs were favored in all states compared to less than one percent of base enrolled in the ACRE program.

The 2002 and 2008 farm bills are responsible for the support programs are designed to assist producers manage risk by using price-triggered subsidy programs to buffer the price risk faced by farmers. These programs include countercyclical payments, direct payments, and loan deficiency payments. Additionally, crop insurance programs provide another layer of protection that has traditionally mitigated yield risk (Thomas, et al., 2007). Prior to the 2008 bill, revenue-based subsidy programs did not exist in federal farm legislation and supporters claimed that a revenue target, not a price target, would reduce the number of years that farm revenue falls to an unacceptable level.

Table 1.17. DCP/ACRE enrolled base acreage for selected crops in the Mississippi River delta portal of the Mid-south region, 2009-2013.

State/Crop	DCP Base Acres	ACRE Base Acres	Total Base Acres
Arkansas			
Corn	109,613	0	109,613
Cotton	1,146,917	0	1,146,917
Rice (LG)	1,716,239	0	1,716,239
Rice (MG)	125,601	0	125,601
Soybeans	2,305,333	110	2,305,443
Total Program	6,857,242	386	6,857,628
Louisiana			
Corn	269,160	4,774	273,934
Cotton	1,024,371	3,382	1,027,753
Rice (LG)	753,737	68	753,806
Rice (MG)	13,692	2	13,694
Soybeans	506,960	2,485	509,445
Total Program	2,947,950	12,836	2,960,785
Mississippi			
Corn	242,194	5,513	247,707
Cotton	1,657,419	63	1,657,482
Rice (LG)	393,948	0	393,948
Rice (MG)	0	0	0
Soybeans	935,188	11,482	946,669
Total Program	3,729,275	21,177	3,750,452

Source: USDA FSA, 2014.

Advocates of revenue-based programs are generally located in the Corn Belt region. Producers of traditional crops in the South such as rice and cotton tend to prefer price-based programs, much like the current programs. This dichotomy occurs because areas where prices and yields are not negatively correlated respond better to programs that separate price risk from yield risk (Thomas, et al., 2007).

Farm management decisions coupled with the political climate of agricultural policy adds a tremendous degree of uncertainty as to the future role of governmental support to the U.S. agricultural sector. The safety net provisions contained in Title I of the 2008 farm bill (direct payments, countercyclical payments, and marketing assistance loans) underwent major changes in both language and substance as well as the level of federal funding available as the 2008 bill expired. The impending changes combined with market driven revenue-based program options, varying degrees of crop insurance coverage, disaster assistance programs, and adjusted gross income limitations have given way to a complex array of legal guidelines and questions regarding the overall efficiency of programs that are administered.

The Agricultural Act of 2014 (P.L. 113-79) represents a landmark rewrite to the farm safety net in American agriculture for major row crops such as corn, cotton, rice, and soybeans. Significant revisions were included in this legislation which alters the current structure of government support for production agriculture, notably the aforementioned row crops. The three major issues that are embedded in the farm safety net proposals that were considered for the new farm bill, as identified by Shields and Schnepf, 2012, are: (1) how price (or revenue) protection is established (i.e. within-year versus averaging across multiple years or fixed in statute); (2) at what geographic level-the farm level or a more aggregated regional level-program benefits are triggered; and (3) whether the proposal addresses ‘shallow losses’ in revenues, or those not covered by federally subsidized crop insurance but paid by the producer via the policy deductible. Program type, commodity coverage, type of losses covered, program mechanics, payment limits, conservation compliance, cost to producers and taxpayers, and political strategy of the proposal as well as the sponsoring lawmaker’s political rationale are examined by Shields and Schnepf, 2012.

Stepping back from the program specifics, the general policy and political context for the 2014 farm bill’s safety net may provide additional perspective. This farm bill was written in an era of heightened scrutiny over federal debt and deficits; it was considered politically necessary to reduce the bill's spending for passage in a budget-obsessed Congress. Fairly relentless criticism of commodity programs, particularly direct payments, in an era of high commodity prices and strong farm incomes also complicated matters. These forces combined to bring about the end of direct payments and altered the existing structure of commodity policy. An underlying principle to the changes in this farm bill was a focus on helping farmers manage the considerable risks they face in crop production in a move away from existing income support. In a politically-challenging environment, the debate centered on how to make the farm safety net more defensible to the general public, as well as being effective and relevant to the farm sector. Real challenges emerged, however, and significant concerns were raised with the two main policy proposals of the House and Senate. Crop insurance already provides valuable risk management tools that many were reluctant to interfere with, while federal subsidies tied too close to actual production risk raised concerns about distorting production decisions creating market and trade problems. Therefore, the final agreement decoupled both Title I programs and ended up being more of an approximation of risk-based assistance than actual risk management- supplement to what is provided through crop insurance. While this is familiar territory for price-based programs, decoupling revenue policy from production is a new direction that has yet to be tested. It remains to be seen how well revenue payments on base acres will function on the farm.

The Agricultural Act of 2014 (i.e. the 2014 Farm Bill) repeals DP, CCP, and ACRE programs. Producers will no longer receive direct farm payments that are made at a fixed rate that are dispersed regardless of current market conditions. Instead, new commodity support programs for the 2014 through 2018 crop years will consider rolling averages of farm conditions (e.g. yield levels calculated at the county-level and marketing year average prices) that will calculate a benchmark revenue threshold per acre per crop per farm. During the farm bill debate period, Southern agricultural interests succeeded in retaining a countercyclical-style price support program that uses a price floor for each commodity, with their reference prices protected by legislative authority. The farm bill debate pitted Midwestern corn and soybean interests against Southern crops such as cotton, peanuts, and rice. Soybean and corn growers of the Midwest wanted a revenue protection plan to replace the traditional supports. Rice and peanut growers preferred traditional supports. Each faction said the other tried to skew the farm bill towards its region. Much of this regional divide centered on the design of commodity support programs which ultimately gave way to the notion that a single style of support (revenue versus price) could not applied uniformly to the entire subset of American agriculture- or that the 'umbrella' approach would not be entirely effective in mitigating risk.

The difficult negotiations between competing approaches to the farm safety net resulted in the compromise approach in the farm bill, which identifies four main points of consideration discussed in Coppess, 2014. The House farm bill required the owners of a farm to choose between a county revenue program and a fixed-price program. The Senate version of the bill provided both a price and revenue program for all farms and covered commodities but within the revenue program it required a choice between county-level or individual farm-level revenue. The final bill requires a choice among a price program, a county revenue program, or an individual farm revenue program. Title I of the 2014 farm bill includes a price-based assistance program and a revenue-based assistance program. Reflecting significant concerns about market and planting distortions, the compromise utilizes base acres for program payments (i.e. payments are made on a percentage of the farm's base acres); neither program makes payments on the acres actually planted to covered commodities with the exception of cotton base acres (now termed generic base acres) that are planted to covered commodities. Cotton is no longer a covered commodity due to the WTO trade-dispute claim originated by Brazil.

Although the new design of commodity program support alone is not expected to result in any major acreage shifts in southern agriculture, it will force landowners and tenant producers to renegotiate their crop land rental arrangements. This will affect the return levels for all parties with a shared interest in the crop(s), as some commodity programs remain tied to the USDA FSA farm number (under control of the landowner) regardless if the producer has land privileges for the duration of the farm bill. Therefore, the combination of price and/or revenue support coupled with crop insurance policies for farms located in the Mid-south region will significantly impact the risk level of the producer. The crop selection decision as well as the combination of these support mechanisms will determine the profitability of the operation(s) under the control of the producer.

Marketing loan provisions are largely maintained in the 2014 farm bill, with a slight alteration to the cotton loan rate. The marketing loan rate is established for wheat at $2.94; corn at $1.95; rice at $6.50; and soybeans at $5.00. For cotton, the loan rate is set equal to the simple average of the adjusted prevailing world price for the two immediately preceding marketing years but not less than $0.45 and no more than $0.52 per pound.

From a policy standpoint, the single biggest decision in the bill is to end direct cash payments to farmers, which cost more than $4.5 billion annually (CBO, 2014). Instead, producers will have to make a decision between two options linked to real market losses. In lieu of direct cash payments, which are tied to the land, producers will have to make a choice between two options linked to real market losses- the agriculture risk coverage (ARC) or the price loss coverage (PLC) programs. Producers will face an irrevocable decision choice in program selection that persists for the five-year duration of the 2014 farm law. Simultaneously, producers and landowners must also decide if they wish to reallocate their base acres between covered commodities going forward. Southern crops like rice, peanuts, and sorghum are expected to sign up for the PLC option. And as an added inducement, the bill allows these growers access to a new supplemental crop insurance option (SCO) that will become available in 2015, providing lower cost coverage based on county-wide revenues.

Producers will have the choice of traditional price supports or insurance-like protection against a drop in crop revenue under the 2014 farm bill. Under the bill, producers will make a one-time choice for their covered commodities on whether to enroll for revenue protection, based on yields and national MYA prices or a program similar to the target price design that sets a minimum price. Reference prices used in the bill to trigger payments are up sharply from current law. Reference prices are set at $14.00 per hundredweight for long and medium grain rice, $5.50 per bushel for wheat, $8.40 per bushel for soybeans, and $3.70 per bushel for corn. This is in comparison to the 2008 farm bill's target prices of $4.17 wheat, $2.63 corn, and $6.00 soybean price levels. For farmers who choose revenue protection (ARC program), payments would become available when crop revenue is less than 86% of the rolling five year average. Protection would end when revenue falls below 76% of the average. Crop insurance would then act to cover deep revenue losses. The PLC program would operate similar to 2008 farm law, with payments triggered when MYA prices are below the guaranteed price. For the purpose of making PLC payments, a single opportunity is afforded to producers to update yields equal to 90% of the average yield per planted acre for the crop for the 2008 through 2012 crop years. Pertaining to base acres, there is a provision for the retention of one-time reallocation of base acres on a farm. The reallocation of base acres may not result in a total number of base acres in excess for the farm on September 30, 2013. The premise of this option is to allow the farm owner to update their production history that may better reflect their farm composition, if desired.

The ARC program, favored by the Senate, promises early but temporary assistance to producers faced with a downward cycle of prices. Payments would be triggered once prices fall 14 percentage points below the prior five year average. But the subsidy covers only a narrow 10-point band- from 86% to 76% of revenues- and will fade after several years if prices do not improve. The second choice, PLC, fits the more classic countercyclical model of fixed, government-set target prices- not a rolling 5-year average. The PLC program uses target prices, or reference prices. PLC payments would typically be triggered later in a market downturn but then promise a more permanent floor to cover a producer's production costs- a major priority for House Agriculture Committee.

PLC payments are made for the 2014-2018 crop years if the effective price for the covered commodity for each crop year is less than the reference price for the commodity. The effective price is equal to the higher of the national average market price or the national loan rate. The payment rate is the difference between the reference price and the effective price. The payment amount is equal to the payment rate multiplied by the payment yield multiplied by the payment acres. For ARC, payments is the actual crop revenue for the crop year is less than ARC guarantee for the crop year. Actual crop revenue, for the county coverage option, is equal to the actual county yield per planted acre multiplied by the higher of the national average market price or the loan rate. For the individual coverage option, total production is multiplied by the higher of the national average market price or the loan rate. The ARC guarantee is equal to 86% of the benchmark revenue. Benchmark revenue for county-level coverage is equal to the average historical county yield for the most recent five crop years, excluding the highest and the lowest and the national average market price for the most recent five years, excluding the highest and the lowest. If the national market price during any of the five years is lower than the reference price, the reference price is used in the calculation. The payment rate is equal to the lesser of the amount that the guarantee exceeds actual crop revenue or 10% of the benchmark revenue. Appendix B provides the U.S. Code for agricultural commodity program specifications.

1.4 Legislative Markup of Title I Programs

Both the Senate and House Agriculture committee-reported bills borrow conceptually from current farm programs, revising and renaming them to enhance either price or revenue protection for producers. In contrast to earlier farm bill proposals, both the House and Senate Agriculture Committees' versions included a price support program. The key differences in the proposals was the varying levels of support across covered commodities with the inclusion of new revenue-based commodity programs. The Senate Agriculture Committee proposed a target price program called the adverse market program (AMP) in addition to a new revenue program called ARC. The AMP would provide payment if price falls below a specified reference price. AMP reference prices are defined as 55% of the previous five year Olympic average of national market price for each covered commodity. This is vastly different from House-proposed price support programs. Rice and peanuts, however, have reference prices that are set legislatively. An AMP payment acre is defined as 85% of base acres with updates allowed for rice and peanut crops. The House Agriculture Committee proposal advocated the PLC program with an optional election of a county-level revenue loss coverage program (RLC). The implications were such that the Senate version of the bill would favor Midwest and northern Corn Belt interests as ARC spending accounts for almost 90% of the Senate-proposed commodity title spending (S.954). The House-proposed bill (H.R.1947) was viewed as 'balanced 'pertaining to the choice between RLC and PLC. The Senate ARC program offers the choice of coverage between farm and county- level coverage, with the major difference being the yields used to determine the benchmark and actual revenues, and the percent of payment acres upon which the ARC payment would be received if actually triggered.

Concerns to the Federal budget deficit have led to various proposals to reduce farm program spending (FAPRI, 2011). Key results from the FAPRI study indicate that the reduction in farm program payments results in lower farm income and agricultural land values (FAPRI, 2011). Also, effects of eliminating direct payments will differ across crops because of differences in direct payment rates, projected market prices, and expected revenue volatility (FAPRI, 2011). The FAPRI report stated that setting direct payment rates to zero would increase potential countercyclical payments, since payments are made when the season-average farm price falls below a trigger level set equal to the target price minus the DP rate. Increases in target prices and reductions in loan rates, DP rates, or market prices can collectively increase the CCP rates (FAPRI, 2007). If direct payments were eliminated by setting direct payment rates per unit to zero, the result would be an increase in the price that triggers CCPs. This effect could be avoided if DPs were eliminated in a different way, such as by specifying that no acreage is eligible for the payments. Eliminating direct payment program reduces government payments to producers, with negative effects on farm income. The elimination of DP has a significant effect on production expenses than on market sales. The single largest impact is on rental payments made to non-operator landowners (FAPRI, 2011). DPs are a much larger share of income for some producers than for others. Results differ across commodities. DPs are lower on a per acre basis for soybeans than for other crops. For cotton and especially rice, DPs per base acre are much greater than for corn, wheat, and soybeans. Thus the reductions in producer income are greater for producers of cotton and rice than for producers of other crops (FAPRI, 2011). Eliminating DCP and ACRE payments, therefore, has a larger proportional impact on producers of some crops than on others.

In a 2012 FAPRI report that analyzed commodity title provisions, the effect on crop returns, soybean producers (at one extreme) would lose $11.00 per base acre in DCP payments while rice producers (at the other extreme) would lose approximately $96.00 per base acre in DCP payments. Tables 1.17 and 1.18 provide a regional view on this aspect. When there is a large enough decline in revenues relative to a benchmark, payments can be quite large. The combination of lost DCP and ACRE payments and lower prices more than offset the new ARC and the stacked income protection plan (STAX) benefits for producers that have one base acre for each acre planted. Base acreage was determined by cropping patterns many years ago, and planted acreage can prove to be difficult to administrate, both on a particular farm and for the country as a whole. Producers with a lot of base acreage relative to planted acreage will be the most affected by the loss of DCP payments. Production and price impacts can be explained by the proposed shift from payments tied to base acreage to payments tied to planted acreage. Because DCP are tied to base acreage and do not require producers to grow any particular crop, payments have a smaller impact on planted acreage, dollar-for-dollar, than ARC or STAX benefits that do require current production (FAPRI, 2012).

In the House PLC program, reference prices are set by Congress and, in general, are set above current CCP target prices. Payment acres are 85% of planted acres up to base acres with payment yields allowed to be updated from current levels to 90% of average yields from 2009 to 2012. The ARC program promises early- but temporary- assistance to growers faced with a downward cycle of prices. ARC payments are expected to be triggered once prices fall at least 14 percentage points below their prior five-year average. This program will likely be favored by producers in the Midwest, given the price declines in the corn markets. The subsidies provide assistance to help growers compensate for low returns, but will fade after several years if prices do not improve. The PLC program fits the more classic countercyclical model of fixed, target prices- not a rolling five year average. PLC payments will typically trigger later in a market downturn but then promise the farmer a more permanent floor to cover production losses. But for both programs, the subsidies are designed to be greater in periods of stress. The choice of ARC or PLC hinges on price expectations. For example, if multi-year average prices for corn are expected to persist above $3.70 (corn reference price of $3.70 per bushel) over the life of the farm bill, ARC will provide better protection since PLC will never trigger payment. If prices are expected to be low, for instance averaging less than $3.00, PLC will provide better coverage. With lower market prices, PLC has become more relevant for corn and soybeans at a particular moment in time, although ARC still starts with a higher effective guarantee and could protect more revenue for the life of the farm bill. Individual farm-level ARC coverage could accommodate those with yields outside the county average. Producers should also consider how to best cover the gap between their personal crop insurance level and their farm program coverage level.

Wailes, et al. 2012, states that the ARC program is in stark contrast to Title I of the 2008 farm law. This is in part due to the relatively high market process for the period 2008 through 2012 that provided income transfers primarily through the DP program that has been of considerable importance for southern agriculture and rice producers in particular. ARC provides assistance in the deductible range of crop insurance utilizing indications of actual losses (county-wide or multiple-commodity revenue movements from a recent average) and an emphasis on multi-year price risk. PLC is traditional income support policy utilizing price floors for commodities to help with market uncertainties such as sustained low prices.

Concerns were expressed that the market-oriented nature of the assistance could become ineffective if prices are depressed for a sustained period of time. Concerns about the distortive potential of this policy were strongly voiced in the wake of Brazil's successful challenge of cotton supports at the WTO. Concerns were also raised that policies using reference prices fixed for the life of the farm bill may not reflect actual market conditions. In this view, if the prices are fixed too low that the program may not help mitigate actual price risk, missing the impact on tight farm margins from volatile markets and input costs. If reference prices were set too high and run the risk of being viewed like direct payments, the program could be criticized for providing assistance in times when farm incomes are strong.

Brazil and the United States reached an agreement in October of 2014 that resolves a long-standing cotton dispute in the World Trade Organization that was originated by Brazil in 2002. The WTO case (# DS267) was initiated by Brazil- a major cotton export competitor. Schnepf, 2014, provides a summary of the case by which Brazil charged that U.S. cotton programs were depressing international cotton prices and thus artificially (and unfairly) reducing the quantity and value of Brazil's cotton exports, causing adverse harm to Brazil's domestic cotton sector. In the wake of these challenges, a new cotton support policy was developed and included in both the Senate and House farm bill proposals. The resulting cotton policy for the 2014 through 2018 removed cotton from price and income support program eligibility. Instead, cotton will rely upon a within-year, market-based insurance guarantee as its primary support measure. Under the new cotton program, producers have to pay into the program in order to gain benefit, a loss (albeit at the county level) has to occur before a payment is made, and the sum of the program payments is prohibited from exceeding the value of the crop insured in order to minimize any potential incentive. (Schnepf, 2014). The major cotton-related provisions enacted in the 2014 farm bill include: (1) current cotton support program such as DP, CCP, and ACRE are repealed; (2) cotton is ineligible for new price (PLC) and income support (ARC) programs; (3) a reduced marketing loan program benefit, (4) an opportunity to purchase a cotton-only insurance plan, (5) opportunity to receive a cotton transition assistance payment (CTAP) for the 2014/15 crop years, (6) concessions to the Brazil Cotton Institute, and (7) additional changes made to the GSM-102 export credit guarantee program (Schnepf, 2014).

1.5 Crop Insurance in the Region

Crop insurance has been used as a risk management tool in the Mid-south region. As modern agricultural policy migrates towards a market-oriented approach, crop insurance products have the potential to become more widely adopted by producers of corn, cotton, rice, and soybeans in this region. Traditionally, crop insurance products have been a key fixture among Midwestern producers in lieu of the reliance of DCP payment to offset income risk. Information is presented in Tables 1.19 to 1.21 on the number of insured acres per crop per policy type as well as the percentage of insured acres to total acres in the state pertaining to the most recent crop year, 2014.

Crop insurance profiles for Arkansas, Louisiana, and Mississippi were obtained from the USDA RMA for the 2004 to 2013 observational period. Common insurance policy products that are available in each state include: revenue protection (RP), revenue protection with harvest price exclusion (RPHPE), yield protection (YP), group risk income protection with harvest price exclusion (GRIPH), and a group risk plan (GRP). Revenue protection policies guard against a loss of revenue caused by a price increase or decrease, low yields, or a combination of both. RP policies guarantee an amount based on the individual farm's actual production history (APH) and the greater of the projected insurance price or the harvest time price. These aforementioned price parameters are established through the USDA RMA price discovery period for the applicable crop. The projected insurance price is used to calculate the premium. An indemnity is due when the calculated revenue is less than the revenue protection guarantee for the crop acreage (National Crop Insurance Service, 2014). RPHPE policies are similar to RP, however RPHPE provides protection against loss of revenue caused by a price decline, low yields, or a combination of both. Unlike RP policies, the revenue protection guarantee for RPHPE is based on the projected insurance price only and does not increase based on the harvest time price (National Crop Insurance Service, 2014). YP policies provide protection against a loss in yield due to unavoidable, naturally occurring events. Like the APH plan of insurance, YP guarantees a production yield based on the individual producer's APH. The projected insurance price is used to determine the yield protection guarantee, premium, and to value the production. An indemnity is due when the value of the production is less than the yield production guarantee (National Crop Insurance Service, 2014). GRIP and GRP are alternatives to traditional APH and other various revenue insurance products, and are based on county average yields rather than the actual yield of the farm or the insured unit (Edwards, 2011). Under GRP, a producer would receive payment (indemnity) when the actual county yield falls below the triggered yield that the producer chooses. Under GRIP, a producer would receive an indemnity when the actual county revenue falls below the triggered revenue that the producer chooses (Edwards, 2011). GRIP can be purchased with a harvest time price option, which means the harvest time price is used to calculate the triggered revenue if it is greater than the projected insurance price during the USDA RMA price discover period for the applicable crop.

In a historical context, the previous three years have brought three predominate types of crop insurance policies to the insurance-based safety net for the Mississippi River delta region: RP, RPHPE, and YP. These three products represent the predominate types of crop insurance policies purchased for corn grown in Arkansas. From 2011 to 2013, the percent of insured acres for corn under RP coverage increased from 39 to 48%, while the amount of insured acres for YP policies decreased from 59% to 51%. RPHPE policies accounted for approximately 1% of insured corn acres in Arkansas. The total amount of insured corn acreage in Arkansas ranged from 484,120 to 749,985 acres over the 2011 to 2013 crop years (producing an annual average of 588,086 acres). Cotton insured in Arkansas since 2011 favors an increasing preference for YP policies. The share of insured cotton acres in the state over the three years has increased from 80 to 83%, while the share of RP acres has undergone a cyclical pattern of between 18 and 22%. The total number of insured cotton acres in the state over the three-year period ranged from 278,413 to 587,607 acre (annual average of 448,408 acres). Rice insured in Arkansas has shifted from YP policies to RP policies. RP policies have increased from 40 to 49% of insured acres while YP policies decreased from 61% to 50%. From 2011 to 2013, rice insured acreage ranged from 891,936 to 1,190,608 acres (annual average of 1,027,844 acres). Finally soybean policies follow the trend associated with rice insurance policy preference. RP policies command 48% of the insured acres while YP command 51%. The total amount of insured soybean acres in Arkansas exhibited the least degree of variability, ranging from 2,447,892 to 2,563,156 acres over the 2011 to 2013 crop year period annual (average of 2,502,393 acres). Table 1.18 provides a description of insurance policies in Arkansas for selected crops purchased for the 2014 crop year.

Table 1.18. Insurance plans available for selected crops in Arkansas, 2014.

Insurable Crop (Policy Type)	Insured Acres	Total Acres	Percent Insured
Corn (RP)	216,090	--	--
Corn (RPHPE)	390	--	--
Corn (YP)	263,488	--	--
Corn (all)	479,968	540,000	89%
Cotton (RP)	81,398	--	--
Cotton (YP)	191,750	--	--
Cotton (all)	273,148	335,000	82%
Rice (RP)	632,400	--	--
Rice (RPHPE)	5,601	--	--
Rice (YP)	580,251	--	--
Rice (all)	1,218,252	1,486,000	82%
Soybeans (RP)	1,368,352	--	--
Soybeans (RPHPE)	7,331	--	--
Soybeans (YP)	1,237,651	--	--
Soybeans (all)	2,613,334	3,240,000	81%

Source: USDA RMA, 2015.

In Louisiana, the amount of insured corn acres under RP policies has increased from 49% to 71% from 2011 to 2013. The other common policy purchased for corn is YP, with those policies decreasing in terms of the percentage of insured acres from 49% to 29%. The total amount of insured corn acreage in the state ranged from 514,784 to 650,723 acres from 2011 to 2013 (annual average of 572,438 acres). A similar pattern of policy purchase can be observed for the RP polices for insured cotton acres in the state. RP policies increased from 45% to 66%, while the concentration of YP policies decreased from 53% to 31%. The total amount of insured acres for cotton has drastically been reduced since 2011- associated with the decrease in the number of planted acres in the state. Insured acres for the crop have ranged from 277,865 in 2011 to just 123,339 acres in 2013. RP policies for rice have increased from 25% to 40% while YP policies of the crop have decreased from 75 to 60%. The number of insured acres for rice has been consistent over the 2011 to 2013 period, with acreage ranging from 330,403 to 374,288 acres (annual average of 351,516 acres). RP is the dominant policy for soybeans produced in Louisiana, witnessing a 41 to 61% increase in insured acres. YP policies for soybean acres decreased from 57% to 38%. Pertaining to the amount of insured soybean acres in Louisiana, the same observation that is observed for Arkansas insured soybean acres proves true. The amount of Louisiana soybean insured acres has shown little variability. Acreage ranged from 945,069 to 1,045,140 acres from 2011 to 2013 (annual average of 1,010,158 acres). Table 1.19 provides a description of insurance policies in Louisiana for selected crops purchased for 2014.

Table 1.19. Insurance plans available for selected crops in Louisiana, 2014.

Insurable Crop	Insured Acres	Total Acres	Percent Insured
Corn (RP)	273,440	--	--
Corn (RPHPE)	288	--	--
Corn (YP)	128,062	--	--
Corn (all)	401,790*	400,000	100%*
Cotton (AYP)	143	--	--
Cotton (RP)	116,845	--	--
Cotton (YP)	44,713	--	--
Cotton (all)	161,701	170,000	95%
Rice (RP)	192,708	--	--
Rice (RPHPE)	555	--	--
Rice (YP)	210,339	--	--
Rice (all)	403,602	462,000	87%
Soybeans (RP)	874,009	--	--
Soybeans (RPHPE)	3,171	--	--
Soybeans (YP)	445,672	--	--
Soybeans (all)	1,322,852	1,420,000	93%

Source: USDA RMA, 2015. Where * denotes prevented planted acreage caused insured acre to exceed planted acres.

In Mississippi, the total amount of insured corn acres ranged from 748,016 to 997,387 acres during the 2011 to 2013 period (annual average of 841,140 acres). RP for insured corn acres has increased from 70% to 78%, while YP policies have decreased by a proportional amount (30% to 22%). RP is also the favored insurance product for cotton acres in the state, undergoing an increase of 52% to 64%. YP policies for cotton in Mississippi have decreased from 47% to 36%. Total amount of insured cotton acres decreased from 575,061 to 303,587 acres over the three-year period (average of 439,550 acres). The decrease in cotton acres throughout the region supports this trend. For rice planted in Mississippi, the amount of insured acres has been cyclical over the 2011 to 2013 period- with a low of 118,800 acres to a high of 196,510 acres. The average amount of insured acres over the period is 156,678 acres annually. RP policies for rice has significantly increased from 46% to 72% of insured acres. YP policies decreased from 54% to 28%. For soybeans that are insured in Mississippi, RP policies represent 64% to 73% of the insured acres, while YP has decreased from 36% to 27%. The amount of insured soybean acres has been consistent over the 2011 to 2013 period, ranging from 1,688,727 to 1,906,074 acres (annual average of 1,811,722 acres).

In an historic change, driven by years of international trade disputes, approximately 10 million acres of cotton will transition out of the commodity title support and into a new revenue-based insurance program called STAX (the stacked income protection plan) to begin operating for the 2015 crop year. The premium costs for cotton are even more heavily subsidized than regular crop insurance and is estimated cost the Federal government $3.8 billion over nine years, including $556 million in cotton transition payments designed to assist growers through the 2014 crop year (CBO, 2014). On balance, this is still less than cotton's share of Federal direct payments, as the cotton industry hopes the new approach will settle claims made by Brazil in the WTO court. Table 1.20 provides a description of insurance policies in Mississippi for selected crops purchased for the 2001 crop year.

Table 1.20. Insurance plans available for selected crops in Mississippi, 2014.

Insurable Crop	Insured Acres	Total Acres	Percent Insured
Corn (RP)	456,732	--	--
Corn (YP)	130,736	--	--
Corn (all)	587,468*	510,000	115%*
Cotton (ARP)	2,668	--	--
Cotton (RP)	274,682	--	--
Cotton (YP)	121,304	--	--
Cotton (all)	398,654	425,000	94%
Rice (RP)	128,892	--	--
Rice (YP)	61,380	--	--
Rice (all)	190,272	191,000	99%
Soybeans (RP)	1,569,145	--	--
Soybeans (YP)	537,763	--	--
Soybeans (all)	2,106,908	2,220,000	95%

Source: USDA RMA, 2015. Where * denotes prevented planted acreage caused insured acre to exceed planted acres.

The farm bill established transition assistance for producers of cotton for the 2014 and 2015 crop year (in a county where STAX is not available). The transition assistance rate is equal to the June 12, 2013 midpoint estimate for market price for the marketing year minus the December 10, 2013 estimated for market price as contained in the USDA's World Agriculture Supply and Demand Estimate (WASDE) multiplied national program yield for upland cotton of 597 pounds per acre. Payment is made on 60% of base in 2014 and 36.5% of base acres if offered in 2015. STAX will provide coverage for revenue losses of not less than 10% and not more than 30%. Coverage is established based on an expected price established under existing GRIP or area-wide policies that are offered with an expected county yield that is the higher of the expected county yield in existing area-wide plans or averaged applicable yield data for the county for the most recent five years, excluding the highest and the lowest, from USDA RMA or NASS. There is an option to for producers to select a multiplier factor to establish a maximum protection level per acre at 120% of yield. Indemnity is paid based on the amount that expected county revenue exceeds actual county revenue, as applied to individual coverage. The Federal Crop Insurance Corporation (FCIC) will subsidize 80% of the premium cost.

As the name ‘stacked’ implies, the program will be available in addition to a producer’s crop insurance policy while a producer would not necessarily have to purchase a crop insurance policy in order to be STAX-eligible. STAX is subsidized at an 80% level and like the current GRIP policy, the maximum protection per acre is calculated by multiplying the expected county yield by the price and by a 120 percent multiplier. The multiplier is useful to producers with above average yields to purchase a higher level of liability (American Farm Bureau Federation, 2012). It involves using an area-wide revenue product such as a modified group risk income protection program where losses are determined at the county-level rather than the farm-level. STAX would be delivered through crop insurance, providing protection against shallow losses by adding a layer of additional protection to existing crop insurance policies. GRIP is an insurance product designed to protect farms against revenue losses that occur at the county-level rather than at the individual farm-level. Area-wide policies such as GRIP are generally cheaper than farm-level policies since the risk of loss is pooled at a more aggregate level (Shields and Schnepf, 2012). STAX coverage is between 70 and 90% of county target revenue with a maximum payment not to exceed 20% of the county target revenue. STAX may not overlap an individual crop insurance policy. For example, if a producer has a 75% crop insurance policy, STAX could only be purchased on 76-90% coverage rather than 70-90% (American Farm Bureau Federation, 2012). STAX would be designed to help bridge the gap between the deep revenue losses and the more shallow losses that can hinder a producer’s ability to repay any crop loan debt or build equity in the farming operation.

1.6 Problem Statement

Since the FAIR Act of 1996, producers were free to respond to changing market conditions without losing federal farm program benefits as they weighted planting decisions across their farming operations. This signified a shift away from mono-cropped production systems that were common throughout the Mississippi River delta region. Over the past decade, changes in the production costs of major row crops affected the net returns of these farming operations. As producers in the region rely on crop rotations, federal commodity support programs, and crop insurance to manage price and income risk, significant variability in the fuel and fertilizer markets can significantly affect the return level of energy-intensive crops such as rice and cotton. This, coupled with constant changing market conditions, adds to the uncertainty of agricultural production from one year to the next. With the onset of newly crafted agricultural policy, further analysis is warranted as to the degree that new farm programs and insurance policies mitigate price and yield risk to producers of corn, cotton, rice, and soybeans in the Mississippi River delta region. As these new commodity and crop insurance programs/products become available to producers, economic analysis is needed to evaluate the degree that current federal programs have on risk mitigation and overall farm profitability. Also, further analysis is needed to estimate how each program will likely function for most commodities and farms under different risk scenarios. The 2014 farm bill requires producers and landowners to elect which program design they prefer based on what they think will be most effective for their operation, particularly in conjunction with crop insurance.

1.7 Objectives

The purpose of this research is to provide analysis of farm bill commodity provisions and crop insurance policies in terms of the associated impact on corn, cotton, rice, and soybean net return variability in the Mississippi River delta region. The political component of agriculture income support policy coupled with crop production cost volatility can affect the economic vitality of farms in the region. This research intends to present economic analysis evaluating the risk level of commodity support programs and crop insurance selection across multi-crop farming operations in the Delta region. Specifically, the study area consists of representative farms that are modeled to reflect typical cropping patterns and practices of farms operating in Southeast Arkansas, Northeast Louisiana, and Northwest Mississippi.

Specifically, the objectives of this research are: 1) simulate net returns per acre via a multivariate distribution of commodity prices, yields, and prices of selected energy-related farm inputs over the past ten-year historical period for each state in the region; 2) identify common crop rotations based on production systems on representative farms in the region as to develop a set of enterprise budgets; 3) specify new federal farm program mechanics that are applicable to the diversified agricultural production of the region; and 4) evaluate the risk preference of varying groups of producers in the region based on their participation in multiple commodity support programs and crop insurance policies relative to the crops being produced.

The scope of the research will specifically focus on defining crop rotation alternatives on representative farms in the Mississippi River delta region of the Mid-south and comparing the level of net returns across the whole farm. The representative sample of farms will include commodity price and yield distributions over a ten-year historical time period from 2004 to 2013. Production costs and farm size are additional parameters that will be addressed as production costs can vary from farm-to-farm within the region due to the requirements of different crop production systems employed. Through the use of detailed enterprise budgets, production cost volatility can be identified between crop rotation alternatives as to denote regional variability. Farm size is a necessary parameter to include in this analysis as farm programs will be paid on base acres and not planted acres on a farm, should payments be triggered for a crop year. Data from the 2012 U.S. Census of Agriculture will assist in determining the acreage of the representative farms in each state. Secondly, this research will attempt to evaluate commodity farm program choice and insurance options per crop per farming operation for the economic analysis. Through the use of simulation modeling, the impacts of farm program selection on net return mean variability can be expressed. Third, the measure of risk in each state in the Mississippi River delta region can be evaluated for alternative farm program choice and underlying insurance policy options; given the specified utility function and risk aversion coefficients that measure profitability.

For selected commodities, statistics on price, yield, input prices, and net return variability are presented using a risk return framework methodology. An applied procedure is used to simulate stochastic prices and yields in a farm simulation model that can assist farm managers and policy analysts in evaluating the impact that crop rotation choice and farm program election have on net returns. Key production unit prices for inputs such as nitrogen, phosphorous, and potash fertilizer and diesel fuel are simulated to generate a production cost per acre for each crop in the region. For each farm, commodity support program choice, and crop insurance policy, returns for each management prescription are compared using the risk-return framework of stochastic efficiency with respect to a function (SERF). The set of alternatives presented to agricultural producers in the SERF framework will include the net returns per acre for alternative crop rotations and various farm program choices. This economic data is present over a range of risk aversion coefficients so that the risk behavior of producers can be approximated.

In combination with production cost volatility, the elimination of DCP to cotton and rice producers is expected to have a larger impact on gross revenue when government program payments are added to market receipts since there are more acres eligible for a direct payment. Evaluations of alternative farm safety net proposals (e.g. ARC, PLC, SCO and STAX) are warranted in this research pertaining to rice farms located in the Mississippi River delta region. ARC, PLC, and marketing assistance loans will be calculated for covered commodities that include corn, long grain rice, and soybeans. Since cotton is no longer considered a covered commodity, it will transition out of traditional commodity support and move to insurance-based risk mitigation tools, such as SCO and STAX.

The following research questions will be posed: (1) For the ARC and PLC programs, how do risk preferences affect program choice specifically for operations that contain a majority of corn and soybean acreage? (2) For those producers who produce cotton, how does their risk preference vary among STAX and SCO optional insurance endorsements? (3) Can SERF analysis be used as a risk measurement tool to answer these questions by assigning different utility functions and risk aversion coefficients? (4) Do different utility functions of producers affect their risk preferences for selecting the ARC or PLC Program?

CHAPTER 2: ECONOMIC LITERATURE REVIEW

Multiple agricultural economic studies have used simulation approaches for the purposes of examining risk management in the farm management decision making process (Richardson, et al,. 2000; Flanders and Wailes, 2010; Flanders, 2008; Ray, et al., 1998). These studies use simulation as a methodology to estimate crop price and yield parameters (e.g. probability distribution of prices and yields), production cost variability, and crop returns from competing rotation systems. These studies also identify the level of returns to the farming operation for each scenario examined. In addition to measuring production risk, simulation analysis and modeling is used in by agricultural policy economists to evaluate the effect of farm-level policy decisions- chiefly the commodity price and income support programs as well as crop insurance products.

2.1 Stochastic Simulation

A simulation model is an organized collection of equations with relevant data to calculate output variables that represent realized outcomes in a real system as exogenous variables change values (Flanders and Wailes, 2010). Optimal selections for decision making can be determined by evaluating the simulated outcomes. Stochastic simulation models allow changes in variables that represent random occurrences that correspond to risks associated with decision making. Deterministic models lead to simulated outcomes that regard all variables as fixed with constant values. Stochastic models are preferred for analyzing government payments designed to provide levels of farm income support that vary with stochastic production and marketing conditions (Flanders and Wailes, 2010).

Richardson, et al., (2000) uses simulation analysis as a method to evaluate multivariate non-normally distributed random variables. Observations for input prices and quantities, market prices, and/or yields each carry their own probability distributions that must be parameterized.

This is often the case when using annual data to estimate each parameter. For instance, the number of observations can be considered too few when one wants to examine the past decade. A limited number of observations can rule out the use of standardized probability distributions due to the fact that too few observations exist to prove that the data fit a particular distribution. With the assumption that the data are distributed empirically, a specific distribution is not enforced on the variables and does not limit the ability of the model to deal with correlation of heteroskedasticity.

Richardson, et al., (2000) outlines a seven step procedure for estimating the parameters for a multivariate empirical distribution (MVE). The first step outlined by the authors is to separate the random and the non-random components for each of the stochastic variables. The second step is to calculate the random component of each stochastic variable. The third step for estimating parameters for a multivariate empirical distribution is to convert the residuals (from step two) to relative deviates about their respective deterministic components. The fourth step is to sort the relative deviates (from step three) and to create pseudo-minimums and pseudo-maximums for each random variable. The fifth step is to assign probabilities to each of the sorted deviates (done in step four). The sixth step is to calculate the intra-temporal correlation matrix for the random variables. The seventh step is to calculate the inter-temporal correlation coefficients for the random variables.

In the Richardson, et al., (2000) study, the multivariate empirical distribution is simulated for a ten year period using historical annual yields and national prices. For the simulation, it is assumed that the relative variability of yields would be the same in the future as it has been in the past. Richardson, et al., (2000) states that by separating the non-random component from the random component, the multivariate empirical distribution has the flexibility to impose the historical variability on the mean value of the parametrized variable. The simulated coefficient of variation is the same as the historical coefficient of variation for all yields and prices. Using the percentage deviations as parameter estimates in the multivariate empirical distribution forces the coefficient of variation to remain stationary, even when the mean changes from year to year. A process that uses a constant standard deviation would generate a declining coefficient of variation. For example, if a researcher wanted to increase the relative variability of crop prices in the last year of the simulated period, the coefficient of variation would increase. Multivariate empirical distribution has the flexibility to impose the historical variability on any assumed mean value and accounts for the interrelationships occurring in the data (Richardson, Klose, and Gray, 2000; Flanders, 2008). The resulting simulated random variables are bounded by historical minimums and maximums of the original data (Flanders, 2008). By using historical price and yield information specific to northeastern Louisiana, Deliberto, et al., (2013) obtains the distribution functions of each variable around a selected mean level representative of expected market and growing condition for the region.

Stochastic simulations rely on the interactions of random variables within a model to analyze the uncertainty present in the model and how those variables behave under alternative conditions that are imposed. Each random variable's subsistent distribution can be estimated and the distribution of each variable is then randomly sampled so that probabilistic outcomes can be modeled (Richardson, Schumann, and Feldman, 2008). Stochastic simulation models allow changes in variables that represent random occurrences that correspond to risks associated with production and policy aspect of decision making (Flanders and Wailes, 2010).

Historical variability in agricultural prices, supplies, exports, and returns can be attributed to factors over which individual producers have neither control nor reliable predictive ability (Ray, et al., 1998). Producers and policymakers are cognizant of the sources and magnitude of this variability surrounding crop yields, as well as prices and net returns. Ray, et al., (1998) poses this on the basis of the existence of price and net return variability being greater (or lesser) in the Southern region than for the U.S. as a whole. Producers, policymakers, agricultural lenders, agribusinesses, and others are increasingly interested in the range and relative frequency of prices given the variability associated with yields and exports.

Stochastic simulation techniques allow estimation of probability distributions for endogenous variables such as prices and net returns, given probability distributions for uncertain variables in the system. With this technique, the disturbance terms for particular equations represent the form of uncertainty in the system (uncertainty of probability distributions of random variables, such as yield or the disturbance term). Stochastic simulation of such a model results in an estimate of the probability distributions on the endogenous variables, and thus provides an important dimension to the information base for decision makers (Ray, et al., 1998). This added dimension of variability around key indicators of agricultural performance (e.g. prices, yields, input prices, income levels, etc.) will be especially important in examining agricultural sector impacts of subsequent farm bills or other types of agricultural-based legislation. Using a ten-year stochastic baseline, Ray, et al., (1998) measures selected agricultural policies, domestic and global economic conditions, weather, technological change, and other influences that characterize the stochastic baseline simulation. Stochastic yield and export shock are introduced into their model. While a deterministic model could be used to perform multiple simulations that introduce randomness to desired variables, stochastic techniques provide a statistical framework to perform a series of simulations in an efficient and systematic manner (Ray, et al., 1998).

When attempting to model policy implication of federal agriculture-related legislation, the representative farm methodology can be employed. The representative farm approach treats a farm business unit as a unique system characterized by local features and resources with local conditions internalized in the creation and simulation of each farm (Richardson, et al., 2014b). In this research, information necessary to simulate the economic activity of these representative farms is developed from panels of producers using a consensus-building interview process. Panel members are tasked with providing the data needed to build a farm that is representative of their operations. Such data include: size of operation, land tenure, commodities produced, production practices, fixed costs, variable costs, equipment compliment, yields, and prices received for their commodities (Richardson, et al., 2014b). Similar approaches to modeling the financial performance of representative farms can be explored in Richardson, et al., (2014a) and Richardson, et al., (2014c). Multiple years of historical data are included in the analysis so that the results are ensured to track the financial outcomes that were experienced in the recent past by the farming operation (Outlaw, et al., 2012). Key assumptions that pertain to modeling the farm level impact of policy provisions contained in Outlaw, et al., (2012) are such that actual price and yield data made available was obtained from the producers. Multiple policy scenarios were analyzed reading new commodity and crop insurance products of what is now the 2014 farm bill. Through the use of representative farms, a farm's preference for one policy alternative over another was based on the alternative with the highest average net cash farm income over the duration of the simulated period (Outlaw, et al., 2012).

2.2 Stochastic Efficiency with Respect to a Function

The most direct way to measure risk preferences is to derive the decision maker's utility function. Utility functions relate the outcomes of choices to single-valued indices of desirability. As such, they are a representation of preferences (King and Robison, 1981). Expected utility theory states that a decision maker's utility function for outcomes is needed to assess risky alternatives as the shape of the actual utility function reflects an individual's attitude towards risk (Hardaker, et al., 2004; Schumann, et al,. 2004). The utility of a risky alternative is the decision maker's expected utility for that alternative, meaning the probability-weighted average of outcomes. Stochastic dominance criteria is useful in situations involving a single decision maker whose preferences are not known precisely and in situations where more than one decision maker might be involved, such as analyzing policy alternatives for a group of decision makers. An attractive feature of generalized stochastic dominance is that it does not require specific knowledge of an individual's utility function (Williams, 1988; Maynard, et al., 1997).

A stochastic dominance criterion provides a partial ordering of risky alternatives for decision makers whose preferences conform to specified conditions about their utility functions (Hardaker, et al., 2004). It is important to note the trade-offs made in conducting a stochastic dominance analysis. The fewer restrictions that are placed on the utility function, the more general applicability the results will have, but the less powerful will be the criterion in selecting between alternatives. The decision maker must then make the final choice from among the members of the efficient set. Criteria that identify small efficient sets usually require more specific information or assumptions about preferences (Hardaker, et al., 2004).

Stochastic efficiency with respect to a function (SERF) allows for tighter restrictions on risk aversion. Eliciting from the decision makers the bounds on their risk aversion coefficients may be simpler than eliciting a complete utility function. The name is chosen to distinguish it from conventional stochastic dominance with respect to a function (SDRF) and to indicate that the method works by identifying utility efficient alternatives for ranges of risk attitudes, not by finding a subset of dominated alternatives. (Hardaker, et al., 2004). SDRF has been used because it is a generalized version of the commonly used first- and second-degree stochastic dominance criteria and, at the same time, is more flexible and discriminating and does not require the specification of the decision maker's utility function (Williams, 1988). Imprecision in the measurement of decision maker preferences can be recognized explicitly be using an efficiency criterion rather than a single-valued utility function to order alternatives.

SERF partitions alternatives in terms of certainty equivalents as a selected measure of risk aversion is varied over a defined range (Hardaker, et al., 2004; Schumann, et al. 2004). SERF can be applied for any utility function for which the inverse function can be computed based on ranges in the absolute, relative or partial risk aversion coefficient, as appropriate. Conventional SDRF picks only the pairwise dominated alternatives. By contrast SERF will potentially identify a smaller efficient set than SDRF because it picks only the utility efficient alternatives, comparing each with all the other alternatives simultaneously. SERF allows for estimation of the utility-weighted risk premiums between alternatives to provide a cardinal measure for comparing the payoffs between risky alternatives (Hardaker, et al., 2004).

SERF provides an ordinal ranking of alternatives at each risk aversion level between the lower and upper risk aversion bounds customarily tested. SERF is a one step process that is similar to, but potentially more discriminating than, running an SDRF analysis at all risk aversion levels within the stated bounds. SERF provides a cardinal measure of the decision maker's conviction for preferences among alternatives at each risk aversion level by interpreting the differences between certainty equivalent (CE) values as risk premiums. SERF evaluates CE values for alternatives over many values and then graphically displaying ordinal and cardinal rankings for many different groups of agents across a spectrum of risk aversion levels. (Hardaker, et al., 2004; Schumann, et al. 2004).

Primary assumptions involved in expected utility analyses are those relating to the distribution of the data and the utility function of the decision maker. Differing assumptions regarding these can greatly impact decision analysis and efficient sets under alternative risk aversion levels. The SERF procedure can be carried out for many specified parametric distributions. In many cases, the specific form of the utility function, let alone the parameterization, is relatively unknown apart from general characteristics (Schumann, et al., 2004). Apart from having to choose a specific utility function, a composite of several utility functions can be used in the ranking process for a SERF analysis. Choosing utility functions with the assumption of concavity in the range of risk aversion and weighting them to create a composite ranking can be useful to analyze decision maker's choices under quasi-risk aversion conditions (Schumann, et al., 2004). In addition to the difference in discriminating power, whether pairwise SDRF and SERF applied using the same form of utility function will give comparable results will also depend on differences in data handling (Hardaker, et al. 2004).

Strategies (outcomes) with higher CEs are preferred to those with lower CEs. The CE of a risky strategy is the amount of money at which the decision-maker is indifferent between the certain (generally lower) dollar value and the expected value of the risky strategy. For a risk-averse decision-maker, the estimated CE is typically less than the expected value of the risky strategy. The calculation of the CE depends on the utility function specified. Given a negative exponential utility function, a specific absolute risk aversion coefficient (ARAC), which represents the ratio of the second and first derivatives of the decision-maker's utility function, is used to derive CEs. Values of the absolute risk-aversion function are simply local measures of the degree of concavity or convexity of a utility function. As such, they also serve as indicators of the extent to which a decision maker is risk averse or less risk averse (King and Robison, 1981). To calculate the CEs using SERF various types of utility functions can be used, e.g. power; negative exponential, quadratic, log-log (Fathelrahman, et al., 2011). A negative exponential utility function used in the SERF analysis conforms to the hypothesis that farm managers prefer less risk to more given the same expected return. This functional form assumes managers have constant absolute risk aversion. Under this assumption, managers view a risky strategy for a specific level of risk aversion the same without regard for their level of wealth. A negative exponential function can be used as a reasonable approximation of risk averting behavior (Williams, et al. 2012).

The degree of precision with which preferences are measured- i.e., the size of the interval between the lower and upper bound functions-can be specified directly in accordance with the characteristics of the problem under consideration. The procedure for constructing interval measurements of decision maker preferences is based on the premise that under certain conditions, a choice between two distributions defined over a relatively narrow range of outcome levels divides absolute risk aversion space over that range into two regions: one consistent with the choice and one inconsistent with it (Williams, et al., 2012). The decision maker's preferences, as revealed by the ordering of the two distributions, determines which of the two regions their level of absolute risk aversion lies. By confronting the decision maker with a series of choices between selected pairs of distributions, the region of absolute risk-aversion space consistent with the decision maker's preferences can repeatedly be divided. With each choice, a portion of that region is shown to be inconsistent with the decision maker's preferences, and the interval measurement for the level of absolute risk aversion is said to narrow. The procedure continues until a desired level of accuracy is attained (Williams, 1988). Varian (1992) states that if a consumer is risk averse over some region, then the chord drawn between any two points of the graph of their utility function in this region must lie below the function. This is equivalent to the mathematical definition of a concave function. Hence, concavity of the expected utility function is equivalent to risk aversion. The more concave the expected utility function, the more risk averse the consumer. Normalizing the second derivate results in the Arrow-Pratt measure of absolute risk aversion (Varian, 1992).

Interval preference measurements are used in combination with the evaluative criterion of stochastic dominance with respect to a function to order choices. Lower and upper bound absolute risk-aversion levels for each of the outcome levels where direct measurements have been made and the outcome distributions to be ordered serve as inputs to the computer program designed to accomplish this task (King and Robison, 1981). King and Robison, 1981, go onto suggest that most intervals for stochastic dominance with respect to a function be established between the ranges from -0.0001 to 0.0010. Elicited risk preferences suggest that similar farm managers would exhibit risk-neutral behavior within the range of -0.00001 and 0.00001. Those above this range would exhibit more risk-adverse behavior, whereas those below would exhibit more risk-seeking behavior (Williams, 1988).

Under conditions of risk, mean-variance/mean-standard deviation analyses and stochastic dominance approaches have been used to provide for risk aversion behavior under general assumptions concerning farmer’s utility functions and cumulative distribution functions (CDFs) of returns (Fathelrahman, et al. 2011). For economic analyses, this normally involves comparison of cumulative income (e.g. gross margin or net return) probability distributions from a set of agricultural management alternatives (e.g. tillage or cropping systems). SERF analyses are dependent on the range of risk aversion coefficients used. The decision rule for SERF is to rank the risky alternatives (within the decision makers specified risk aversion coefficient) from the most preferred (i.e. the highest CEs at specified levels of risk aversion) to the least preferred (i.e. the lowest CEs at specified levels of risk aversion). Another advantage of the SERF method is its ability to produce ranking of alternatives for any utility function with risk attitudes defined by corresponding ranges of absolute, relative or partial risk aversion coefficients (Hardaker, et al. 2004; Schumann, et al., 2004). The relative risk aversion coefficient is typically around 1.0. Anderson, Dillon, and Hardaker, (1977) proposed a classification of degrees of risk aversion, based on the relative risk aversion with respect of wealth in the range 0.5 (hardly risk averse at all) to approximately 4.0 (very risk averse) as evaluated in the Hardaker, et al., (2004) study. Fathelrahman, et al., (2011) uses this range in their study for SERF analysis of the tillage system alternatives as well as including the situation where risk aversion with respect to wealth was equal to zero, i.e. a risk neutral condition. For a rational decision maker who is risk averse (as in the case of farm planning), the estimated CE is less than the expected monetary value of the risky strategy. The difference between the expected variance and the CE is called the risk premium (Hardaker, et al., 2004), indicating the effect of the decision maker's risk aversion.

Bryant, et al., (2008) uses SERF methodology to place upper and lower bounds on the value of the dominant cotton technology with respect to a set of dominated technologies. Multiple technologies are compared simultaneously and risk is appropriately considered. Bryant, et al. (2008) builds on the Johnson and Blackshear, (2004) work that uses stochastic simulations to evaluate the profitability of Roundup Ready® and conventional cotton varieties considering the variability of prices, yields, and production costs. Stochastic dominance with respect to a function was used to rank the varieties accounting for the inherent stochasticity and different levels of producer risk aversion. A stochastic approach compared various levels of risk aversion and risk neutrality. The analyses were conducted for twenty different alternative levels of ARAC ranging from 0 to 0.05. Bryant, et al., (2008) employs a negative exponential utility function is chosen to calculate the ARAC for each study location by dividing two extreme ARAC values for relative risk aversion with respect to wealth measures of 0.5 and 4.0 by an average of wealth for alternative cotton seed technologies at each location. Subtracting CE for less preferred alternatives from the CE of the preferred alternative yielded a measurement of preference for the preferred alternative at a given risk aversion level.

Stochastic dominance is a mathematically precise evaluative criterion to rank actions or choices for classes of decision makers defined by specified lower and upper bounds of their absolute risk aversion coefficient (King and Robison, 1981). The ARAC is defined as the –U"(x) divided by U'(x), where U represents a von Neumann-Morgenstern utility function (King and Robison, 1981). A positive absolute risk aversion coefficient (ARAC) implies a concave utility function for a risk averse decision maker. Conversely, a negative ARAC implies a convex utility function for a risk loving decision maker (King and Robison, 1981).

Furthermore, the specification of lower and upper bounds places constraints on the range of risk attitudes entering the stochastic dominance analysis (Giesler, Paxton, and Millhollan, 1993). The advantage of this approach is that it utilizes all simulated observations and provides an indication of the confidence a decision maker has regarding the ranking of alternative variety selections (Richardson, 2002). Furthermore, the results are preferred to the simple "average" results, which do not internalize any considerations for risk preferences.

Barham, et al., (2011), examines the risk efficiency of alternative combinations of risk management strategies over a range of risk aversion levels for a representative Texas Lower Rio

Grande Valley farming operation. Risk mitigating aspects of irrigation in combination with crop insurance, hedging, and farm programs are considered as part of the management strategy employed. A multivariate empirical distribution was used to avoid biasing the results and to adequately represent the data from a small sample (Richardson, et al., 2000). SERF is used to rank the expected benefits of 16 alternative management strategies using a power utility function with risk aversion coefficients ranging from 0.0 to 4.0. The CE is calculated over a range of risk aversion coefficients (RACs), rather than selecting a single RAC, and ranks risky alternatives based on the CE values over the range of RACs. Barham, et al., (2011) conclude that a rational decision maker prefers a higher CE to a lower value at their particular RAC, so scenarios can be ranked by observing the highest CE at each relative risk aversion coefficient.

Hignight, et al., (2010) evaluates production costs, crop yields, and economic risk of tillage systems in five rice-based cropping systems (continuous rice, rice-soybean, rice-corn, rice-wheat, and rice-wheat-soybean-wheat) of the Arkansas prairie region. Yields, crop prices, and key input prices are simulated to create a distribution of net returns to the farm. Stochastic efficiency with respect to a function (SERF) is used to evaluate profitability and risk efficiency. Crop prices received, fuel, fertilizer, a glyphosate herbicide, and yields are the stochastic variables contained in the model. Multivariate empirical distributions of the variables followed the estimation procedures identified in Richardson, et al., (2008). The MVE distribution creates a distribution of the deviations expressed as a fraction from the mean or trend and simulates the random value based upon the frequency distribution of the actual data. A MVE distribution has been shown to appropriately correlate random variables based upon their historical correlation (Richardson, et al., 2000). Hristovska, et al., (2011) examined rice and soybean yield distributions under competing tillage systems that were simulated using historical yield data from a long term rice-based cropping systems study in Arkansas for the period 2000 to 2010. The historical crop yields represent yields obtained in a two-year rice-soybean rotation. Deviations from the mean yields were used to estimate the parameters for the MVE yield distributions. The SERF method of the SIMETAR feature of Microsoft® Excel uses a negative exponential utility function to estimate the CE values at each ARAC. The ARAC formula proposed by Hardaker, et al., (2004) is used to calculate a farm manager's degree of risk aversion. Given the CE values, risk premiums can be calculated across alternative cropping systems and between tillage practices. Certainty equivalents and risk premiums are presented by cropping system for a range of ARACs in are used to predict preferences of tillage practice applied to each cropping system. Certainty equivalents are equal to the mean (risk neutral) when the ARAC is equal to 0. Positive ARACs represent risk aversion, and risk aversion increases as ARACs become more positive. Alternatively, negative ARACs represent risk seeking behavior, and risk seeking behavior grows as ARACs become more negative. ARACs values from -0.15 to 0.15 are used to give a range of how the cropping systems and tillage practice would be ranked across risk aversion levels.

The economic feasibility of soybeans, grain sorghum, and corn in annual rotation with winter wheat using reduced tillage and no-tillage systems in the Central Great Plains region were evaluated in Williams, et al., 2012. Net returns were calculated using simulated yield and price distributions based on historical yields, two historical annual price series, and 2011 production costs. SERF was used to determine the preferred strategies under various risk preferences. The objective of this analysis was to determine which tillage systems and row crops rotated with winter wheat are preferred under varying degrees of risk preference for producers in the region. A simulated correlated multivariable empirical yield distribution derived from actual historical yields was multiplied by a simulated multivariate empirical price distribution derived from actual historical prices to calculate gross returns for each cropping system. Empirical distributions were specified using the yield and price data following Richardson, Klose, and Gray, (2000) because too few observations existed to estimate parameters for another distribution (e.g., truncated normal distribution). The price and yield distributions were used to generate a CDF using the historical yield data with the probability ranging from 0.0 to 1.0, formed by ordering the data and assigning a cumulative probability for each observation. The same process was repeated using annual marketing year prices. The simulated net return data outcomes from each crop production system were sorted into CDFs, which were used in the SERF analysis. Once the strategies were ranked using the CE results, a utility-weighted risk premium was calculated.

Williams, et al., 2012 applied the simulated net return data outcomes from each crop production system sorted into CDFs, which were used in the SERF analysis. Once the strategies were ranked using the CE results, a utility-weighted risk premium was calculated. The risk premium for a risk-averse decision maker reflects the minimum amount (dollars per acre) that a decision-maker has to be paid to justify a switch from the preferred strategy to a less-preferred strategy under a specific risk aversion coefficient. An alternative set of commodity prices was used to simulate net returns for the SERF analysis. Annual commodity price projections from the University of Missouri's Food and Agricultural Policy Research Institute (FAPRI) for the marketing years compared with the SERF results from the marketing year commodity price series from 2006 through 2010 in the observation period.

Luitel, Knight, and Hudson, (2015) used simulation analysis to evaluate the relative benefit of different crop insurance policies at varying levels of underlying coverage. This application was specific to cotton production in Texas where farm production history was derived via surveys of representative panel participants. Initial wealth was measured, which represented the revenue earned from the crop plus insurance indemnity (if warranted) less the premium cost. Premium rates for the surveyed production region were obtained from USDA RMA rates, county reference yields, and enterprise unit. Crop revenue produced was simulated using a yield distribution. Luitel, Knight, and Hudson, (2015) assumed that the producer would maximize the CE of stochastic ending wealth through analysis that is consistent with a constant relative risk aversion utility function. The CE are calculated in dollar values which represents the difference between the CE of a specific insurance choice and the CE of no insurance.

CHAPTER 3: METHODOLOGY

3.1 Production History and Farm Characteristics within the Region

This research will utilize production data from the 2004 through 2013 historical period (with future production scenarios presented for 2014 through the 2018 years) for corn, cotton, rice, and soybean crops in the three state Mississippi River delta region via USDA NASS county-level yield data and national marketing year average price data. National marketing year prices for 2014 through 2018 crop years are obtained from the University of Missouri's Food and Agricultural Policy Research Institute.

In an attempt to model farm-level production variability in each state, specific cost estimates are used to approximate the regional production cost estimates. Production cost data were obtained for selected row crops of the region using enterprise budgets developed by multiple University Extension Services. The general procedures used by Salassi and Deliberto, (2014) are applied to estimate machinery and other input costs for common production practices for corn, cotton, rice, and soybeans in Arkansas, Louisiana, and Mississippi. Input prices contained in the enterprise budgets were obtained from surveys of farm suppliers, machinery dealers, and aerial applicators to provide a basis for estimating budget item categories. The budgets are categorized by the total direct expenditures and total fixed expenses (per acre) incurred in a typical production season. Within these two broad categories, the various inputs are itemized with their respected costs. Direct expenses include such cost items as seed, fertilizer, chemicals, fuel, labor, repairs, and irrigation. Fixed expenses include such items as depreciation and interest on investment which are generally incurred in the production period. Enterprise crop budgets itemize the direct or variable expenses per acre relative to net income gained from the crop, excluding government payments. This serves as a decision-making tool enabling both the producer and landlord to examine the significance that rising input prices have on the gross economic returns of the crop(s) being produced.

An application model of the multivariate empirical distribution method will be developed using ten years of historical price and yield data for a mixed crop farm specific to: (1) Acadia Parish located in the southwestern region of Louisiana; (2) Tensas Parish located in the northeastern region of Louisiana; (3) Morehouse Parish located in the northeastern region of Louisiana; (4) Arkansas County located in the southeastern region of Arkansas; (5) Phillips County located in the southeastern region of Arkansas; (6) Mississippi County located in the northeastern region of Arkansas; (7) Bolivar County located in the northwest region of Mississippi; (8) Coahoma County located in the northwestern region of Mississippi; and (9) Leflore County Mississippi located in the northwestern region of Mississippi. Figure 3.1.

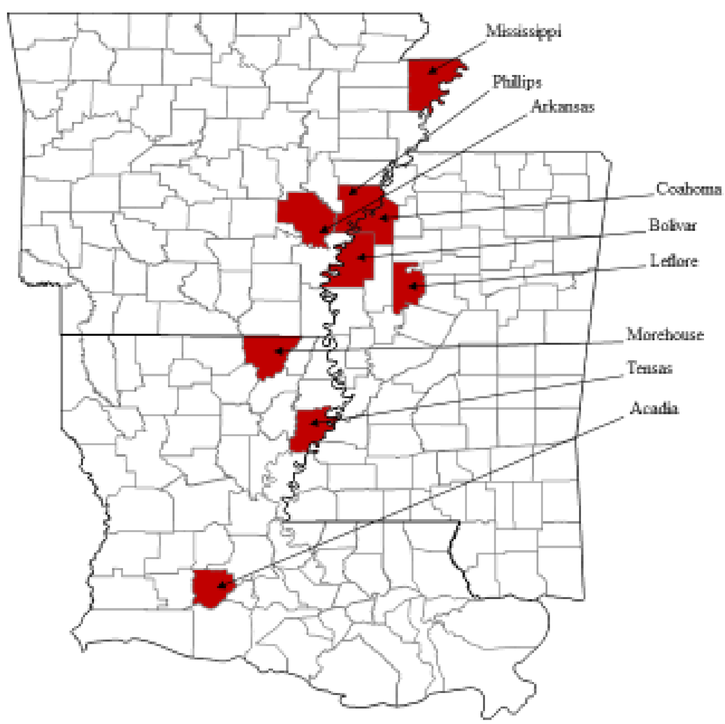

Figure 3.1. Location of representative farms included in the study.

A representative farm approach is applied to model traditional cropping patterns of each region to include corn, cotton, rice and soybeans. Typical farm size (harvested acres) per locale is obtained from the 2012 U.S. Census of Agriculture data. Historical data on commodity prices, output (yield) levels, as well as selected input parameters are obtained for the recent ten-year time period. Commodity prices and yield level per acre are those that are published by USDA NASS. For each variable, the average yearly estimate was obtained for the elapsed period of 2004 through 2013. The prices and yield levels of the major row crops in Arkansas, Louisiana, and Mississippi from 2004 to 2013 were entered into the SIMETAR software program of Microsoft® Excel, as developed by Richardson, Schumann, and Feldman, (2008). Random variables are simulated for the purposes of parameter estimation. A total of 1,000 iterations for each variables were generated within the model. Distributions of net returns to land and management were calculated using simulated yield and price distributions based on actual historical yields, annual marketing year price series, and current input cost estimates of the specified farming operation. Revenue variability, expressed as the grower's share of net returns above variable costs, is indicated by the coefficient of variation for each farming operation. According to 2012 U.S. Census of Agriculture data, Arkansas has 7,316,469 acres harvested across 25,535 farms. Selected counties in the Prairie and Mississippi River delta regions were selected to determine the majority of farm sizes in the localized production area. Selected counties in Arkansas were grouped into two categories: farms between 1,000 to 1,999 acres and farms larger than 2,000 acres. Data from the Census shows that farms in both acreage categories comprise over 50% of the total number of farms in Arkansas, Chicot, Desha, Mississippi, and Monroe counties. A similar approach was used for Louisiana and Mississippi. In Louisiana, farms greater than 1,000 acres in the parishes of East Carroll, Madison, and Tensas represented approximately half of the farms in each parish, respectively. These parishes are located in the Mississippi River delta region of the state predominantly produce corn, cotton, and soybeans. For the southwest rice-producing region of the state, farms greater than 1,000 acres represented a 22% to 26% share of the total farms in Acadia and Jeff Davis parishes. For counties in the state of Mississippi, farms greater than 1,000 acres represented over 43% of the total farms in Coahoma, Issaquena, Leflore, Sharkey, Sunflower, and Tunica. In Bolivar County, a leading rice-producing county, the percentage of larger farms (1,000 acres plus) comprises approximately 33% of total farms in that locale. Appendix B contains 2012 U.S. Census of Agriculture farm data on the basis of farm count and harvested cropland acres for selected counties in the Mississippi River delta region.

The Texas A&M Agricultural and Food Policy Center (AFPC) compares farm level economic impacts of baseline price scenarios on representative crop farms that are typically conducted over a multi-year planning horizon using a whole farm simulation model (Richardson, et al., 2015). Data that are utilized in representative farm construction originate from producer panel cooperatives that are used to develop descriptive economic information. Characteristics for each of the farming operations in terms of location, size, crop mixes, assets, and average receipts are identified. The locations of these farms are primarily the results of discussions with staff member for the House and Senate Agriculture Committee of Congress (Richardson, et al. 2015). Key assumptions of representative farm analysis (presented in Richardson, et al., 2015) include the following: (a) All farms classified as moderate scale are considered to be representative of a majority of full-time commercial farming operations in the study area; (b) farm level stochastic simulation incorporates price and yield risk faced by farmers over the past ten-years; (c) farm program payments for participating corn, cotton, rice, and soybeans are included in the model;

and (d) farms are assumed to carry crop insurance policies at coverage levels common to the area.

The AFPC uses a representative farm approach to model the economic outlook for different farm types using a series of current baseline market price projections. The farm's size, crop mix and location are also part of the categorical grouping that acts to simulate the economic activity on these representative farms throughout the country, with Table 3.1 presenting the characteristics of operations located in the Mid-south region.

Table 3.1. Representative farms used by the AFPC denoting the acreage share of crop mixes of each farm.

State	Locale	Acres	Crop Mix on Representative Farm (acres)
Arkansas	Mississippi County	5,000	Cotton (5,000)
	Desha County	6,500	Rice (325), Soybeans (4,000), Cotton (325), Corn (1,500), Wheat (150)
	Arkansas County	3,240	Rice (1,296), Soybeans (1,620), Corn (324), Wheat (324)
	Cross County	1,400	Rice (700), Soybeans (700)
	Lawrence County	3,000	Rice (1,800), Soybeans (1,050), Corn (150)
Louisiana	Morehouse Parish	2,640	Corn (1,056), Cotton (264), Soybeans (1,188)
	Madison Parish	2,500	Rice (500), Soybeans (800), Cotton (250), Corn (950)
	Acadia Parish	1,480	Rice (800), Soybeans (530)

Source: Texas A&M AFPC, 2015.

In examining the five Arkansas counties employed by the AFPC, comparisons to Agriculture Census data can be made on the basis of farm size with respect to the referenced county. For farms located in Mississippi County, Arkansas, farms larger than 2,000 acres constitute 30% of the total number of farms in the county. In terms of acreage, this large farm class accounts for 72% of cropland in the county. For the larger panel farm in Arkansas County, farms larger than 2,000 acres constitute 21% of the total number of farms and represent 52% of cropland acres in the county. Farms in Cross County ranging between 1,000 and 1,999 acres constituted 21% of total farms and 24% of cropland in the county. Lawrence County farms greater than 2,000 acres constitute 10% of the farms and 52% of the cropland in the county. In Louisiana, farms larger than 2,000 acres in Morehouse Parish constituted 16% of farms and 51% of the cropland acres. Farms in the 2,000 acre ‘plus’ category for Madison Parish accounted for 16% of the farm count and 43% of the cropland. Farms in the 1,000 to 1,999 acre category for Acadia Parish constituted 13% of farms and 36% of cropland acres for the locale. There is no panel farm originating in the state of Mississippi, included in the AFPC representative farm analysis.

Unique to this research endeavor, three representative farms were constructed in the states of Arkansas, Louisiana, and Mississippi to reflect common production systems of the area and to measure farm financial performance under varying Federal farm program policy and crop insurance options. The production systems of the representative farms include (1) a rice and soybean operation, (2) a corn, cotton, and soybean farming operation that produces a significant amount of cotton relative to the feed grain crops, and (3) a corn, cotton, and soybean operations that is centered in the production of corn and soybeans but does retain significant cotton production. County (parish) level production data are coupled with region enterprise production budgets in order to depict a realistic operation in each state, with particular attention devoted to agronomic soil conditions, irrigation delivery systems, disease pressure, and weed pressure at each locale selected to host a representative farm. The selection criteria used to evaluate, and ultimately determine the location for each farming operation per state, was based on the amount of planted acreage in the county, correspondence with Extension Service personnel from each state, and comparison to the Texas A&M AFPC representative farm outlook simulator. From this collection of data, representative counties (parishes) were selected and modeled.

A representative rice and soybean farming operation spanning 3,000 acres was modeled for Arkansas County, Arkansas. This county ranked second in planted rice acreage 13 times and ranked third and fourth twice, each respectively during the 1996 to 2013 observational period. In regards to planted soybean acreage, Arkansas County ranked first on three occasions, ranked second on five occasions, ranked third on three occasions, fourth on three occasions, and ranked fifth on four occasions. University of Arkansas Extension Service personnel have stated that a 3,000 acre farm is consistent with the current agricultural landscape and validated since the Texas A&M AFPC models a representative farm in this County for rice and soybean production across 3,240 acres. An assumption imposed on the farm model suggests that rice is the predominate crop on the farm. For the second representative farm modeled in the Mississippi River delta region of Arkansas, Phillips County was selected. Phillips County ranked first in planted corn acres on three occasions, ranked second once, ranked third once, ranked fourth on three occasions, and ranked fifth on four occasions. Phillips County ranked second in planted cotton acres on two occasions, ranked third on four occasions, and ranked fourth on four occasions. In terms of soybean acres, the county ranked first on one occasion, ranked second on six occasions, ranked third on three occasions, and ranked fourth on three occasions over the eighteen year observational period. Given the fact that a large portion of Arkansas planted cotton acreage is centered in Mississippi County, a third representative farm was modeled to reflect a predominant cotton, corn, and soybean operation. Mississippi County led the state in planted acres to cotton in each year of the 18 year period. In addition, this same county led the state in planted soybean acres ten times.

In Louisiana, a representative rice and soybean farm was constructed for Acadia Parish. Acadia ranked first and second in rice planted acreage on nine occasions, respectively. Acadia Parish ranked second in soybean acres only twice in the observation period. Rice farms in the southwestern region of the state typically employ either a soybean or crawfish rotational system to combat infestations of red rice and to supplement farm income through farm diversification. Therefore, soybean production in this parish is expected to be limited as soybeans are not the major crop of the region and do not receive the management intensity that a rice crop would. Similar to the assumption imposed on the Arkansas County farm, rice is said to be the predominant crop grown. The size of this farm is 2,000 acres. This acreage is based on communication with LSU Agricultural Center Extension Service personnel and is consistent with the Texas A&M AFPC model farm in the parish of 1,480 acres. The additional acres on this rice and soybean farm considers that the farm does contain fallow (idle) acres removed from crop production as a part of the farm's rotation. The second representative farm constructed in Louisiana is located in the Mississippi River delta region of the state, specifically in Morehouse Parish. This 2,500 acre farm is diversified in its production of corn, cotton, and soybeans. Morehouse Parish ranked first in corn acreage once, ranked second on eight occasions, and third on three occasions. Morehouse Parish ranked first in cotton acreage once, ranked second on three occasions, ranked third on three occasions, and ranked fourth on four occasions. In terms of soybean acres, the parish ranked fourth on two occasions. In comparison, the Texas A&M AFPC models a similar 2,640 acre farm in this location. A majority of the cotton that is produced in Louisiana is grown in Tensas Parish, therefore a third representative farm (2,500 acres) was modeled in this locale for a corn, cotton, and soybean operation. Tensas parish ranked first in planted cotton acres 15 out of the 18 years. Accordingly, the parish is home to soybean and corn production.

In Mississippi, a representative rice and soybean farm was constructed in Bolivar County encompassing 3,000 acres. Bolivar County ranked first in planted acres for both commodities in each of the 18 years of the observation period. The second representative farm depicts a 4,000 acre corn, cotton, and soybean farming operation in Leflore County. Leflore County ranked first in planted corn acres once, ranked third on two occasions, ranked fourth on four occasions, and ranked fifth on two occasions. Leflore County ranked second in planted cotton acres on two occasions, ranked third on eight occasions, ranked fourth on four occasions, and ranked fifth on three occasions. This county ranked fifth in soybean acres on four occasions. Coahoma County was selected to represent a corn, cotton, and soybean farming operation (4,000 acres) since this county ranked first in planted cotton acres on 13 occasions and second on five occasions. Coahoma County ranked second in soybean acres on two occasions, ranked third on three occasions, ranked fourth on six occasions, and ranked fifth on four occasions. As previously mentioned, the Texas A&M AFPC does not model a rice and soybean or a mixed cotton and grain farm in the state of Mississippi. Therefore, farm size was estimated through personal correspondence with the Mississippi State University Extension Service at the Delta Research and Extension Center in Stoneville, Mississippi.

To summarize the correspondence between extension service personnel, Table 3.2 contains a list of the representative farm and the crops produced (number of acres in production) on those farms for the purposes of this research. From communication from University of Arkansas, Division of Agriculture, Extension Service personnel, a typical farming operation in the Mississippi River delta region would consist of between 3,000 and 6,500 acres. Louisiana State University Agricultural Center Extension Service personnel estimates that a typical or representative farm size in the Mississippi River delta region would be approximately 2,500 acres. For predominately rice-producing farms located in the southwestern region of the state, farms are considerable smaller, at 1,500 acres. Mississippi State University personnel estimate that a typical rice and soybean farm in the Mississippi delta region resembles 2,300 to 3,000 acres while a corn, cotton, and soybean farm would consist of 3,000 to 6,000 acres.

Table 3.2. Representative farms constructed in Arkansas, Louisiana, and Mississippi.

State	Locale	Acres	Crop Mix on Representative Farm (Acres)
Arkansas	Arkansas	3,000	Rice (1,500) and Soybeans (1,500)
	Mississippi	4,000	Corn (1,500), Cotton (1,000) and Soybeans (1,500)
	Phillips	4,000	Corn (1,500), Cotton (1,000), and Soybeans (1,500)
Louisiana	Acadia	2,000	Rice (1,175), Soybeans (375), and Fallow (500)
	Tensas	2,500	Corn (750), Cotton (875), and Soybeans (875)
	Morehouse	2,500	Corn (750), Cotton (875), and Soybeans (875)
Mississippi	Bolivar	3,000	Rice (1,500) and Soybeans (1,500)
	Coahoma	4,000	Corn (1,500), Cotton (1,000) and Soybeans (1,500)
	Leflore	4,000	Corn (1,500), Cotton (1,000) and Soybeans (1,500)

Starting from the 1996 crop year, production data were collected via USDA NASS in an attempt to record the number of planted acres for corn, cotton, rice, and soybeans at the county (parish) level for selected agricultural locales in the states of Arkansas, Louisiana, and Mississippi. The FAIR Act of 1996 signaled a new market-oriented era of planting flexibility for U.S. agriculture by provided seven years of predetermined direct payments to producers and eliminated acreage use restrictions (Nelson and Schertz, 1996). Tables 3.3 through 3.14 denote the leading locales of production for corn, cotton, rice, and soybeans. Counties (parishes) were sorted by their rank relative to the total number of acres planted in the state for each major commodity. Only the top five counties (parishes) were included in this analysis for the 1996 through 2013 time period. For example, Table 3.3 can be interpreted as that for corn acreage in Clay County, Arkansas, this locale ranked first (highest number of planted corn acres) in eight of the 18 year historical observation period; ranked second three times; and ranked third and fourth twice, respectively.

Table 3.3. Frequency of state ranking on acres planted to corn in Arkansas, 1996 to 2013.

County	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Clay	8	3	2	2	0
Woodruff	0	5	1	1	2
Mississippi	0	0	1	0	1
Greene	0	0	0	1	0
Phillips	3	1	1	3	4
Randolph	0	0	1	0	2
Jefferson	2	1	1	0	2
Miller	1	2	1	4	1
Monroe	2	3	0	3	2
Jackson	0	0	1	2	0
Crittenden	0	0	1	1	0
Lee	0	0	0	0	1
Chicot	1	2	5	0	0
Desha	1	1	0	1	1
Lonoke	0	0	1	0	1
Arkansas	0	0	1	0	1
Craighead	0	0	0	0	0

Table 3.4. Frequency of state ranking on acres planted to cotton in Arkansas, 1996 to 2013.

County	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Mississippi	18	0	0	0	0
Craighead	0	16	2	0	0
Desha	0	0	6	6	2
Phillips	0	2	4	4	2
Poinsett	0	0	0	1	7
Lee	0	0	4	5	3
Ashley	0	0	0	1	1
St Francis	0	0	0	0	1
Clay	0	0	1	2	0

Table 3.5. Frequency of state ranking on acres planted to rice in Arkansas, 1996 to 2013.

County	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Arkansas	1	13	2	2	0
Poinsett	17	1	0	0	0
Cross	0	1	9	1	4
Jackson	0	1	3	10	4
Lawrence	0	2	4	5	5
Craighead	0	0	0	0	1
Lonoke	0	0	0	0	3
Greene	0	0	0	0	1

Table 3.6. Frequency of state ranking on acres planted to soybeans in Arkansas, 1996 to 2013.

County	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Mississippi	10	1	3	3	1
Arkansas	3	5	3	3	4
Cross	0	0	1	1	3
Phillips	1	6	3	3	1
Crittenden	4	4	7	1	1
Lee	0	0	0	1	2
Jackson	0	1	0	1	1
Poinsett	0	0	1	5	5

Table 3.7. Frequency of state ranking on acres planted to corn in Louisiana, 1996 to 2013.

County	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Madison	15	1	2	0	0
Tensas	0	4	6	3	2
East Carroll	0	0	3	7	4
St. Landry	0	0	0	1	0
Pointe Coupee	0	0	0	0	2
Richland	0	0	0	2	5
Concordia	0	0	0	3	2
Morehouse	1	8	3	0	0
Franklin	2	5	3	2	3

Table 3.8. Frequency of state ranking on acres planted to cotton in Louisiana, 1996 to 2013.

County	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Franklin	1	2	2	5	6
Richland	1	2	1	1	3
Tensas	15	1	2	0	0
Morehouse	1	3	3	4	0
Catahoula	0	6	1	1	6
Madison	0	3	7	3	2
Concordia	0	1	2	4	0
Caddo	0	0	0	0	1

Table 3.9. Frequency of state ranking on acres planted to rice in Louisiana, 1996 to 2013.

County	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Vermilion	4	2	9	1	1
Acadia	9	9	0	0	0
Jeff Davis	6	6	6	0	0
Evangeline	0	0	2	14	2
Morehouse	0	0	1	2	13
St. Landry	0	0	0	1	2

Table 3.10. Frequency of state ranking on acres planted to soybeans in Louisiana, 1996 to 2013.

County	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Concordia	5	2	3	3	2
Acadia	0	2	0	0	1
St. Landry	10	3	3	1	1
Avoyelles	0	0	3	6	8
Catahoula	0	0	0	2	1
Madison	0	0	6	1	3
East Carroll	3	10	2	2	0
Pointe Coupee	0	1	0	1	2
Morehouse	0	0	1	2	0

Table 3.11. Frequency of state ranking on acres planted to corn in Mississippi, 1996 to 2013.

County	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Yazoo	11	3	1	0	3
Washington	2	8	2	2	3
Tallahatchie	1	0	1	1	1
Leflore	1	0	2	4	2
Sunflower	1	1	3	5	4
Noxubee	2	4	0	2	0
Sharkey	0	1	3	2	0
Issaquena	0	0	4	0	1
Monroe	0	0	0	0	2
Bolivar	0	1	2	2	2
Coahoma	0	0	0	0	0

Table 3.12. Frequency of state ranking on acres planted to cotton in Mississippi, 1996 to 2013.

County	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Washington	3	6	2	1	1
Coahoma	13	5	0	0	0
Leflore	0	2	8	4	3
Sunflower	0	0	0	1	1
Yazoo	2	5	2	2	4
Tallahatchie	0	0	0	1	2
Humphreys	0	0	0	1	1
Bolivar	0	0	2	5	1
Tunica	0	0	4	1	1
Holmes	0	0	0	1	3
Quitman	0	0	0	1	1

Table 3.13. Frequency of state ranking on acres planted to rice in Mississippi, 1996 to 2013.

County	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Bolivar	18	0	0	0	0
Sunflower	0	15	3	0	0
Washington	0	0	14	4	0
Tunica	0	3	1	9	4
Tallahatchie	0	0	0	1	1
Leflore	0	0	0	3	8
Coahoma	0	0	0	1	1
Quitman	0	0	0	0	4

Table 3.14. Frequency of state ranking on acres planted to soybeans in Mississippi, 1996 to 2013.

County	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Bolivar	18	0	0	0	0
Coahoma	0	2	3	6	4
Sunflower	0	9	9	0	0
Tunica	0	0	0	1	4
Washington	0	7	6	4	1
Leflore	0	0	0	0	4
Tallahatchie	0	0	0	7	5

Using this USDA NASS data set from 1996 to 2013, yield data were compiled for each corn, cotton, rice, and soybean producing county (parish) in the three state study region, relative to leading commodity-producing locales. Appendix C contains data to summarize the yield per acre for each representative farm location.

3.2. Model Attributes and Development

A farm-level simulation model is conducted on separate farming operations in different geographical locations within the Mississippi River delta region. Actual data for county (parish) yields are combined with national marketing year average prices to develop a multivariate empirical yield and price distribution for each farming operation employed in this analysis. The farming operation is simulated for each year of the 2014 to 2018 crop years using stochastic yields and prices to estimate the distribution of total crop receipts for the farm. The prices of selected farm-level production inputs (nitrogen fertilizer, phosphate fertilizer, potash fertilizer, and farm-grade diesel fuel) are also simulated stochastically, as the fertilizer and fuel categories of enterprise budgets account for a large share of the variable production costs. The flexibility of this multivariate empirical distribution procedure allows one to control the stochastic process in many dimensions. Properties of the residual values (deviations) associated with the imposed mean of each parameters are held consistent with their historical behavior (i.e. variations throughout the ten-year observation period are considered likely to occur when a specified mean is imposed).

A stochastic simulation model will be used to simulate the producer's share of net returns above variable production cost for each crop farm in the region. Stochastic simulation based on the historical relationships of national market prices, regional crop yields, and selected farm production inputs with a multivariate empirical distribution includes a correlation matrix that generates correlated stochastic variables that are entered into a financial simulation model for each farming operation. Rental assumptions are made based on those arrangements common to agricultural producers of rice, soybeans, cotton, and corn based on personal communication with farm industry representatives. Rental charges for crop share leases are calculated as a function (percentage) of the simulated yield level and are factored into the producer's and landlord's share of gross income in the economic evaluation of each planted crop on the farming operation. The allocation of federal farm program payments (specific to the legislative guideline of Title I of the 2014 farm bill) are assumed to be shared in the same equitable proportion. In an approach similar to Williams, (1988) the variability of net returns is examined by evaluating risk that is associated with each system, relative to the aforementioned production costs simulation, with and without crop insurances as a response to yield risk.

For the purposes of the federal farm programs (e.g. ARC-CO and PLC), a ten-year trend of the county (parish) yield was used to estimate the county (parish) final reported yield for the 2014 to 2018 outward crop years, identified in Tables 3.15 to 3.23, respectively. These yield parameters will represent key factors in determining if the ARC-CO program triggers a payment in any of the 2014 future crop years. For the purposes of upland cotton, USDA RMA yield data were obtained and utilized on the purposes of enterprise unit separation (i.e. dryland and irrigated cotton tracts). Irrigated cotton yields in each of the locales in Arkansas, Louisiana, and Mississippi were used in the ten-year trend yield estimation. Corn, rice, and soybean yields for each locale were obtained via USDA NASS. In order to determine a yield at the farm gate, it was assumed that each farm in the study historically produced at 5% over the county's reported yield. In the unique production situation of rice in southwestern Louisiana (Acadia Parish), a second rice crop (ratoon) is assumed to be produced on the farm. Published 2013 Louisiana ratoon acreage estimates released by the Louisiana State University Agricultural Center state that Acadia parish had 32,924 acres of rice producing a second crop. This corresponds to approximately 40% of the parish's first crop rice (82,310 acres) producing a ratoon crop in late August to early September. Statewide, 30% of the rice acreage produced a second rice crop in 2013. Therefore, a conservative estimate for Acadia parish was imposed into the model suggesting that 30% of the rice acreage on the representative farm produces a second rice crop. This assumption was carried into each of the 2014 through 2018 crop years. Ratoon crop yield was set to equal 35% of the simulated first crop rice yield per model iteration. Production costs were weighted according to the percent of acreage devoted to producing a second crop.

Table 3.15. Mean yield parameters simulated on the representative Arkansas County, Arkansas farm.

Crop	2014	2015	2016	2017	2018
Rice (cwt)	77.85	78.75	79.10	80.17	81.87
Soybeans (bu)	48.97	50.46	51.02	52.49	54.32

Table 3.16. Mean yield parameters simulated on the representative Mississippi County, Arkansas farm.

Crop	2014	2015	2016	2017	2018
Corn (bu)	176.51	177.05	177.10	180.44	185.04
Cotton (lbs)	971.33	955.33	931.71	934.08	938.00
Soybeans (bu)	40.65	41.87	41.86	42.79	42.43

Table 3.17. Mean yield parameters simulated on the representative Phillips County, Arkansas farm.

Crop	2014	2015	2016	2017	2018
Corn (bu)	176.41	179.18	182.09	186.55	197.19
Cotton (lbs)	832.60	813.17	809.80	802.74	795.06
Soybeans (bu)	41.72	43.83	45.13	44.23	44.97

Table 3.18. Mean yield parameters simulated on the representative Acadia Parish, Louisiana farm.

Crop	2014	2015	2016	2017	2018
Rice (cwt)	71.40	72.51	74.50	75.92	78.05
Soybeans (bu)	38.77	37.39	36.37	37.14	38.60

Table 3.19. Mean yield parameters simulated on the representative Morehouse Parish, Louisiana farm.

Crop	2014	2015	2016	2017	2018
Corn (bu)	177.08	176.81	178.67	180.06	186.23
Cotton (lbs)	1,063.87	1,127.95	1,171.13	1,239.13	1,340.79
Soybeans (bu)	56.40	60.26	63.12	65.98	69.40

Table 3.20. Mean yield parameters simulated on the representative Tensas Parish, Louisiana farm.

Crop	2014	2015	2016	2017	2018
Corn (bu)	155.01	160.28	167.16	169.82	177.83
Cotton (lbs)	1,078.07	1,087.83	1,116.50	1,183.69	1,252.26
Soybeans (bu)	49.46	51.48	54.07	55.29	59.84

Table 3.21. Mean yield parameters simulated on the representative Bolivar County, Mississippi farm.

Crop	2014	2015	2016	2017	2018
Rice (cwt)	72.71	73.28	72.89	73.22	74.92
Soybeans (bu)	48.25	50.12	52.32	51.13	53.54

Table 3.22. Mean yield parameters simulated on the representative Coahoma County, Mississippi farm.

Crop	2014	2015	2016	2017	2018
Corn (bu)	183.32	191.55	194.13	197.63	206.65
Cotton (lbs)	1,314.27	1,376.44	1,419.26	1,453.06	1,521.02
Soybeans (bu)	47.20	49.65	51.56	50.74	52.67

Table 3.23. Mean yield parameters simulated on the representative Leflore County, Mississippi farm.

Crop	2014	2015	2016	2017	2018
Corn (bu)	184.86	188.16	191.32	193.33	202.18
Cotton (lbs)	1,128.87	1,184.08	1,214.12	1,281.97	1,360.96
Soybeans (bu)	52.70	55.53	58.12	58.86	61.73

Information on marketing year pricing information was obtained from FAPRI's April 2015 baseline U.S. crop price report, denoted in Table 3.24. This baseline is used for the purposes of MYA price parameters for the marketing loan, ARC-CO, and PLC calculations for federal farm program benefits. In order to simulate the season average farm price per state, the final MYA price was compared to the final reported state average farm price over the past ten year period. The difference between the MYA price and the state price was then randomly applied to the simulated MYA price per model iteration, so that a state price could be determined for the farm's revenue calculation. It is noted that this state farm price is not used in any farm program or crop insurance program payment calculation. The historic seasonal average farm prices for each state are presented in Tables 3.25 to 3.27.

Table 3.24. Mean values for simulated MYA price projections as obtained from University of Missouri's Food and Agricultural Policy Research Institute April 2015 baseline.

Crop	2014	2015	2016	2017	2018
Corn (bu)	$3.71	$3.86	$3.97	$4.02	$4.15
Soybeans (bu)	$10.11	$9.17	$9.58	$10.00	$10.36
Cotton (lbs)	$0.6045	$0.6095	$0.6257	$0.6266	$0.6432
Rice (cwt)	$12.22	$12.55	$12.82	$12.81	$12.84

Source: University of Missouri FAPRI, 2015.

Table 3.25. State average farm prices for selected commodities in Arkansas, 2004-2013.

Year	Corn ($/bu)	Soybeans ($/bu)	Cotton ($/lb)	Rice ($/cwt)
2004	$2.39	$5.88	$0.411	$7.13
2005	$2.15	$5.92	$0.470	$7.27
2006	$2.73	$6.41	$0.465	$9.43
2007	$3.80	$9.02	$0.578	$12.10
2008	$4.42	$9.64	$0.479	$15.00
2009	$3.79	$9.66	$0.630	$13.40
2010	$4.55	$10.90	$0.735	$11.30
2011	$6.27	$12.30	$0.947	$13.40
2012	$6.81	$14.30	$0.715	$14.30
2013	$5.12	$13.10	$0.794	$15.20

Source: USDA NASS, 2014.

Table 3.26. State average farm prices for selected commodities in Louisiana, 2004-2013.

Year	Corn ($/bu)	Soybeans ($/bu)	Cotton ($/lb)	Rice ($/cwt)
2004	$2.45	$6.29	$0.414	$7.77
2005	$2.25	$5.97	$0.470	$7.47
2006	$2.80	$5.94	$0.461	$9.83
2007	$3.80	$8.43	$0.570	$12.70
2008	$4.45	$9.52	$0.524	$15.40
2009	$3.55	$9.66	$0.628	$13.00
2010	$4.90	$10.50	$0.810	$11.90
2011	$6.10	$12.00	$0.930	$13.40
2012	$3.90	$14.70	$0.693	$14.40
2013	$5.10	$13.40	$0.784	$15.50

Source: USDA NASS, 2014.

The input costs of selected farm-level production units were set to vary based on the previous three-year rolling average of those reported unit prices appearing in each state's enterprise production budgets, published annually by the University of Arkansas Extension Service, the Louisiana State University Agricultural Center, and the Mississippi State University Extension Service.

Table 3.27. State average farm prices for selected commodities in Mississippi, 2004-2013.

Year	Corn ($/bu)	Soybeans ($/bu)	Cotton ($/lb)	Rice ($/cwt)
2004	$2.43	$6.20	$0.410	$7.48
2005	$2.22	$5.92	$0.461	$7.36
2006	$2.84	$6.23	$0.450	$9.38
2007	$3.68	$8.36	$0.576	$12.60
2008	$4.63	$9.29	$0.481	$15.40
2009	$3.72	$9.24	$0.655	$12.90
2010	$4.37	$10.40	$0.791	$10.50
2011	$6.23	$12.00	$0.977	$13.30
2012	$6.94	$14.50	$0.761	$14.60
2013	$5.05	$13.20	$0.815	$15.40

Source: USDA NASS, 2014.

Farm level inputs such as nitrogen fertilizer, phosphorus fertilizer, potash fertilizer, and farm-grade diesel fuel appear in Tables 3.28 to 3.30.

Table 3.28. Mean values for simulated fertilizer and diesel fuel input costs for Arkansas farms.

Input	Unit	2014	2015	2016	2017	2018
N Fertilizer	(lb)	$0.60	$0.64	$0.62	$0.62	$0.63
P Fertilizer	(lb)	$0.65	$0.67	$0.65	$0.66	$0.66
K Fertilizer	(lb)	$0.49	$0.50	$0.49	$0.49	$0.49
Diesel Fuel	(gallon)	$3.32	$3.46	$3.46	$3.42	$3.45

Note: Prices for fertilizers are presented as the unit cost per pound of active ingredient.

Table 3.29. Mean values for simulated fertilizer and diesel fuel input costs for Louisiana farms.

Input	Unit	2014	2015	2016	2017	2018
N Fertilizer	(lb)	$0.57	$0.59	$0.57	$0.57	$0.58
P Fertilizer	(lb)	$0.66	$0.67	$0.66	$0.66	$0.66
K Fertilizer	(lb)	$0.49	$0.49	$0.48	$0.49	$0.49
Diesel Fuel	(gallon)	$3.19	$3.33	$3.28	$3.27	$3.29

Note: Prices for fertilizers are presented as the unit cost per pound of active ingredient.

Table 3.30. Mean values for simulated fertilizer and diesel fuel input costs for Mississippi farms.

Input	Unit	2014	2015	2016	2017	2018
N Fertilizer	(cwt)	$17.38	$19.01	$19.16	$18.52	$18.90
P Fertilizer	(cwt)	$26.65	$28.20	$28.05	$27.63	$27.96
K Fertilizer	(cwt)	$27.33	$28.77	$28.63	$28.25	$25.55
Diesel Fuel	(gallon)	$3.10	$3.33	$3.31	$3.25	$3.30

Note: Prices for fertilizers are presented for UAN 32% nitrogen, DAP P, and a 60% K concentration per 100 pounds.

Other production costs such as drying and hauling are a function of the farm's yield per acre. Therefore, drying and hauling expenses for corn, soybeans, and rice were adjusted based on the simulated county level yield parameter per model iteration. The unit cost for drying corn (bushel) was $0.19 in Arkansas and Louisiana. Mississippi did not include a corn drying charge in their enterprise budget. Hauling charges applied to corn in Arkansas, Louisiana, and Mississippi were set at $0.22; $0.23; and $0.23 per bushel, respectively. A drying charge was assessed to rice in Arkansas ($0.35 per bushel); Louisiana ($0.90 per cwt); and Mississippi ($0.40 per bushel). Hauling charges for rice were set at $0.22 per bushel for Arkansas, $0.30 per cwt in Louisiana, and $0.35 per bushel in Mississippi. For soybeans, hauling charges of $0.22; $0.27; and $0.27 per bushel were applied to the production cost function for Arkansas, Louisiana, and Mississippi. These unit rates were held constant for the five-year period between 20014 and 2018. For the cotton crop, hauling and ginning costs were removed for the cost equation as these items are typically shared between the gin and producer.

Other non-energy related production categories such as custom farming operations (lime application and spraying), harvest aids, herbicides, insecticides, fungicides, seed, technology fees, labor, repair charges, and scouting amounts were set to increase at a rate of 2% per year during the 2014 to 2018 crop years. This increase was consistent with the average percentage increase in the MYA price baseline used in the analysis. The rationale for this 2% assessment was that given the change in market prices received for commodities, input supplies would be likely to vary their rates based on market price increases so that economic gains could be captured by industry sectors of agricultural chemical suppliers relative to the change in overall pricing conditions. Fixed costs incurred in the production process are set to increase at a rate of 1% per year from the associated per enterprise per locale. The 2014 fixed costs per acre, appearing in enterprise budgets per state are presented in Table 3.31. Fixed costs are presented for illustrative purposes and are not included in the results section of this study.

Table 3.31. Fixed cost per acre for selected enterprises in the Mississippi River delta region, 2014.

State	Crop	Fixed Cost/ac
Arkansas	Corn	$73.91
	Cotton	$129.93
	Rice	$110.15
	Soybeans	$66.34
Louisiana	Corn	$90.97
	Cotton	$151.24
	Rice	$84.36
	Soybeans	$83.80
Mississippi	Corn	$81.81
	Cotton	$152.27
	Rice	$107.31
	Soybeans	$82.18

Sources: University of Arkansas Extension, Service, Louisiana State University Agricultural Center, and Mississippi State University Extension Service, 2014.

Through personal communication with extension service personnel, land rents were estimated so that a net return dollar amount could be calculated for the producer. Given the fact that there exists several land tenure arrangements within the Mid-south region, some of the more common arrangements were selected for each crop enterprise. For rice produced in Louisiana, the landlord is assumed to receive a 20% share of the crop in exchange for providing the land as well as paying the irrigation pumping costs. Farm program payments are said to be allocated in an equitable portion, identical to the 20% contribution made to the enterprise by the landowner. (The common notation for this rental percentage can be referenced as an 80% producer share and a 20% landowner share, expressed by the notation 80/20.) A general practice in Arkansas rice production is for the landowner to contribute 25% of the cost of drying the rice crop in exchange for providing land privilege, expressed as a 75/25 agreement. Again, farm program payments are assumed split in the same proportion. For Mississippi rice production, share rental arrangements were less typical, with a cash rent being the preferred rental mechanism of the area. A downside to applying a cash rental rate is determining an 'average' amount from the available data, which was supplied by the Mississippi State University Extension Service. Cash rental rates ranged from $80 to $185 per acre. From the information, an 80/20 rental rate for rice was indicated as a 'common' but less typical share rental arrangement, with the landowner sharing in no production category outside of granting land privileges. In a similar approach to Louisiana and Arkansas, farm program payments to this Mississippi rice farm were allocated 20% to the landowner, with the producer receiving the remaining 80% share.

Since soybeans are also said to be produced on these predominant rice farms, the land rents for this enterprise did vary slightly in one instance. Soybeans produced in southwestern Louisiana were assumed to be under an 85/15 share rental rate where the landowner received 15% of the crop in exchange for providing the land. In the case of the Arkansas farm, the landowner received a 25% share of the crop similar to the rice arrangement. On the Mississippi rice operation, the landowner received a 20% share of the crop.

For the mixed crop farms located in the Mississippi River delta region, an 85/15 rental arrangement was applied to corn and soybean enterprises while a 90/10 share rental arrangement was applied to cotton enterprises. This notation can be interpreted as the landowner receives 15% of the corn and soybean crops, respectively while receiving a 10% share on revenue generated from cotton production. Farm program payments for these crops are allocated in the same proportion. Two reasons for the alternative land charge on cotton were the decline in planted acres across each state and the management intensity of the crop which can make production cost sharing between each vested party expensive compared to cheaper alternative grain crops.

The selection criteria used to determine the product pairing of crop policies to the applicable crops is in conjunction with the predominant type of policy that was purchased in the state over the past three years. The multiple type of product offerings, per enterprise unit, were vetted with extension service personnel in Arkansas, Louisiana, and Mississippi as to determine the applicable policies for the farm. Through this communication, a revenue policy (RP) was assumed to be purchased for corn, cotton, and soybean crops throughout the Mississippi River delta region study area. However, rice is not eligible to receive revenue protection in 2015 according to the USDA RMA (USDA RMA, 2015). In February of 2015, USDA RMA informed producers that revenue plans will automatically function as yield plans for the 2015 crop year. The information regarding the calculation of a price volatility factor, which is used in the calculation of RMA’s premium rates for revenue coverage was not available due to limited liquidly of the rice contact as defined by the Commodity Exchange Price Provisions. The minimum requirements to establish the projected price for revenue coverage were not met according the USDA RMA on February 23, 2015. For crop insurance analysis in this study, it is assumed that revenue coverage is offered to rice producers. Information relating to type of crop insurance product(s) purchased is contained in Table 3.32.

Table 3.32. Crop insurance products applied to representative farms per locale.

Farm Type	State	Locale	Corn Policy	Cotton Policy	Rice Policy	Soybean Policy
R/SY	Arkansas	Arkansas	--	--	RP	RP
CT/SY	Arkansas	Mississippi	--	RP,STAX,SCO	--	RP
CR/CT/SY	Arkansas	Phillips	RP	RP,STAX,SCO	--	RP
R/SY	Louisiana	Acadia	--	--	RP	RP
CT/SY	Louisiana	Tensas	--	RP,STAX,SCO	--	RP
CR/CT/SY	Louisiana	Morehouse	RP	RP,STAX,SCO	--	RP
R/SY	Mississippi	Bolivar	RP	--	RP	RP
CT/SY	Mississippi	Coahoma	--	RP,STAX,SCO	--	RP
CR/CT/SY	Mississippi	Leflore	RP	RP,STAX,SCO	--	RP

Where: RP is a revenue protection insurance policy, STAX is the stacked income protection plan insurance policy only eligible to cotton producers, and SCO is the supplemental coverage option insurance policy. R is rice, SY is soybeans, CT is cotton, and CR is corn.

In order to simulate crop insurance indemnity payments per planted acre of enrolled crops, an insurance projected price and a harvest month price are required for calculation of insurance coverage per county (parish) per crop. Since this pricing information is based on volatility of certain futures month contract prices, a method was applied to approximate the insurance projected price and the harvest month price relative to the simulated MYA price value per model iteration. For example, the difference between the national monthly price at harvest (e.g. November) and the reported MYA price was calculated for each harvest month for the previous ten years. This difference was then randomly applied to the simulated MYA price for each iteration. Recall, this was a similar approach used to determine the season average farm price at the state level. For the insurance projected price, usually determined from the futures contract prices in January and February, the same methodology was applied. The monthly MYA price in February was obtained for the previous ten years and applied to the final reported MYA price during that time span, with the difference being randomly applied to the simulated MYA price per iteration.

The net returns to each crop can be determined by applying Equation 1 to each commodity produced in the crop rotation (where *i* = the covered commodity and *j* = state). Market income to the producer (*GRWINC*) can be expressed as:

$$(1)\ GRWINC_{ij} = \left(P_i * Y_{ij}\right) * GRWSH_{ij}$$

where P_i is the MYA price for the commodity and Y_{ij} is the yield per planted acre for the commodity in the state. Net returns above variable cost ($NRAVC_{ij}$) can be expressed by the following equation considering the producer's share of market income ($GRWSH_{ij}$) relative to land rental percentage. Key production input categories that will be estimated in Equation 2 include: custom farming operations to include spraying and application charges ($CUSTOM_{ij}$), fertilizer ($FERT_{ij}$), herbicides ($HERB_{ij}$), fungicides ($FUNG_{ij}$), insecticides ($INSECT_{ij}$), seed ($SEED_{ij}$), labor via operator and irrigation service ($LABOR_{ij}$), diesel fuel ($FUEL_{ij}$), repair and maintenance (RM_{ij}), and interest on operating capital ($INTEREST_{ij}$). Drying and hauling charges are a function of yield and therefore will vary with the amount of output produced on the farm.

$$(2)\ NRAVC_{ij} = (P_i * Y_{ij} * GRWSH_{ij}) - (CUSTOM_{ij} + FERT_{ij} + HERB_{ij} + FUNG_{ij} + INSECT_{ij} + SEED_{ij} + LABOR_{ij} + FUEL_{ij} + RM_{ij} + INTEREST_{ij}\ )$$

In order to model the contribution of farm program payments to the producer's share of net return per acre, alternative agricultural policy and insurance parameters related to price and income support are evaluated as contained in the 2014 farm bill ($GPINS_{ij}$) estimated by Equation 3. When considering farm program payment parameters of the ARC_{ij} and PLC_{ij} programs and selected crop insurance policies, the net returns above variable cost equation was modified to include the farm program benefits (if the applicable criteria is met in the crop year). The price for the SCO_{ij}, endorsement with the underlying insurance policy (INS_{ij}), and $STAX_j$ are then subtracted from this equation as it is an expense incurred for by the producer. The annual producer premiums are represented by $INSDED_{SCOij}$, $INSDED_{policyij}$, and $INSDED_{STAXij}$.

$$(3)\ GPINS_{ij} = GRWSH_{ij} * \{(yARC_{ij} + 1 - yPLC_{ij} + 1 - ySCO_{ij} + INS_{ij} + STAX_{j})\} - (INSDED_{SCOij} + INSDED_{policyij} + INSDED_{STAXj})$$

Income from all federal government programs and crop insurance policies are listed in the equation above. In Equation 3, the variable *y* is a binary variable where (y = 0) for PLC participation and (y = 1) for ARC participation. Equation 4 calculates the PLC program (not adjusted for the grower's share).

$$(4)\ PLC_{\ ij} = RP_i - MAX\ (MYA_i, LR_i) * PLCYLD_{ij} * 0.85$$

The RP_i identifies the congressionally established reference price for the covered commodity multiplied by the higher of the MYA price or the loan rate (LR_i) of the covered commodity. $PLCYLD_{ij}$ represents the program yield for the covered commodity on record with the local USDA FSA office. Since PLC and ARC program payments are made to the base acres of enrolled covered commodities, the 85% payment rate is applied to the payment, so that this can be recorded by the individual base acre enrolled.

County-level ARC program payments (ARC-CO) are estimated by a series of equations that are performed using a product of national MYA prices and USDA-reported county level yields ($CTYYLD_{ij}$). No individual farm data are used in the calculation and ultimately the determination of ARC-CO payments other than the applicable number of the base acres of the covered commodity that exists on the farm. The ARC-CO actual revenue equation is determined by applying Equation 5 to the model.

$$(5)\ ARCCOACTREV_{ij} = CTYYLD_{ij} * MAX\ (MAY_i, LR_i)$$

In this equation, $ARCCOACTREV_{ij}$ is the actual revenue for the crop year in the referenced county obtained by the product of the reported county yield and the higher of the MYA price or the loan rate (LR_i) for the covered commodity. The ARC-CO benchmark revenue ($ARCCOBENCH_{ij}$) is determined by applying Equation 6. This equation obtains the previous five year Olympic average yield for the county and the five year Olympic average of the higher of the MYA or the LR for the covered commodity.

$$(6)\ ARCCOBENCH_{ij} = \frac{\sum_1^5 ij\ \left(\left(CTYYLD_{IJ1} + \cdots + CTYYLD_{IJ5}\right) - MAX\left(CTYYLD_{IJ1} + \cdots + CTYYLD_{IJ}\right) - MIN\left(CTYYLD_{IJ1} + \cdots + CTYYLD_{IJ5}\right)\right) * \sum_1^5 ij\ ((MYA_{i1}, LR_{i1}) + \cdots + (MYA_{i5}, LR_{i5}) - MAX\ (MYA_{i1}, LR_{i1} + \cdots + MYA_{i5}, LR_{i5}) - Min\ (MYA_{i1}, LR_{i1} + \cdots + MYA_{i5}, LR_{i5}))}{3}$$

The ARC-CO revenue guarantee ($ARCCOREVGUART_{ij}$) is calculated by Equation 7, which is simply 86% of the benchmark revenue measure $ARCCOBENCH_{ij}$, obtained in Equation 6.

$$(7)\ ARCCOREVGUART_{ij} = ARCCOBENCH_{ij} * 0.86$$

In the likelihood that the $ARCCOACTREV_{ij}$ is less than the $ARCCOREVGUART_{ij}$, the difference is applied as a program payment on 85% of the base acres of the covered commodity present on the individual farm. However, there is a limit on the size of the ARC-CO payment. The congressionally-imposed limit is 10% of the benchmark revenue.

Insurance policies have the potential to vary by coverage type and protection level for different commodities produced on the representative farms in the region. Equations 8 through 10 represent an example of yield protection coverage where the insurance guarantee ($INSGUAR_{ij}$) is equal to the insured acres $INSACRES_{ij}$ times the yield protection level and projected insurance policy price, PP_i. The value of this protection is denoted by the $INSVPROTECT_{ij}$ formula which is the product of the protection level ($PROTLEVEL_{ij}$) and the projected policy price (PP_i). An insurance indemnity payment is made when the guarantee exceeds the protection level afford to producers thorough this specific policy for the commodity, expressed by INS_{ij}.

$$(8)\ INSGUAR_{ij} = INSACRES_{ij} * YP_{ij} * PP_i$$

$$(9)\ INSVPROTECT_{ij} = PROTLEVEL_{ij} * PP_i$$

$$(10)\ INS_{ij} = INSGUAR_{ij} - INSVPROTECT_{ij}$$

In Equation 11, the SCO protection is calculated (SCO_{ij}). The 2014 farm bill establishes the maximum amount of coverage when the county revenue from the commodity falls below 86%. The SCO endorsement pays out its full amount when county revenue falls to the coverage level percent of its expected level (always equal to the percent of the underlying policy), expressed as 86 less the $YPROT_{ij}$ level. The percent of the commodity covered by SCO is the difference between the two.

$$(11)\ SCO_{ij} = \left(86 - YPROT_{ij}\right) * (YP_{ij} * PP_{ij})$$

As an alternative to the yield protection aspect of the supplemental coverage option, Equations 12 through 22 present the necessary calculations for the operational mechanics of the SCO endorsement that is paired with an underlying revenue protection policy to be presented. Equation 12 calculates the expected revenue for the area ($SCOEXPCTYREV_{ij}$), or county. This is not based on any individual characteristics of the farm. Where $EXPCTYYLD_{ij}$ is the expected county level yield, released by USDA RMA and $BASEPRICE_i$ is the insurance projected price.

$$(12)\ SCOEXPCTYREV_{ij} = \left(EXPCTYYLD_{ij} * \ BASEPRICE_i\right)$$

Equation 13 and 14 calculate the upper and lower bounds of the SCO policy, denoted by the $SCOTRIGGERUPPER_{ij}$ and $SCOTRIGGERLOWER_{ij}$ variables. Here it is assumed that 75% is the coverage level of the required underlying insurance policy.

$$(13)\ SCOTRIGGERUPPER_{ij} = 0.86 * \left(SCOEXPCTYREV_{ij}\right)$$
$$(14)\ SCOTRIGGERLOWER_{ij} = 0.75 * \left(SCOEXPTCTYREV_{ij}\right)$$

SCO coverage range ($SCORANGE_{ij}$) is calculated by Equation 15. This is expressed as the difference between the coverage bands of the policy.

$$(15)\ SCORANGE_{ij} = (SCOTRIGGERUPPER_{ij} - SCOTRIGGERLOWER_{ij})$$

SCO actual revenue equation ($SCOACTREV_{ij}$) is obtain throught the application of Equation 16. In this equation, the actual revenue is determined by the product of the actual county-level yield ($ACTCTYYLD_{ij}$) and the reported USDA RMA insurance harvest price, $HARVTPRICE_i$.

$$(16)\ SCOACTREV_{ij} = (ACTCTYYLD_{ij} * HARVTPRICE_i)$$

Next, the SCO percent loss factor ($SCOPERCENTLOSS_{ij}$) is determined. Equation 17 applies the difference between the trigger level (Equations 13 and 14) and the actual revenue (Equation 16) divided by the SCO coverage range as presented in Equation 15.

$$(17)\ SCOPERCENTLOSS_{ij} = \frac{SCOTRIGGER_{ij} - SCOACTREV_{ij}}{SCORANGE_{ij}}$$

Equation 18 represents the SCO expected farm revenue, $EXPFARMREV_{ij}$. This is a key determination of the potential indemnity as this equation ‘scales’ the area loss to the individual farm’s APH.

$$(18)\ EXPFARMREV_{ij} = (APH_{ij} * BASEPRICE_i)$$

Equation 19 is the determination of the SCO threshold revenue ($SCOTHRESH_{ij}$). This equation relies on the expected farm revenue calculated in Equation 18. Note that this is a factor of the maximum coverage range for the SCO endorsement of 86%.

$$(19)\ SCOTHRESH_{ij} = 0.86 * \ EXPFARMREV_{ij}$$

SCO revenue insured liability, considering the underlying revenue protection policy, ($RPINSLIAB_{ij}$) is presented by Equation 20. Recall, in this example, the underlying policy was revenue-protected at a coverage level of 75%, therefore 75% is applied to the liability calculation. This is used to determine if the SCO and the underlying policy each produce an indemnity payment for the crop year.

$$(20)\ RPINSLIAB_{ij} = 0.75 * EXPFARMREV_{ij}$$

SCO insurance liability ($SCOINSLIAB_{ij}$) is calculated by Equation 21, which takes the difference between the SCO threshold (Equation 19) and the revenue insurance liability (Equation 20).

$$(21)\ SCOINSLIAB_{ij} = \left(SCOTHRESH_{ij} - RPINSLIAB_{ij}\right)$$

The SCO indemnity ($SCOINDEM_{ij}$) is obtained, by applying Equation 22 to the model.

$$(22)\ SCOINDEM_{ij} = (SCOINSLIAB_{ij} * SCOPERCENTLOSS_{ij})$$

Another insurance product scheduled for released in 2015 is the STAX program. STAX protection for producers of upland cotton is applicable when revenue falls below 90% of its expected level. Payments reach the maximum when area revenue falls to 70%. The $PROTFACTOR_j$ variable represent the protection factor that is selected by the producer that is a scalar of the expected revenue, ranging from 0.80 to 1.20. Where the subscript j is the state in which the representative farm is located. The STAX expected revenue is presented in Equation 23. As previously stated, STAX borrows from the mechanics of the SCO program as both are designed to work as area-wide insurance policies that guard against shallow losses that a traditional underlying policy may not cover. The expected revenue ($STAXEXPREV_j$) is the product of the insurance projected price (PP_i) and the expected county revenue as previously determined under the SCO calculation.

$$(23)\ STAXEXPREV_j = (PP_i * EXPCTYREV_j)$$

The STAX actual county-level revenue ($STAXACTCTYREV_j$) equation is denoted by Equation 24. It can be explained as the product of the insurance projected price reported by USDA RMA and the yield for the area ($ACTCTYYLD_j$).

$$(24)\ STAXACTCTYREV_j = (INSHARVTPRICE_j * ACTCTYYLD_j)$$

STAX indemnity ($STAXINDEM_j$) is calculated by Equation 25. For this example, the indemnity is the minimum value of the upper coverage level (90%), multiplied by the difference between the expected revenue for the area and the actual revenue ($STAXACTREV_j$) or 20% of the expected revenue.

$$(25)\ STAXINDEM_j = MIN\left((0.90 * STAXEXPREV_j - STAXACTREV_j\right), (0.20 * STAXEXPREV_j))$$

The STAX premium ($STAXP_j$) equation is calculated by applying Equation 26 to the model. The USDA RMA will publish the premium rates associated with irrigation practice, coverage level, and protector factor multiplier for each county. This factor is represented by the variable RMAPRATE.

$$(26)\ STAXP_j = \left(0.90 * \left(EXPCTYYLD_j * INSPROJPRICE_j\right)\right) * PROTFACTOR_j * RMAPRATE * 0.20$$

Specific to the producers of cotton, Title I of the Agricultural Act of 2014 grants cotton transition assistance payments ($CTAP_j$) for the 2014 crop year. That payment is made regardless of MYA price or production levels of cotton that is produced on the farm. The payment amount of the CTAP is $0.09 per pound. Adjusting for the fact that this program payment is made on 85% of the existing 2013 cotton base acres on the farm, the CTAPRATE becomes $0.054 per pound per base acre. In equation 27, the cotton transition assistance payment $CTAPPYMTi_j$ is calculated. The $DPYLD_{ij}$ is the direct payment program yield on file with the local USDA FSA office, as in effect for the previous farm bill. For CTAP, the mandatory 7.2% sequestration rate, authorized by the Budget Control act of 2011 is applied to the payment formula.

$$(27)\ CTAPPYMT_j = \{(CTAP_j * \ DPYLD_{ij}\ ) * BASEACRES_{ij}\} * 0.923$$

Total income to the producer ($GRWINC_{ij}$) is then expressed by Equation 28 for each commodity produced on the representative farm. Economic gains from farm program payments and crop insurance indemnities are considered in this financial indicator.

$$(28)\ GRWINC_{ij} = NRAVC_{ij} + GPINS_{ij}$$

Alternative risk preferences of different agricultural producers in each Mississippi River delta state can then be evaluated using a stochastic efficiency with respect to a function criteria (SERF). SERF operates by identifying utility efficient alternatives for ranges of risk attitudes, not by finding a subset of dominated alternatives (Hardaker, et al., 2004). SERF can be applied for any utility function for which the inverse function can be computed based on ranges in the absolute, relative, or partial risk coefficient and will pick only the utility efficient alternatives by comparing each with another simultaneously. The utility function (U) of a decision maker is as follows with the performance criterion (w) representing wealth. In this research, the wealth variable can be expressed as the producer's share of net return per acre across each representative farming location, expressed by Equation 29.

$$(29)\ U\ (w)$$

In this utility function the argument representing the net return above variable cost for the farm can be extrapolated to include components of Equation 28 into Equation 30.

$$(30)\ U\left(w_{ij}\right) = \ NRAVC_{ij} + GPINS_{ij}$$

Following research by Hardaker, et al., (2004) this research will examine different levels of alternative farm program choices paired with and without crop insurance products that will compare uncertain outcomes, so values of w are stochastic. Utility functions are then converted into CE values be taking the inverse of the utility function stated above and resulting in Equation 31.

$$(31)\ CE\left(w, r(w)\right) = U^{-1}(w, r(w))$$

The calculation depends on the utility function specified. Similar to the negative exponential utility function employed in Bryant, et al., (2008) and Williams, et al., (2012), the risk aversion coefficient is defined below. This represents the ratio of the second and first derivatives of the producer's utility function, U(w). In the equation that follows represents the Arrow-Pratt measure of relative risk aversion denoted by Equation 32.

$$(32)\ r_{\ a}(w) = \frac{-u''(w)}{u'(w)}$$

Following Meyer, (1977) representation of a decision marker's preferences, can be interpreted as a measure of that decision maker's absolute aversion to risk. Restrictions on r(w) can be viewed as specifying a lower r_1(w) and upper bound r_2(w) on the degree of risk aversion for the agents in the set being considered. A decision marker's utility function can be expressed by Equations 33 and 34.

$$(33)\ r_1\ (w) \leq r\ (w) \leq r_2\ (w)$$

$$(34)\ r_1\ (w) \leq \frac{-u''(w)}{u'(w)} \leq r_2\ (w)$$

Schumann, et al., (2004) denotes classes of utility functions typically used in classical stochastic efficiency utility analysis that exhibit concavity in the range of risk aversion. The negative exponential utility function assumes constant absolute risk aversion while the power utility function considers relative risk aversion. Two functional forms of interest are the negative exponential and the power functions in equations 35 and 36.

$$(35)\ U\ (w) = -\exp(-r_a\ w)$$

$$(36)\ U\ (w) = \frac{1}{1-r}\ w^{1-r}$$

In similar to the research conducted by Schumann, et al., (2004), the two utility functions are characterized by their respective risk aversion coefficients, or more specifically, their relative risk aversion coefficients. The expected risk aversion coefficients are based on the same distributional assumptions regarding the CE. The CDFs of the simulated net return for commodity *i* in state *j* per rotational systems were sorted into SERF analysis. Crop rotations along with properties of policy program election were ranked by CE values. Risk premiums could then be calculated by subtracting the CE of the less preferred option and rotation from the preferred strategy.

CHAPTER 4: RESULTS

"Current revenue-based crop insurance programs offer opportunities to cover deep losses but not those that occur when prices or crop yields fall below the long-term trend yields. With today's high input costs, such shallow losses can put a producer out of business" (Laws, 2011). This statement by a popular press farm magazine summaries the interrelationship between farm programs and crop insurance products while suggesting that these 'shallow losses' may be shallow enough to substantially reduce farm revenue. Therefore, in mitigating shallow losses that may occur to the area (and to the farm), the question becomes one of how effective can combinations of farm programs and crop insurance products provide the safety net to agricultural producers for the next five years.

Through simulation modeling of farm production inputs, market prices, and yield levels; net returns per acre to the producer can be measured given historical trends in the Mississippi River delta region. The current farm safety net afforded to agricultural producers via price and income support programs are a key farm income dimension to all major row crop farms. This research aims to evaluate the economic effect of key provisions of the 2014 farm bill which reauthorizes agricultural programs through the 2018 crop year. Those provisions are: (1) the economic consequences of repealing (eliminating) direct payment, counter-cyclical payment, and the ACRE program payments on producer profitability while evaluating the establishment of the ARC and PLC programs. In addition, the SCO and STAX programs are analyzed to measure the area-wide revenue insurance effect on producer returns, and ultimately profitability, on different representative farming operations in the region. These policy programs represent significant change to domestic farm policy and, as such, warrant an economic evaluation presented in a policy context.

Simulation analysis allows the simultaneous evaluation of market price and production cost volatility coupled with yield variability on the farm. The simulated market price and yield level are utilized in evaluating the circumstance in which farm program payments are issued (assuming prevailing conditions exist). The historical trend component of this analysis enables the simulated production parameters to lie within the actual upper and lower bounds of reported bounds for the past ten-years. This historical reference period will serve as an accurate depiction of the range (or movement) of prices, yields, and production costs observed by agricultural producers in three diverse regions of each locale. The program and policy-driven simulated economic return data from each crop production system per locale were used in the SERF analysis. SERF was used to rank the various systems using utility-weighted certainty equivalents for various degrees of risk aversion. The certainty equivalents were used to calculate risk premiums at each risk aversion level. The producer's share of net returns above variable costs were originated from common cost categories contained in enterprise budgets developed for each representative farm. The risk premium for a risk-averse decision maker reflects the minimum amount (dollars per acre) that a decision-maker has to be paid to justify a switch from the preferred strategy to a less-preferred strategy under a specific risk aversion coefficient.

Net returns above variable costs for alternative crop rotations on representative farms are calculated as a function of market receipts, government payments, and crop insurance indemnities for multiple crop mixes produced on the farm over the five year duration of the farm bill. Return variability at the acre- and whole farm-level are presented for each state in the region. For example, the producer net returns are presented for a typical rice and soybean farm located in each state in the study area. Net return variability will be a function of the historic regional yield trend, national market prices, and farm program and crop insurance choice give cropping pattern of the model farm. Acreage allocation on the representative farms were obtained through personal communication with extension service personnel. Given the suite of farm program and crop insurance choices afforded to producers in the region, results are classified by: crop rotation, farm program choice, and risk preferences estimated through a producer's utility function. Competing crop choices, regional yield trends, and farm program and crop insurance options factor into the categorical grouping of producers with their risk preference measured through the utility function.

Tables 4.1 and 4.2 contain descriptive statistics of the policy scenarios that are considered for each representative farm in the study, relative to the crop produced on each farm. It is also assumed that all crops are eligible to participate in the marketing assistance loan program. In the case of cotton, producers are assumed to have a direct payment yield of 750 pounds per acre, corresponding to the individual farm's payment yield on record with their local USDA FSA office. This assumption on payment yield is necessary for the purposes of calculating a 2014 CTAP payment calculation is applied uniformly to all farms in the study area that have existing cotton base. Since the STAX insurance product is available to all cotton-producing counties (parishes) for 2014 there is not expected to be a CTAP payment authorized for the 2015 crop year. Also, in accordance with federal farm law, SCO and STAX are offered through USDA RMA beginning with the 2015 crop year. Another policy-impose structural component of the model is that rice is assumed to have a RP insurance policy for the 2014 through 2018 crop years.

Table 4.1. Description of farm program and insurance policy selection on representative rice and soybean farms in Arkansas, Louisiana, and Mississippi.

Policy Option	Rice Commodity Program	Soybean Commodity Program	Rice Insurance Policy	Soybean Insurance Policy
1	ARC-CO	PLC	RP	RP, SCO
2	PLC	ARC-CO	--	--
3	PLC	ARC-CO	RP, SCO	RP

Table 4.2. Description of farm program and insurance policy selection on representative corn, cotton, and soybean farms in Arkansas, Louisiana, and Mississippi.

Policy Option	Corn Commodity Program	Soybean Commodity Program	Cotton Insurance Policy	Corn Insurance Policy	Soybean Insurance Policy
1	ARC-CO	ARC-CO	--	--	--
2	ARC-CO	ARC-CO	SCO	RP	RP
3	ARC-CO	ARC-CO	STAX	RP	RP
4	ARC-CO	PLC	STAX	RP	RP, SCO
5	PLC	ARC-CO	STAX	RP, SCO	RP

Results in Table 4.3 to 4.11 are presented as the cumulative sum of the grower's share of net returns above variable costs for the entire life of the farm bill. A net present value (NPV) calculation was preformed that imposed an arbitrary 3% interest rate. This economic measure of the farm's performance represents the average return across 5,000 iterations per crop per representative farm over the past five years. The formula for the NPV_{ij} calculation is presented by Equation 37. Where j represents the crop enterprise on each representative farm in each of the five years (n) of the farm bill and i is the interest rate.

$$(37)\ NPV_{ij} = \sum_{n=1}^{5} \frac{GRWINC_{ij}}{(1+i)^n}$$

Values represent the CE (cumulative NPV returns above variable costs to the producer) at varying levels of risk aversion for each policy scenario examined per farm location. Appendix C presents a complete range of CE across varying levels pf risk per policy option.

4.1 Representative Rice and Soybean Farms

Results in Table 4.3 for the 3,000 acres rice and soybean farm in Arkansas County, Arkansas, indicate that policy option number 2 generated the highest level of cumulative net returns to the grower over the duration of the farm bill. This policy option is described as enrolling rice in the PLC program while electing to enroll soybeans into the county-level ARC program (ARC-CO). Crop insurance was not purchased for either crop under this policy scenario. Since crop insurance was not selected and further assumed to not be purchased in the five-year horizon. Soybeans are not eligible to carry an SCO insurance endorsement, as stipulated by statute. Across all levels of risk, policy option number 2 dominated both policy option number 1 and option number 3 as indicated by the largest NPV value (cumulative per acre returns above variable costs to the producer). Although, it can be observed from Figure 4.1 that at increasing levels of risk, policy option 3 appears to reduce the difference in return generation compared to policy option 2 in being the preferred policy option; even as the net return value is reduced. For example, a risk neutral producer (where RAC=0) under policy number 2 is estimated to net $1,361.55 per acre above variable costs. This policy option is $136.08 greater than policy option 3 and $318.30 superior to policy option 1. However, as the risk aversion coefficient increases to 0.0014913, the mean return for all policy options can be estimated as $868.35 for policy option 1, $1,176.88 for policy option 2, and $1,079.36 for policy option 3. This equates to the difference in policy 2 domination to become reduced ($97.44 over policy option 3 and $308.53 over policy option number 1) as the RAC increases in value away from the neutrality position. For the producer who is extremely risk averse (RAC=0.0029826), policy option 2 is still the preferred option, however the return difference from policy option 3 is now $64.98 and still a substantial $294.41 difference over policy option 1.

Table 4.3. Mean net returns above variable production costs to the producer, Arkansas County, Arkansas over the 2014 through 2018 crop years.

Policy Option	Rice Commodity Program	Soybean Commodity Program	Rice Insurance Policy	Soybean Insurance Policy	NPV per acre to Producer ($)
1	ARC-CO	PLC	RP	RP, SCO	$1,043.25
2	PLC	ARC-CO	--	--	$1,361.55
3	PLC	ARC-CO	RP, SCO	RP	$1,225.47

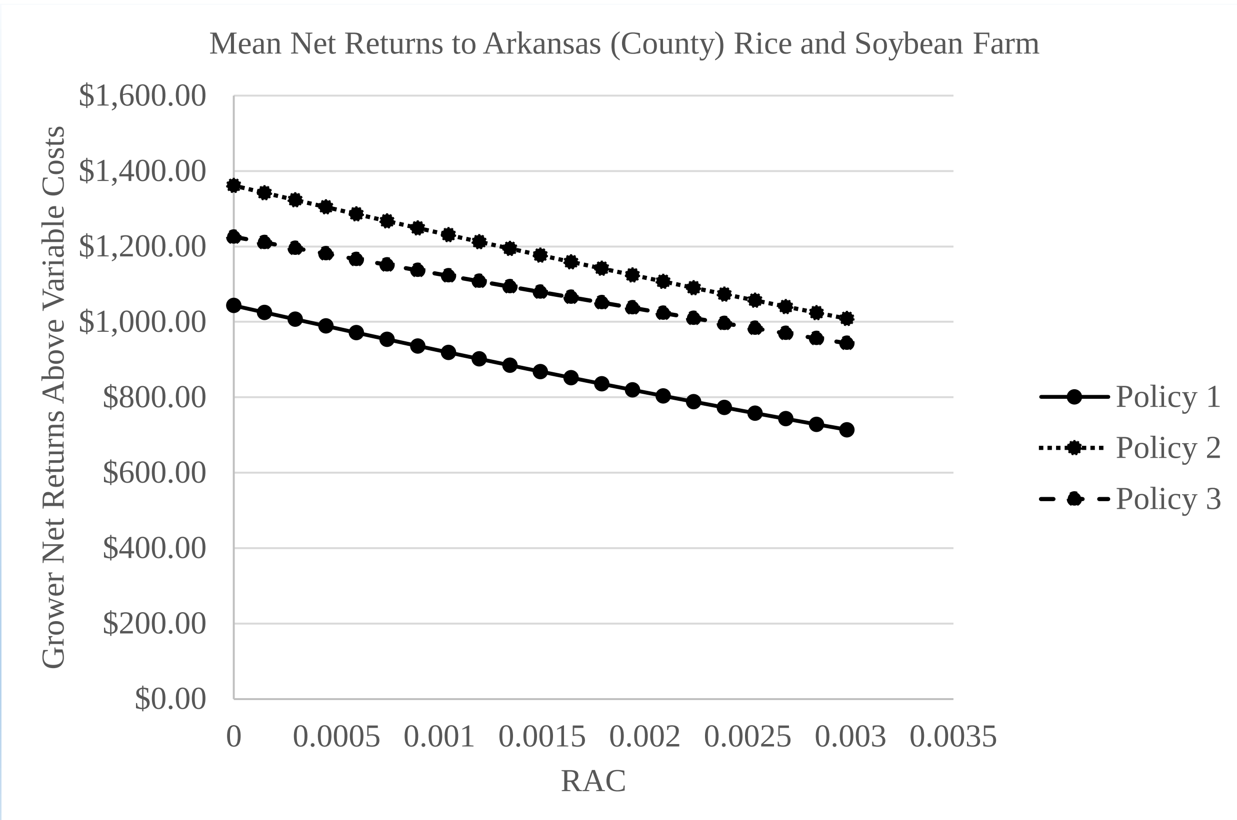

Figure 4.1. SERF results for a representative Arkansas County, AR farm.

For the representative rice and soybean farm in Acadia Parish, Louisiana, unique production practices are considered to be typical of the southwestern rice-producing area of the state. As previously stated, approximately one-quarter of the farm's total acreage is left out of production (fallow) as a means to preserve soil productivity and combat red rice infestations associated with the potential production of crawfish in the winter/spring season. Therefore, the production costs for fallow field activities consisting of multiple diskings and an herbicide application are weighted to reflect this cost to the farming operation. Also, a ratoon rice crop is produced on an apportionment of the rice acres, and is such considered in the economic performance of the farm. Results in Table 4.4 suggest that the mean net returns to the farm over the duration of the farm bill are greatest when policy option 2 is selected. Figure 4.2. This is also the case with the representative rice and soybeans farm in Arkansas County, Arkansas. Policy option 2 consists of rice enrolled in the PLC program and soybeans enrolled in the ARC-CO program dominate both policy alternatives that are presented. For the risk neutral producer (RAC=0), policy option 2 dominates policy option 3 by $60.21 per acre and policy option 1 by a much larger amount, $187.03 per acre. These estimates represent the cumulative sum (adjusted by the NPV calculation) of returns to the producer over the five year life of the farm bill. As the RAC increases to 0.0031006, policy option 2 dominates policy option 3 by a slightly smaller amount ($55.47) and dominated policy option 1 by a larger $215.19 amount. For a risk averse producer at RAC of 0.0062012, policy option 2 is preferred to policy option 3 by an amount of $51.27 per acre and $244.64 over policy option 1. One conclusion that can be drawn from this representative farm is that policy option 2 consistently dominated policy option 3 by roughly $51 to $60 per acre across all risk aversion coefficient levels. This was not seen on the representative rice and soybean farm in Arkansas County, Arkansas, whereas the RAC increased, the policy bundle ‘premium’ actually decreased between options 2 and 3.

Table 4.4. Mean net returns above variable production costs to the producer, Acadia Parish, Louisiana over the 2014 through 2018 crop years.

Policy Option	Rice Commodity Program	Soybean Commodity Program	Rice Insurance Policy	Soybean Insurance Policy	NPV per acre to Producer ($)
1	ARC-CO	PLC	RP	RP, SCO	$540.42
2	PLC	ARC-CO	--	--	$727.45
3	PLC	ARC-CO	RP, SCO	RP	$667.24

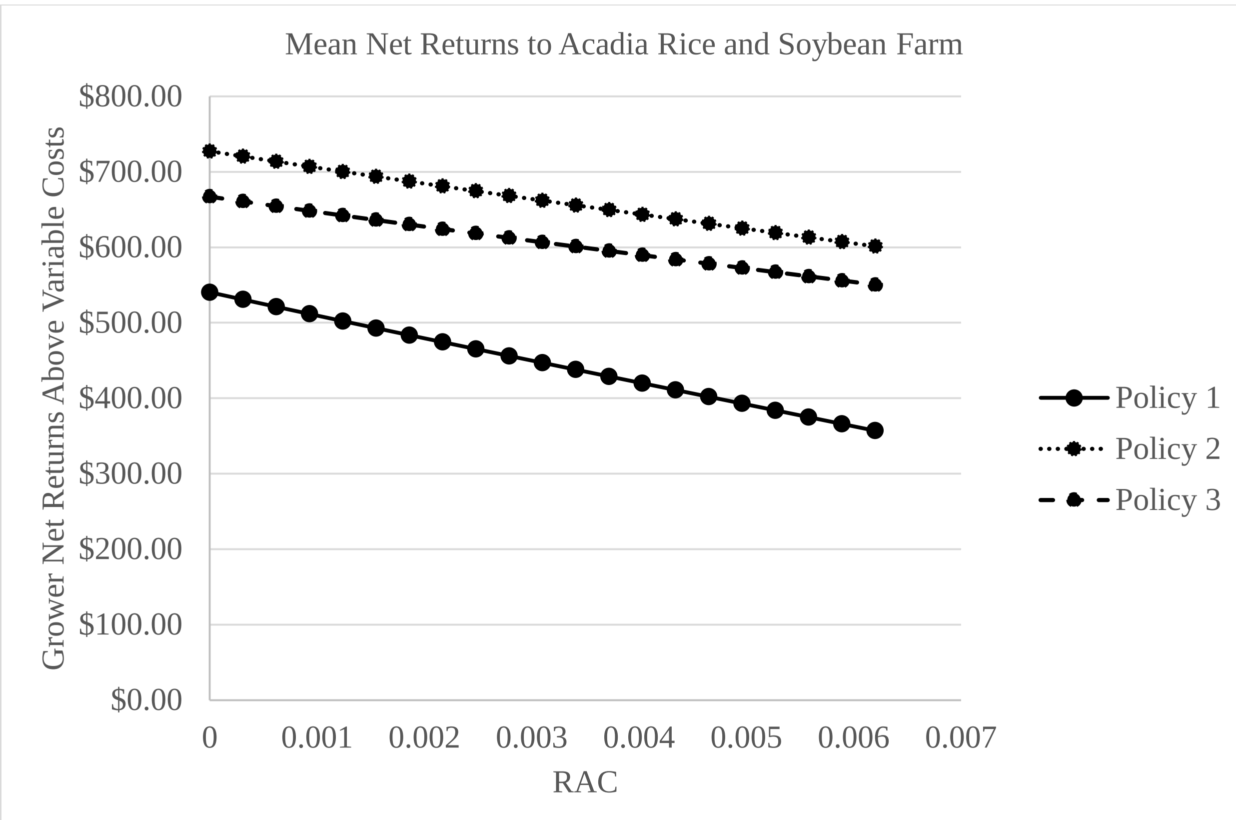

Figure 4.2. SERF results for a representative Acadia Parish, LA farm.

The final rice and soybean farm in the Mississippi River delta region is located in Bolivar County, Mississippi. Results in Table 4.5 again indicate that the preferred policy option for the risk neutral producer is policy option number 2. Policy option 2 dominates all other policy scenarios presented across all level of imposed risk. Figure 4.3. Policy option 2 produces cumulative five year returns per acre above variable costs of $50.57 over policy option 3 and $193.20 over policy option 1. As the RAC increases, similar results to those of the Acadia Parish farm can be observed. At a RAC of 0.0035963, policy option 2 exceeds policy option 3 by $48.81 and policy option 1 by $205.82 per acre, respectively. For the extreme risk averse producer (RAC=0.0071926) policy option 2 dominated policy option 3 by nearly an identical amount of $48.82 per acre and policy option 1 by a substantial $2014.75 per acre. A notable difference with this Bolivar County, Mississippi farm is that policy option 2 of rice enrolled in the PLC program and soybeans enrolled in the ARC-CO program consistently result in returns of approximately $50 per acre greater than the alternative policy choices presented. This behavior was observed with the Acadia Parish farm, although by a slightly larger return variation level.

Table 4.5. Mean net returns above variable production costs to the producer, Bolivar County, Mississippi over the 2014 through 2018 crop years.

Policy Option	Rice Commodity Program	Soybean Commodity Program	Rice Insurance Policy	Soybean Insurance Policy	NPV per acre to Producer ($)
1	ARC-CO	PLC	RP	RP, SCO	$444.19
2	PLC	ARC-CO	--	--	$637.39
3	PLC	ARC-CO	RP, SCO	RP	$586.82

4.2 Representative Corn, Cotton, and Soybean Farms

Results in Table 4.6 are associated with a corn, cotton, and soybean farm located in Mississippi County, Arkansas. For this mixed crop farm, five policy alternatives were analyzed. For the risk neutral producer (RAC=0), policy option 1 dominated the remaining policy considerations. Policy option 1 consisted of corn and soybean crops being enrolled in the ARC-CO program

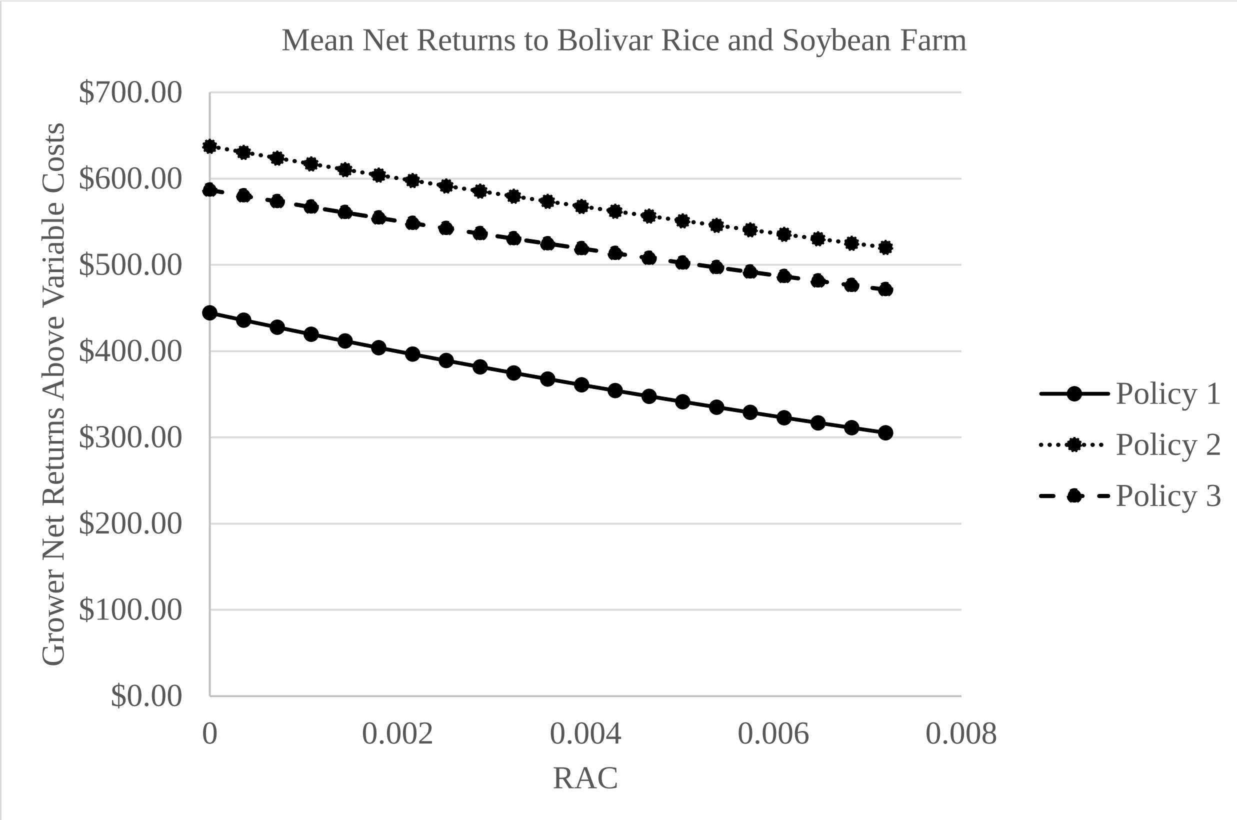

Figure 4.3. SERF results for a representative Bolivar County, MS farm.

while cotton was not selected to carry either the SCO or STAX insurance endorsement. This option dominated option 2 by $80.61; option 3 by $52.93; option 4 by $48.72; and option 5 by $35.22 per acre, respectively. Among policy options 2 through 5 that elected to carry either SCO or STAX insurance endorsement on the farm's cotton acres, policy option 5 was the preferred choice to the risk neutral producer. This option enrolled corn in the PLC program and soybeans into the ARC-CO program. Cotton did receive a fixed CTAP payment only in the 2014 crop year. Interestingly, in terms of the insurance policies obtained for the farm, cotton enrolled in the STAX program (20% coverage with a 1.2 protection factor), corn carried the option SCO endorsement to supplement the underlying 75% RP policy, and soybeans carried a 75% RP policy, the differences in preferred policies changed. Comparing only the insurance-based policy scenarios, policy option 5 dominated policy 2 by $45.39; option 3 by $17.71; and option 4 by $13.50 per acre, respectively over the life of the bill.

As the RAC increased, the competing policy alternatives returns started to become reduced. At a RAC of 0.0094304, policy option 1 dominated all other options with a cumulative return of $136.57 per acre. However, this was a reduction of $119.01 from a risk neutral standpoint. Of the insurance-based policy alternatives, policy option 5 was still the preferred choice yielding $115.62 cumulative net returns to the grower over the duration of the farm bill. At this RAC level, policy option 5 dominated policy option 2 by $57.26; option 3 by $30.25; and option 4 by $22.71 per acre, respectively. At a RAC of 0.0188608 (extreme risk aversion), policy option 1 is still preferred at $60.03 per acre. Policy option 2 results in the producer not generating a net return above variable costs (-$19.76 per acre). Policy option 3 results in the producer exceeding variable costs by $7.36 per acre. Policy options 4 and 5 result in the greatest cumulative returns of all the insurance-based policy alternatives, at $19.44 and $46.39 per acre, respectively.

Table 4.6. Mean net returns above variable production costs to the producer, Mississippi County, Arkansas over the 2014 through 2018 crop years.

Policy Option	Corn Commodity Program	Soybean Commodity Program	Cotton Insurance Policy	Corn Insurance Policy	Soybean Insurance Policy	NPV per acre to Producer ($)
1	ARC-CO	ARC-CO	--	--	--	$255.58
2	ARC-CO	ARC-CO	SCO	RP	RP	$174.97
3	ARC-CO	ARC-CO	STAX	RP	RP	$202.65
4	ARC-CO	PLC	STAX	RP	RP, SCO	$206.85
5	PLC	ARC-CO	STAX	RP, SCO	RP	$220.36

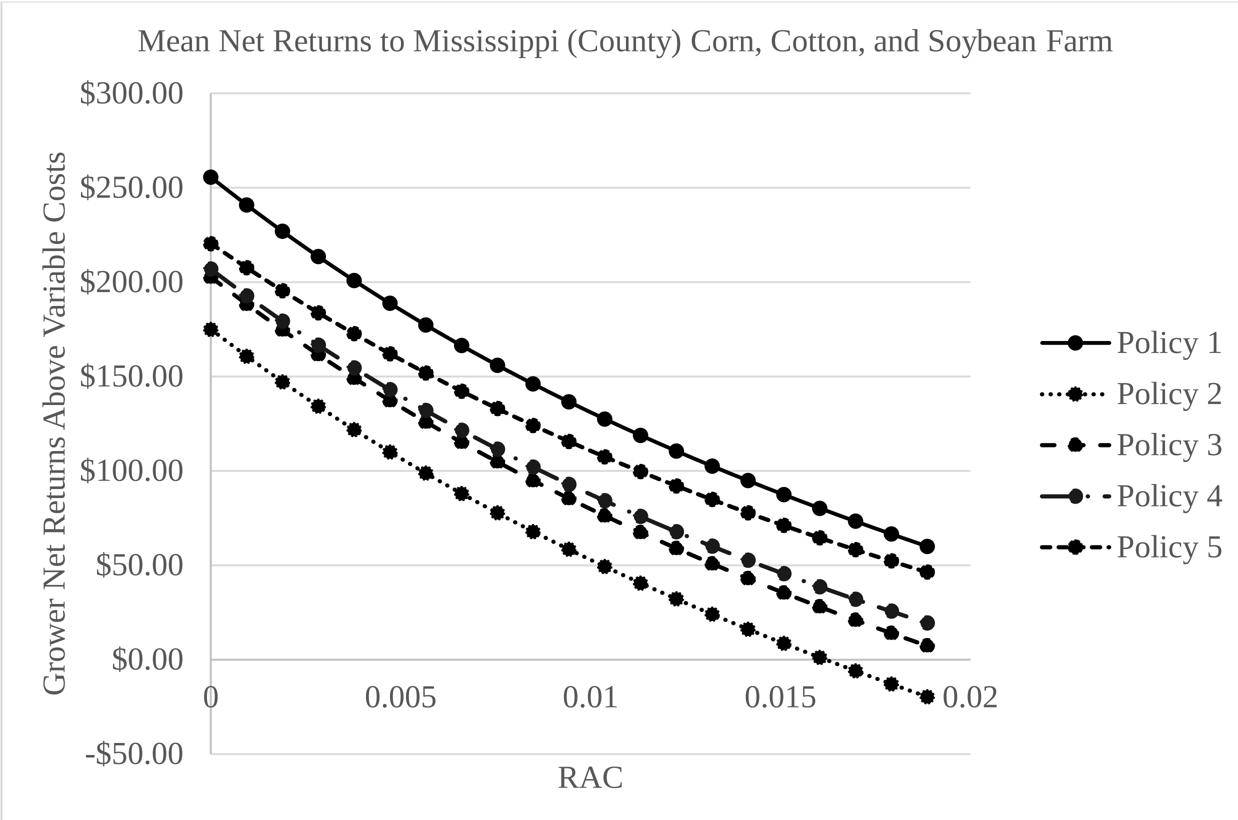

Figure 4.4 SERF results for a representative Mississippi County, AR farm.

In the final representative farm located in the state of Arkansas, a corn, cotton, and soybean farm was constructed to model production of Phillips County. For this mixed crop farm located in the Arkansas delta region, policy option 1 dominated all policy alternatives that were presented. However, results in Table 4.7 indicated that policy option 1 was preferred by only $0.86 per acre to policy option 5 at a RAC equal to 0. Of the previous farm models examined, these policy options are comparable in the amount of cumulative returns generated. Figure 4.5. Although this same outcome persisted for the Mississippi County, Arkansas farm, the difference between policy option 1 and option 5 were not as close ($35.22 per acre).

Table 4.7. Mean net returns above variable production costs to the producer, Phillips County, Arkansas over the 2014 through 2018 crop years.

Policy Option	Corn Commodity Program	Soybean Commodity Program	Cotton Insurance Policy	Corn Insurance Policy	Soybean Insurance Policy	NPV per acre to Producer ($)
1	ARC-CO	ARC-CO	--	--	--	$243.85
2	ARC-CO	ARC-CO	SCO	RP	RP	$160.81
3	ARC-CO	ARC-CO	STAX	RP	RP	$216.72
4	ARC-CO	PLC	STAX	RP	RP, SCO	$207.99
5	PLC	ARC-CO	STAX	RP, SCO	RP	$242.99

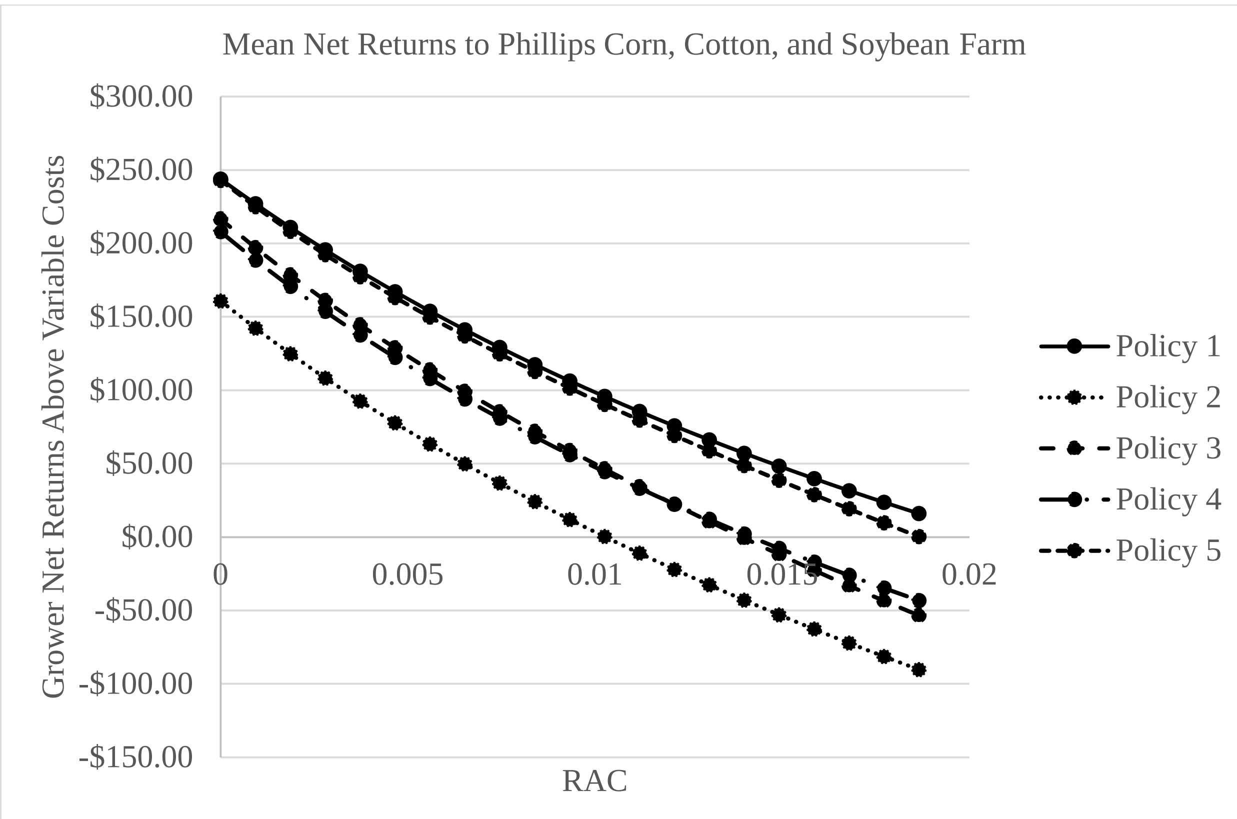

Figure 4.5 SERF results for a representative Phillips County, AR farm.

Policy option 1 is preferred to policy option 2 by $83.04; option 3 by $27.13; and option 4 by $35.95 per acre, respectively. Of the insurance-based policy alternatives, policy option 5 dominated policy option 2 by $82.18; option 3 by $26.27; and option 4 by $35.00 per acre, respectively. The same policy considerations for the STAX insurance endorsement were held consistent (20% coverage with a 1.2 protection factor).

As the RAC is increased 0.0093253, policy option 1 remain the dominant choice for the farm manager at $106.38 per acre, as compared to the $101.50 return generated by policy option 5. As the level of risk aversion increases, the difference between these two policy alternative widens ($0.86 at RAC of 0 to $4.88 per acre at an RAC of 0.0093253). Another observable note is that with the increase of the RAC, the difference between policy options 3 and 4 seems to decrease. This would indicate that as the risk coefficient increases, policy option 4 can dominate policy option 3 ($0.13 per acre) in a pairwise comparison at levels greater than 0.0093253. Such is the case at a RAC value of 0.0121229, where policy option 4 is preferred to policy option 3. At this level of risk aversion, the cumulative return generated to the Phillips County farm are $75.67 by policy option 1, the dominant option; $69.16 by option 5; $22.45 for option 4; $22.32 for option 3; and -$22.03 for policy option 2. At a high level of risk aversion (RAC=0.0186506) policy options1 ($16.01) and policy option 5 ($0.27) are the only option generating a positive cumulative return per acre to the producer.

Results in Table 4.8 illustrate the policy effect of farm program and crop insurance products on a representative corn, cotton, and soybean farm located in the Louisiana delta, specifically Morehouse Parish. Results at levels of risk neutrality are similar to the Phillips County farm, with policy option 1 ($674.65 per acre) slightly dominating policy option 5 ($672.93 per acre). Policy option 1 is preferred by a risk neutral producer (RAC=0) by $61.01 over option 2; $34.42 over option 3; $47.47 over option 4; and over option 5 by $1.72 per acre, respectively. Figure 4.6.

Table 4.8. Mean net returns above variable production costs to the producer, Morehouse Parish, Louisiana over the 2014 through 2018 crop years.

Policy Option	Corn Commodity Program	Soybean Commodity Program	Cotton Insurance Policy	Corn Insurance Policy	Soybean Insurance Policy	NPV per acre to Producer ($)
1	ARC-CO	ARC-CO	--	--	--	$674.65
2	ARC-CO	ARC-CO	SCO	RP	RP	$613.64
3	ARC-CO	ARC-CO	STAX	RP	RP	$640.23
4	ARC-CO	PLC	STAX	RP	RP, SCO	$627.18
5	PLC	ARC-CO	STAX	RP, SCO	RP	$672.93

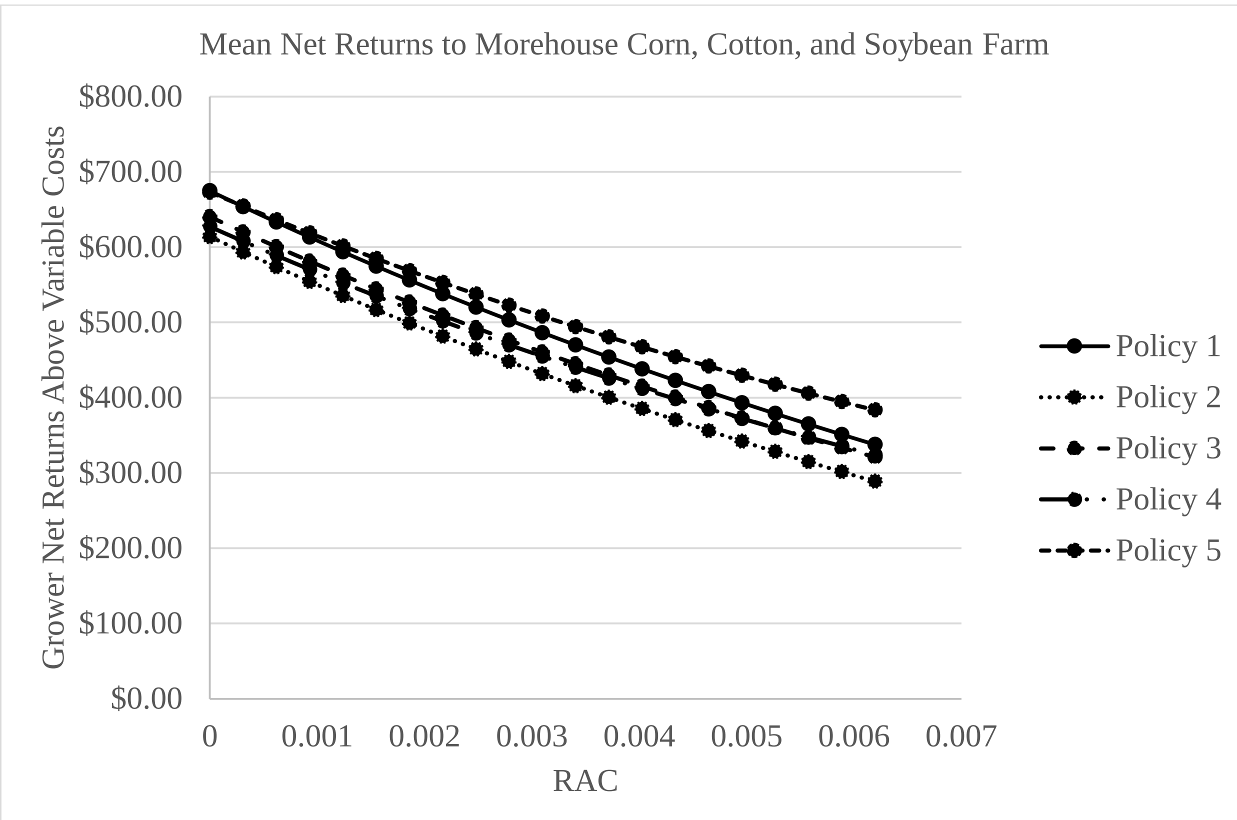

Figure 4.6 SERF results for a representative Morehouse Parish, LA farm.

When only comparing the insurance based options for cotton, policy option 5 is the preferred option, followed by option 3, 4 and finally 2. The corresponding differences between option 5 and the remaining insurance based policy alternatives is $32.70 over option 3; $45.75 over option 4; and $59.29 per acre over policy option 2.

As the level of risk aversion is increased to a value of 0.0030973, policy option 1 is replaced by option 5 as the preferred policy election. At this RAC level, policy option 5 is estimated to generate a $508.31 net return above variable costs to the producer over the duration of the farm bill. This figure is in comparison to the net returns associated with policy option 1 of $486.29 per acre; $460.44 with option 3; $454.96 with option 4; and $431.54 with option 2, respectively. Policy option 5 is preferred to option 1 by $22.02 per acre. Policy option 5 consists of enrolling corn in the PLC program and soybeans in the ARC-CO program. Corn is said to carry the SCO election to supplement the underlying RP insurance policy. Soybeans are protected by RP insurance. The STAX (20% coverage with a 1.2 protection factor) endorsement is purchased for the cotton acres on the farm. This is in comparison to option 1 that carries no crop insurance on the farm and enrolls corn and soybeans in the ARC-CO program.

At high levels of risk aversion (RAC=0.00619545), policy option 5 continues to dominate all alternatives. Policy option 1 is dominated by $45.98; option 2 by $94.92; option 3 by $62.59; and option 4 by $59.68 per acre, respectively.

Results in Table 4.9 are presented for the second corn, cotton, and soybean farm located in the Louisiana delta, Tensas Parish, Louisiana. Drawing similarities from the companion Louisiana delta farm, policy option 1 dominated all scenarios at a RAC of 0.

Table 4.9. Mean net returns above variable production costs to the producer, Tensas Parish, Louisiana over the 2014 through 2018 crop years.

Policy Option	Corn Commodity Program	Soybean Commodity Program	Cotton Insurance Policy	Corn Insurance Policy	Soybean Insurance Policy	NPV per acre to Producer ($)
1	ARC-CO	ARC-CO	--	--	--	$452.03
2	ARC-CO	ARC-CO	SCO	RP	RP	$382.31
3	ARC-CO	ARC-CO	STAX	RP	RP	$409.06
4	ARC-CO	PLC	STAX	RP	RP, SCO	$398.20
5	PLC	ARC-CO	STAX	RP, SCO	RP	$442.99

Policy option 1 dominates option 2 by $69.72; option 3 by $42.97; option 4 by $53.83; and option 5 by $9.04 per acre, respectively. Again, of the insurance-based policy alternatives, policy option 5 dominates options 2, 3, and 4. Amounts are equal to $60.68; $33.93; and $44.79 per acre, respectively.

When the RAC is increased to 0.0047971, policy 5 is the dominant choice for the producer, generating a cumulative net return above variable costs at a level of $263.93 per acre. Figure 4.7.

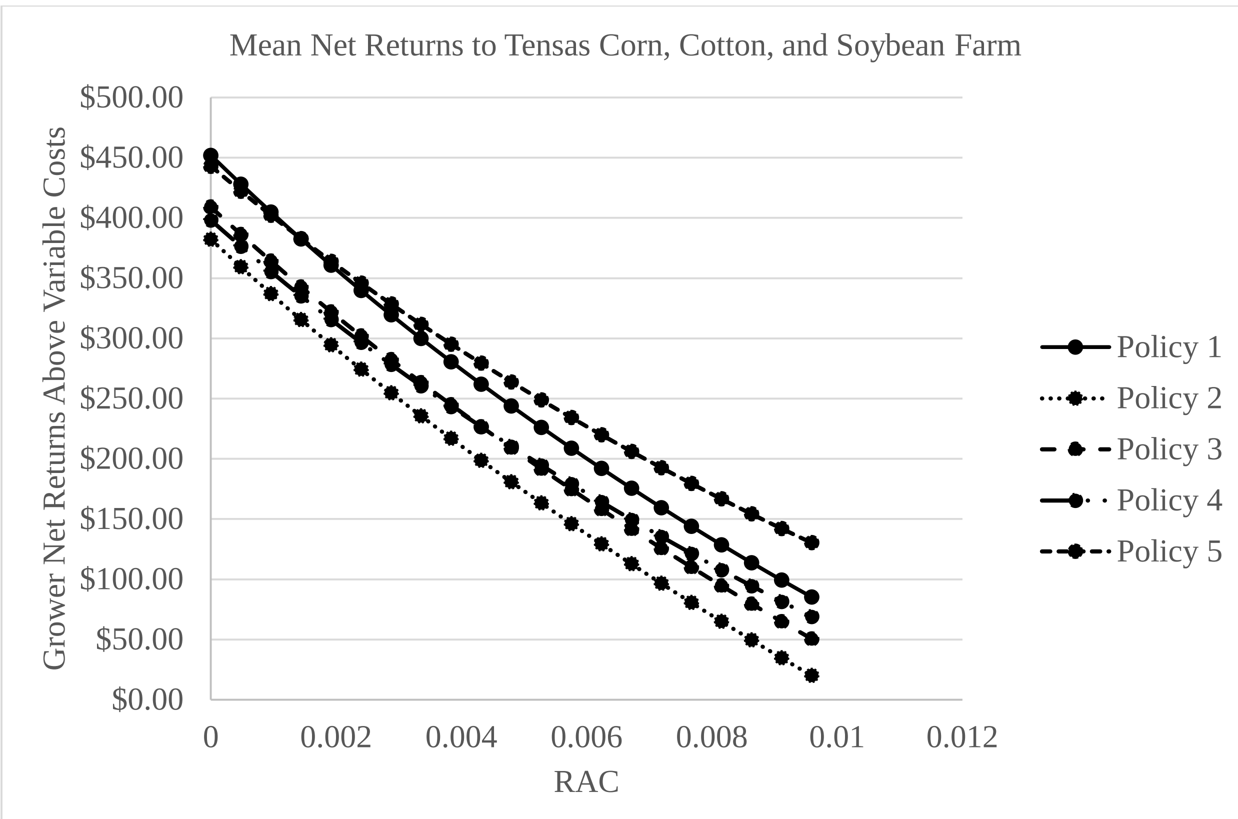

Figure 4.7 SERF results for a representative Tensas Parish, LA farm.

Corresponding economic activity generated under policy options 1, 2, 3, and 4 equate to $243.89; $180.91; $209.02; and $210.50 per acre, respectively over the life of the farm bill. At this level of risk aversion, policy option 4 is preferred to option 3 in a pairwise comparison. A similar result with the Morehouse Parish farm was observed. For higher levels of risk aversion

(RAC=0.0095942), policy option 5 is the dominate option generating a net return estimated at $130.42 per acre. This policy option is followed by option 1 ($85.25); option 4 ($68.96); option 3 ($50.48), and finally option 2 ($20.12), respectively. At very high levels of risk aversion, this Tensas Parish farm generates a positive return above variable costs across all policy options. These returns are smaller in comparison to the per acre benefit realized at the Morehouse Parish location.

A mixed corn, cotton, and soybean farm was constructed in Coahoma County, Mississippi. Results appearing in Table 4.10 suggest that policy option 1 results in the highest net returns per acre to this farming operation at a measure of $770.94 for the risk neutral producer.

Table 4.10. Mean net returns above variable production costs to the producer, Coahoma County, Mississippi over the 2014 through 2018 crop years.

Policy Option	Corn Commodity Program	Soybean Commodity Program	Cotton Insurance Policy	Corn Insurance Policy	Soybean Insurance Policy	NPV per acre to Producer ($)
1	ARC-CO	ARC-CO	--	--	--	$770.94
2	ARC-CO	ARC-CO	SCO	RP	RP	$671.12
3	ARC-CO	ARC-CO	STAX	RP	RP	$688.42
4	ARC-CO	PLC	STAX	RP	RP, SCO	$685.94
5	PLC	ARC-CO	STAX	RP, SCO	RP	$704.31

Policy option 5 ranked second at $704.31; option 3 was third at $688.42; option 4 was fourth at $685.94; and option 2 was fifth at $671.12 per acre, respectively. Policy option 1 exceeded policy option 5 by $66.63 per acre and exceeded options 3, 4, and 2 by $82.85; $85.00; and $99.82 per acre, respectively. Of the insurance-based policy scenarios, option 5 was again the highest producing alternative, followed by options 3, 4, and 2.

As the level of risk aversion increases from 0 to 0.0028403, policy option 1 still remains the dominate alternative among the 5 options. Figure 4.8. This outcome is unlike the Louisiana delta examples of Morehouse and Tenses parishes, where policy option 1 was replaced for option 5 that considers insurance endorsements and the inclusion of the PLC program for corn in lieu of the ARC-CO program. At this RAC level, policy option 1 yields a cumulative net return above variable costs of $632.36 per acre compared to the $582.75 per acre produced by the policy 5 option (a difference of $49.61).

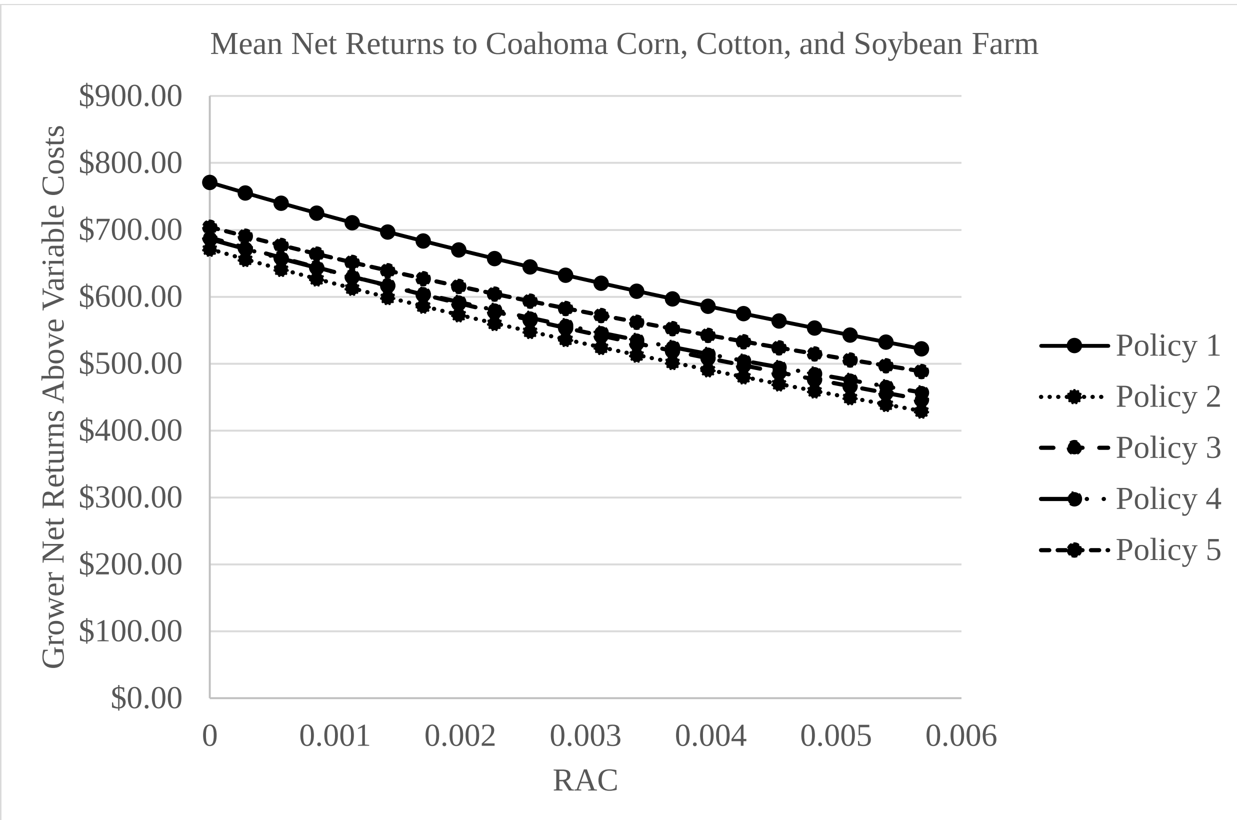

Figure 4.8 SERF results for a representative Coahoma County, MS farm.

This would suggest that electing the ARC-CO for corn and soybeans and purchasing no crop insurance is the preferred policy option for a producer across the calculated risk aversion levels. Of the remaining policy options at this RAC, option 4 is preferred to option 3 by $1.57 and option 3 is preferred to option 2 by $19.45 per acre. At higher levels of risk aversion, RAC=0.0056806, policy option 1 still dominates all alternatives. Economic returns generated form this option are estimated at $522.24 per acre. Policy option 5 produces an estimated $488.50 per acre, followed by option 4 at $457.01, option 3 at $446.56, and by option 2 at $429.20, respectively.

A second corn, cotton, and soybean farm was constructed in the Mississippi delta, this particular farm originating in Leflore County. Results from Table 4.11 suggest that policy option 1 is the dominate policy election for the risk neutral producer. This policy option produced economic returns estimated at $727.59 per acre over the five year duration of the farm bill. Policy option 1 was followed by option 5 ($683.31), option 3 ($660.04), option 4 ($645.26) and finally option 2 ($636.46), respectively. Of the insurance-based policy scenarios, option 5 again resulted in the greatest net returns above variable costs per acre as compared to options 3, 4, and 2. This finding was consistent with the Coahoma County, Mississippi farm.

Table 4.11. Mean net returns above variable production costs to the producer, Leflore County, Mississippi over the 2014 through 2018 crop years.

Policy Option	Corn Commodity Program	Soybean Commodity Program	Cotton Insurance Policy	Corn Insurance Policy	Soybean Insurance Policy	NPV per acre to Producer ($)
1	ARC-CO	ARC-CO	--	--	--	$727.59
2	ARC-CO	ARC-CO	SCO	RP	RP	$636.46
3	ARC-CO	ARC-CO	STAX	RP	RP	$660.04
4	ARC-CO	PLC	STAX	RP	RP, SCO	$645.26
5	PLC	ARC-CO	STAX	RP, SCO	RP	$683.31

For example, as the risk aversion level increased to 0.0029827, policy option 1 remained the dominate alternative ($573.62); again similar to the Coahoma County farm which suggest pairing corn and soybeans with the ARC-CO program and purchasing no crop insurance is the preferred policy election. Figure 4.9. At this RAC, policy option 1 was followed by option 5 ($544.93); option 3 ($509.62); option 4 ($501.16); and option 2 ($485.66), respectively. At even higher levels of risk aversion, (0.0059654) policy option 4 ($390.93) begins to closely approach, but not dominate option 3 ($394.15) upon pairwise comparison.

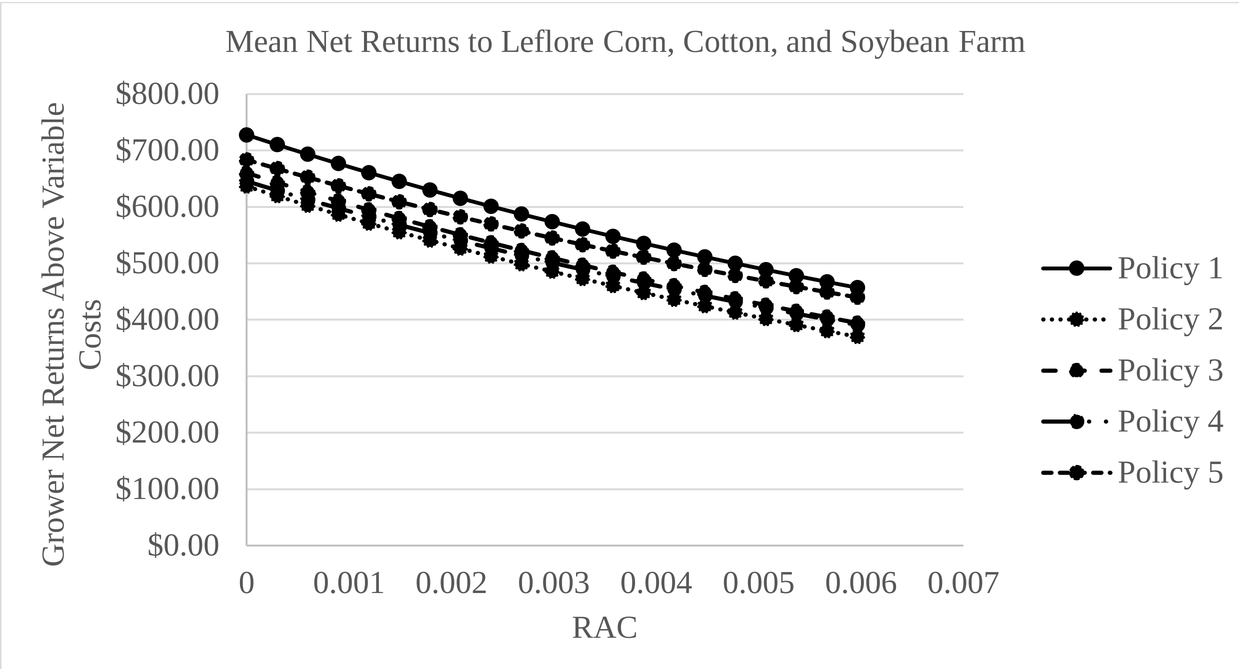

Figure 4.9 SERF results for a representative Leflore County, MS farm.

CHAPTER 5: SUMMARY AND CONCLUSIONS

5.1 Summary of Selected Farm Program and Crop Insurance Policy

A farm bill process that began almost four years concluded on February 7, 2014 when the President signed the Agricultural Act of 2014. This omnibus piece of legislation contains both repeals and reforms to the farm safety net that many producers rely on as a viable risk management tool while contributing $23 billion in deficit reduction. Policy changes to commodity support programs will require producers to evaluate the programs afforded to them under the bill to determine which program offers a better risk management safety net for the five year duration of the law. In other words, attention should be given as to how each program will function for commodities and farms under different risk scenarios.

One major change in the farm bill is the repeal of the direct payment program. Direct payments became a vulnerable target politically during farm bill markup as these payments are made regardless of market price and are dispersed at a fixed rate. Along with the elimination of direct payments, the countercyclical and ACRE programs are also repealed. Producers, under the new law, have the option to retain or reallocate their base acres within their operation. The purpose of reallocating base acres is an important decision to the farm owner, as ARC-CO and PLC program payments are made to 85% of the base acres of the farm.

ARC-CO and PLC can be elected by on a crop-specific basis. This implies that producers may choose ARC for some covered crops produced on their farm and PLC for other covered crops produced on that same farm. Producers should consider two points in weighing their program election. The first point is whether the expected national MYA price will be above/below the reference price. If a producer expects that the MYA price for a particular covered commodity will be above the reference price, the PLC program will not produce a payment that year as the program only produces a payment when the MYA price is below the reference price. Under this scenario, the ARC-CO program may look attractive. The ARC-CO should also be considered relative to price and to the relationship between farm and county yield correlation. If the opposite anticipation is held by the producer and the MYA price is expected to be below the reference price, the PLC program may look attractive in providing downside price protection. A second point to consider is to ask the question of what does the forecasted MYA price look like over the upcoming crop years in deciding which program will provide long-term risk protection relative to the producer's risk strategy. This decision should not be made in a vacuum, meaning it will rest upon more factors than expectations about projected price trends.

There are advantages and disadvantages of using individual farm data opposed to relying on county averages when comparing the ARC versus PLC programs. Given the recent years of high prices that are used in the ARC payment calculations, it is likely that ARC payments will begin at higher price levels than the relatively low reference price (used in PLC payment calculations) for corn, soybeans, and wheat- which can be viewed as an advantage for the ARC program. Since the ARC program uses a five year Olympic average of prices and yields, high prices from the 2011and 2012 crop years are included in the benchmark revenue calculation. A disadvantage is that ARC payments are capped to 10% of the benchmark revenue. This means that if a significant and substantial price decline occurs, maximum payment is reached with the ARC program providing no additional protection with any further price declines. In contrast and keeping with the above policy scenario, PLC payments continue to grow until prices move down to the loan rate levels. These evaluations point to the fact that a program decision should be based on the individual producer's five year price outlook. The more optimistic they are about the price of a crop, the more likely they are to favor ARC. If a producer believes low, or very low prices could occur, they may look more favorably toward PLC. Producers will also need to consider how their government program choice integrates with their crop insurance program and how these programs combine to provide a financial safety net.

Payment limitations can be described as both a technical and legal issue. The total amount of payments (for covered commodities) received by a person or legal entity for any crop under Title I commodity program and as marketing loan gains or loan deficiency payments may not exceed $125,000. In a general sense, the payment limit for a person and a spouse would total $250,000, provided both are actively engaged in the farming operation. A person or legal entity shall not be eligible to receive any program benefit during a crop, fiscal, or program (as appropriate) if the average AGI of the person or legal entity exceeds $900,000.

A complex feature of the 2014 farm bill, is the interaction between Title I commodity programs and Title XI crop insurance products- most notably the SCO policy endorsement. ARC and PLC commodity programs are tied to historical base acres, while traditional crop insurance policies- to include the SCO-are tied to planted acres. Covered commodities that are enrolled in the ARC-CO are not eligible to receive coverage from the SCO insurance program. Whereas, covered commodities enrolled in the PLC program remain eligible to participate in the SCO insurance program. In the event that insurance indemnities are triggered, payments (SCO and STAX) are made on a planted acre basis. SCO and STAX programs are similar to the preexisting Area Risk Protection Insurance (ARPI) policy. Coverage under these programs is based on the experience of the county rather than an individual farm.

SCO is a new insurance product for the 2015 crop year that provides county-level coverage from an 86% to the coverage level of the required underlying insurance policy. Indemnities are triggered based on county losses in excess of 14% (100% - 86%), which means the entire county must suffer at least a 14% loss in order for any individual's SCO policy to pay an indemnity. The size of the county level loss results in a payment factor which is applied to the individual producer's insurance deductible to determine the actual indemnity payment. SCO has important implications for producers as they evaluate commodity program options (i.e. PLC versus ARC) and risk management decisions (i.e. individual insurance coverage levels). Because SCO is limited by the statute to the deductible range of the underlying policy, it will operate as individual-based coverage, but the indemnity is triggered and scaled by area-wide (county) losses.

SCO is only available to commodities enrolled in the PLC program; although enrollment in the PLC program is not a prerequisite. Producers should consider the purchase of an SCO policy in future crop years when making the choice between the PLC and ARC commodity program decisions. Since SCO is an RMA-administered program it acts like other 'traditional' insurance products in that is can be purchased on a year-to-year basis. This annual insurance policy duration complicates alternative farm bill commodity program decision making in that commodity program selection is irrevocable for the five-year life of the farm bill. Linking the decision farm program and crop insurance suite of products can complicate crop insurance delivery, as commodity program choice (beginning with the 2014 crop year) will have to made prior to offering SCO (beginning in 2015).

As an added component to pairing commodity program to crop insurance, there is potential overlap can exist between crop insurance and the PLC program option. An overlap can exist between target price payments and declines in crop insurance price between the pre-plant and the harvest price discovery periods. The exact degrees of the overlap expected between PLC and crop insurance is difficult to calculate because PLC pays on 85% of the farm's base acres while insurance pays on 100% of are planted on the insured unit. Producers should consider this insurance/PLC overlap when making their farm program election. Overlapping payments would provide additional assistance if prices decline and remains below the reference price established by statute.

The farm program decision is a multi-year management decision. ARC and PLC can provide assistance with multiple year losses. ARC-CO is an integrated shallow multiple year loss program. PLC paired with the SCO is not integrated. In further detail to the above-mentioned point, there are two sets of calculations must be combined, one for shallow losses (SCO) and one for multiple year price losses (PLC).

A key consideration with the SCO is a loss at the county level may or may not align with loss experienced on the individual farm. ARC-CO and PLC can influence the crop insurance choices for certain covered commodity that are produced on a farm. Therefore, the farm program/crop insurance selection decision question can be separated such that the crop insurance components (to include SCO) of the decision are examined. Figure 5.1 presents the multiple series of decisions, come of which being interrelated, that are to be made by the farm manager concerning program election and insurance selection. If a commodity’s price is expected to be below the reference price, producers may elect the PLC program to provide downside price protection and possibly reduce their yield insurance protection to cover yield risk. A strength of the ARC-CO is the assistance for shallow multiple year losses. However, ARC-CO also provides some disaster price assistance since it has a minimum price built into its policy design as the inclusion of the PLC reference price. Strength of the PLC program is its assistance for multiple years of declining and stagnant prices, coupled with SCO (or high individual farm insurance coverage) can provide assistance with cumulative shallow losses.

Overview of 2014 Farm Bill Decisions

The schematic that follows illustrated the decisions resting with the farm owner as well as the producers on farm that may vary on a covered commodity-by-covered commodity as well as a farm-by-farm basis.

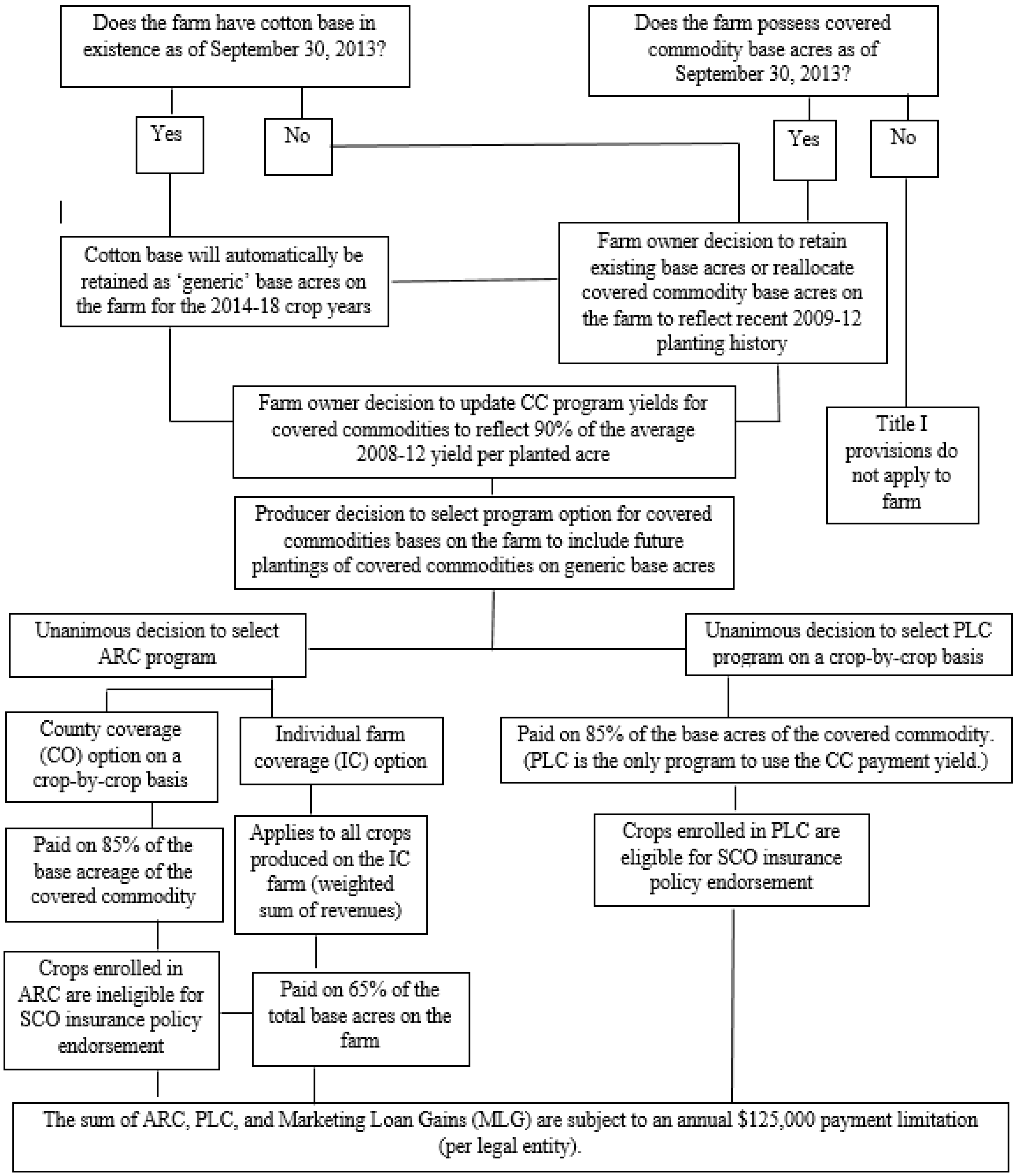

Figure 5.1. Program schematic of selected farm bill program and insurance options.

In conclusion, the 2014 farm bill allows producers to tailor the coverage options for the next five years to their individual farming operations and the commodities that are produced on their farms. To briefly summarize the farm program options, PLC is intended to cover against the risk of lower commodity prices. It is a traditional income support policy utilizing price floors for commodities to help with market uncertainties such as sustained low prices. ARC is intended to cover against lower revenues caused by either lower prices or by lower yields relative to recent averages. ARC provides benefit to producers when price declines relative to recent averages. ARC provides assistance in the deductible range of crop insurance utilizing indications of actual losses and an emphasis on multi-year price risk. There may be times in the future when one program produces a payment and the other program does not.

5.2 Selected Elements of Cotton Farm Policy

For producers of upland cotton, the 2014 farm bill embodies major substantive change to elements of the crop's safety net. Cotton is no longer a covered commodity and is considered a market loan-only program under the guidelines set forth by the commodity title of the farm bill. One of cotton's risk management tools, the direct payment which were made on an annual basis, were replaced with two new insurance policies aimed at mitigating revenue risk. These products will be administered by USDA RMA and are subsequently contained in the crop insurance title of the farm bill. CTAP is identified as a temporary program that provides payments to producers on a farm for which cotton base acres in existence for 2013. This program is designed to be a 'transition' for cotton producers between the previous direct and countercyclical payment programs and the new STAX program, which is authorized to begin in the 2015 crop year. CTAP is decoupled from ARC or PLC program participation. It is possible for cotton base acres eligible for CTAP to also qualify for eligible generic base acres for ARC and PLC.

CTAP payments are subject to a separate $40,000 per person (or legal entity) payment limitation and not applied toward the $125,000 Title I payment limitation of the farm law.

Perhaps, the most significant ‘change’ to cotton policy aside from the insurance programs of 2015, is that the crop is no longer a program or covered commodity in terms of eligibility to participate in commodity revenue and price support programs. Since direct and counter-cyclical program payments were made on 85% of the base acres of an enrolled commodity, policymakers were faced with a decision on how to treat the existing cotton base on farms as of September 30, 2013. Cotton base acres in effect for the farm are automatically retained as generic base acres through the 2018 crop year, regardless of whether the decision is made to retain or reallocate base acres. The uniqueness of these generic acres is that, when planted to a covered commodity, they function as additional base acres for the crop planted and are in addition to established base acres on the farm in that particular crop year. In the event that a farm program is triggered, program payment (ARC or PLC) will be made on 85% of the total base acres on that farm for the respective crop- to include both traditional and generic base acre. Farm bill language states that generic acres must be planted to a covered commodity to be eligible for program benefits and are allocated annually to the covered commodities planted. This couples program payments to planted generic acres as a prerequisite to receive payments.

The treatment of payment acres pertaining to generic base acres reads as follows from the 2014 farm bill. “If a single covered commodity is planted and the total acreage planted exceeds the generic base acres on the farm, the generic base acres are attributed to that covered commodity in the amount equal to the total number of generic base acres. If multiple covered commodities are planted and the total number of acres planted to all covered commodities exceeds the generic base acres, the generic base acres are attributed to each of the covered commodities on the farm on a pro rata basis to reflect the ratio of the acreage planted to a covered commodity on the farm to the total acreage planted to all covered commodities on the farm. If the total number of acres planted to all covered commodities on the farm does not exceed the generic base acres, the number of acres planted to a covered commodity is attributed to that covered commodity."

At farm program election, producers on a farm must indicate their preferred farm program choice for all covered commodities that may or may not be planted to generic acres through the 2018 crop year. Given the flexible nature of generic acres, alternative crops not traditionally produced on a farm may now be eligible to participate in commodity support programs if planted. Therefore, evaluating which program choice is best for a particular farm and production area are a critical component of any risk management strategy.

The majority of cotton support will be contained in Title XI of the new farm bill, as cotton transitions away from traditional commodity price and income support programs. STAX is another new insurance product for the 2015 crop year administered by the RMA. The major feature of this product that sets it apart from other insurance products is that STAX is only available to producers of upland cotton. The new income safety net for cotton will be the USDA RMA-administered STAX product. STAX will be a county area-based revenue insurance plan that will cover losses between 10% (100% - 90% coverage) and 30% (100% - 70% coverage) of expected county revenue. STAX is designed to cover shallow losses and supplement the farms existing yield or revenue policy. STAX may be purchased as a supplement to an existing crop insurance policy or may be purchased as a stand-alone policy. The premium cost of the STAX policy will be subsidized by 80%. Cotton producers can select STAX or SCO but cannot have STAX and SCO on the same cotton acres (prohibiting duplication in coverage of the same acres). STAX and SCO are very similar in terms of operational mechanics and the way in which indemnities are calculated. Ultimately, both are revenue products like the ARC program for covered commodities, in that they are shallow loss programs. While STAX coverage is based on revenue experience, SCO indemnities can be triggered by either county yield or revenue experiences in tandem with the underlying policy.

5.3 Conclusions from the Representative Farm Analysis

Tables that are contained in Appendix D present the economic returns to each representative farm location separated by crop enterprise produced. Net returns above variable costs to the producer are not adjusted for interest, instead they are summed over the five year life of the bill relative to farm program and/or crop insurance policy imposed. These indicators of a farm's financial performance do not consider varying levels of risk, and are to be interpreted as a risk neutral measure. Information contained in this appendix provides an alternative perspective for measuring total economic returns (e.g. crop receipts, farm program payments, and crop insurance indemnities) to each farming operation on the basis of enterprise contribution.

For the three representative rice and soybean farms in the study, the farm program selection of PLC for rice and ARC-CO for soybeans was the dominant option that, in conjunction with the price, yield, and production cost variability imposed across all models, outperformed the remaining policy scenarios that involved purchasing optional revenue-based insurance policies (including the SCO endorsement). This observation holds true when the risk aversion coefficient is increased. Tables 4.3 to 4.5. The inference drawn from this analysis is that for rice and soybean producers located in the study area, the determination of farm program choice and insurance option may be straightforward. One partial explanation of the consistency of rice program selection is that with the relationship between the reference price and the forecasted MYA long grain prices, the PLC program appears to generate a greater program payment in every year of the farm bill as compared to the ARC-CO option. The result is that the producer's net returns above variable costs for the Arkansas County, Acadia Parish, and Bolivar County farms all witness higher returns to the rice enterprise when the PLC option is selected over the ARC-CO program. Tables D.1 to D.3 provide a descriptive summary of the returns per enterprise over the five year observational period. An added benefit not readily observed from this analysis is the residual effect that the updated payment yield of the individual farm has in supplementing the PLC payment. (It was assumed that the farm's yield for the covered commodity mirrored the county average for the 2008 through 2012 crop years).

In the case of soybeans that are produced on these rice farms, the ARC-CO option was the preferred option over the life of the farm bill. Since the operational mechanics of this program consider revenue losses sustained at the county level, individual farm performance is not considered in program payment determination. Overall, the short-term increase in soybean yields across Arkansas, Louisiana, and Mississippi is becoming realized in setting ARC-CO program benchmark and revenue guarantee levels at a substantial threshold level for payment calculation. What can be observed is that as the frequency of higher county yields are included in the revenue calculation, the ARC-CO revenue guarantee will increase. The results is that the actual soybean revenue for the county would increase also, but be dependent upon the current year's production conditions in the area and the MYA and its relation to the previous five year average. A similar inference can be drawn when the price aspect of this revenue support program is evaluated.

A common result to these rice and soybean farms was that policy option 2, which did not include an insurance policy, generated the largest economic grain to each operations over the study period. Since individual crop insurance policies carry adjusted premium rates for a particular area, which are likely to vary from one crop year to the next, causing policy premium cost to affect the economic returns to the farm when measuring farm financial performance. From an actuarial basis, variability in futures prices and USDA RMA reported yield data can influence the volatility of a policy's soundness and ultimately, its premium price that is paid by the producer. Therefore, increases in the policy premium costs incurred by the producer in the absence of an indemnity can reduced the total returns to the farm. This would be the case in years of increased crop yields that act to partially offset stable to declining market prices.

Through the construction of mixed grain and cotton farms in the Mississippi River delta region, economic returns to cotton in the absence of Title I program support is surprising. By examining the mean net return above variable costs to the producer, cotton returns significantly decrease from the 2014 to the 2015 crop year across all farms in the three-state region. Nearly one-half of the base acreage on farms in Mississippi, Phillips, Morehouse, Tensas, Coahoma, and Leflore locations consists of cotton. The reason for the decline in total economic returns is that CTAP payments for the 2014 crop year function as a quasi-direct payment, and cease to exist in any out-year of the farm bill in exchange for the optional SCO and STAX insurance products. In analysis of the ARC-CO and PLC programs for corn and soybean enterprises, cotton being produced on these farms was assumed to maintain STAX insurance coverage. Results from Table 4.6 to 4.11 indicated that total returns to the farming operations are greatest when cotton is endorsed by STAX in lieu of SCO. The purpose, suggested by industry representatives, was to examine each farm's five year financial performance when comparing the feed grain program options.

In order to clarify the economic activity generated from PLC enrollment for mixed cropped farms in the Mississippi River delta region, the imposed MYA price parameter is simulated over several thousand iteration in the analysis as to obtain a single cumulative measure of farm profitability. For each of the 1,000 iterations of the model, the MYA price is said to vary within the empirical distribution of the previous ten-year period, which can result in a generated price variable that falls under the reference price. This aspect of simulation analysis is important to note. For example, a mean soybean price set at $9.17 per bushel is above the $8.40 reference price for soybeans. However, through simulation analysis, a MYA price parameter may be generated, subject to the distribution of the variable, to fall below the $8.40 reference price; thus resulting in a PLC payment being triggered. For corn and soybean prices that are at or near the reference price level and act to serve as the mean for the simulated parameter, several iterations can be below the reference level, while some fall above the reference price.

As a basis for comparison, total returns to the farm to include ARC-CO and PLC programs is set as that corn and soybeans both are enrolled in the ARC-CO program coupled with the RP insurance complement, with cotton receiving insurance-based protection from the STAX product (policy option 3). When examining policy options 3, 4, and 5, the Arkansas corn, cotton, and soybean farms displayed alternative preferences for farm program choice. For the Mississippi County farm, if soybeans were selected to be enrolled in the PLC program (option 4), the returns to the soybean enterprise would be increase. The same observation is made when corn is elected to enroll in the PLC program (option 5), although the return increase to the enterprise is much larger. Table D.4. As the risk aversion level (coefficient value) of the producer increases, farm program and insurance policy options may not be as straightforward as with the rice farms of the region. For the Mississippi County farm, as the risk aversion level increases, policy option 1 remains the preferred choice, followed by 5, 4, 3, and option 2. Over the series of the RAC coefficients that were examined, the results (measured as the five year total of net returns above variable costs to the producer) did not intersect when plotted graphically, indicating the economic preference for one option over another has changed.

In Phillips County, a similar income effect is observed when comparing corn enrolled in the PLC (option 5) in lieu of the ARC-CO (option 4). The decision for this farm on program selection for soybeans proves to be different. Soybean returns are greater under the ARC-CO than the PLC program, resulting the policy option of PLC for corn and ARC-CO for soybeans. Table D.5. As the level of risk aversion increased in Phillips County, policy option 1 dominated option 5 across all levels. However, as risk aversion was increased, option three and four replaced one another in a pairwise comparison. Option 2 resulted in the lowest return level across all levels of risk aversion for the farm.

In the Louisiana delta region, both the Morehouse and Tensas Parish farms generated higher economic returns from corn enroll in the PLC program with the insurance coverage of the SCO option (option 5). Economic returns resulting from soybeans enrolled in the PLC program carrying the SCO option decreased (option 4) when compared to the crop's performance under policy options 3 and 5 where an underlying insurance policy was paired with ARC-CO. When the risk aversion level is increased, results from the Phillips representative farm hold true for the Morehouse Parish location. A notable difference did occur with the Tensas Parish farm. When the risk aversion coefficient is increased, policy option 1 no longer remains the option generating the highest returns to the farm. It is replaced with option 5. However in a similar accordance with the Morehouse location, policy option 3 is replaced by policy option 4.

The same result was observed for the Coahoma and Leflore County Mississippi mixed grain farms. Economic returns generated from the production of corn increased when the PLC program was selected with the SCO insurance option. The opposite held true for soybeans that benefited from participating in the ARC-CO program carrying an underlying revenue protection policy. In Coahoma County when risk aversion is increased, policy option 1 is preferred to options 5, 4, 3, and 2. When the total returns to the farm are presented in the context of SERF analysis, the line on the graph do not intersect over the imposed RAC. This indicates that across all levels of risk aversion, the policies remain ranked in terms of profitability as previously stated. In Leflore County, policy option 1 no longer remains the option generating the highest returns to the farm as it is replaced by option 5 as higher levels of risk aversion. Policy option 3 is replaced by policy option 4 at these levels when comparing these options is isolation.

REFERENCES

American Farm Bureau Federation. 2012. "Stabenow/Roberts Committee Print as interpreted by AFBF". Friday, April 20, 2012.

Anderson, J.R., J.L. Dillon, and J.B. Hardaker. 1977. Agriculture Decision Analysis. Iowa State University Press. Ames, Iowa.

Anderson, J.R. and W.M. Griffiths. 1982. "Production Risk and Efficient Allocation of Resources." *Australian Journal of Agricultural Economics* 26, 3:226-232.

BASF. 2015 "Clearfield® Production Systems Weed Control for Rice". BASF Crop Protection Products. http://agproducts.basf.us/products/clearfield-rice.html Date Accessed: June 1, 2015.

Bryant, K.J., J.M. Reeves, R.L. Nichols, J.K. Greene, C.H. Tingle, G.E. Studebaker, F.M. Bourland, C.D. Capps, Jr., and F.E. Groves. 2008 "Valuing Transgenic Cotton Technologies Using a Risk/Return Framework." *Journal of Agricultural and Applied Economics* 40, 3:767-775.

Burns, H.A., W.T. Pettigrew, W.R. Meredith, and S.R. Stetina. 2007. "Corn Yields Benefit in Rotations with Cotton". *Crop Management* (24).

Cooper, J. "Economic Aspects of Revenue-Based Commodity Support". 2009. Economic Research Service/USDA. Economic Research Report Number 72.

Coppess, J. 2014. "Evaluating Commodity Program Choice in the New Farm Bill." University of Illinois. http://farmdocdaily.illinois.edu/2014/02/evaluating-commodity-program-choices-in-new-farm-bill.html Date Accessed: February 6, 2014.

Deliberto, M.A., B.M. Hilbun, and M.E. Salassi. 2014. "2014 Projected Commodity Costs and Returns for Cotton, Soybeans, Corn, Grain Sorghum, and Wheat Production in Louisiana. Louisiana State University Agricultural Center. Department of Agricultural Economics and Agribusiness. A.E.A. Information Series No. 294.

Deliberto, M.A., M.E. Salassi, and K.M. Guidry. 2013. "Simulating Returns to Alternative Crop Mixes in Northeastern Louisiana". *Journal of the American Society of Farm Managers and Rural Appraisers*. (2013). pp. 207-224.

Ebelhar, M.W., D.R. Clark, H.C. Pringle III, and G.L. Sciumbato. 2011. "Interaction of Nitrogen and Potassium Fertilization on Reniform Nematode Dynamics in a Cotton/Corn Rotation System". 2011 Beltwide Cotton Conference Proceedings. Atlanta, GA. pp.1336-1344.

Edwards, W. 2011. "Group Risk Plan (GRP) and Group Risk Income Protection (GRIP)". Iowa State University. Ag Decision Maker. File A1-58.

Fannin, J.M., K.W. Paxton, and J.D. Barreca. 2008. "Evaluating the Switch from Cotton to Corn: Impacts on the Louisiana Economy". Louisiana State University Agricultural Center. Research Bulletin No. 888.

Fathelrahman, E.M., J.C. Ascough, D.L. Hoag, R.W. Malone, P. Heilman, L.J. Wiles, and R.S. Kanwar. "Economic and Stochastic Efficiency Comparison of Experimental Tillage Systems in Corn and Soybeans under Risk." *Expl. Agriculture* 47, 1:111-136 (2011).

Fernandez-Cornejo, J. 2004. "The Seed Industry in U.S. Agriculture." United States Department of Agriculture. Economic Research Service. Agriculture Information Bulletin No. 786.

Flanders, A. 2008. "Simulation Analysis of U.S. Cotton Production with ERS Costs and Returns Data." *The Journal of Cotton Science* 12:81-86.

Flanders, A. and E.J. Wailes. 2010. "Comparison of ACRE and DCP Programs with Simulation Analysis of Arkansas Delta Cotton and Rotation Crops". *The Journal of Cotton Science.* 14:26-33.

Food and Agricultural Policy Research Institute (FAPRI). 2007. University of Missouri. "Impacts of Changes in Direct Payment Rates, Target Prices, and Loan Rates". FAPRI-MU #21-07 Report.

Food and Agricultural Policy Research Institute (FAPRI). 2011. University of Missouri. "Potential Impacts of Eliminating Direct Payments". FAPRI-MU #08-11 Report.

Food and Agricultural Policy Research Institute (FAPRI). 2012. University of Missouri. "Impacts of Selected Provisions of the *Agricultural Reform, Food, and Jobs Act of 2012*". FAPRI-MU Report #03-12.

Food and Agricultural Policy Research Institute (FAPRI). 2015 University of Missouri. "April 2015 U.S. Crop Price Update". FAPRI-MU #08-15 Report. April 14, 2015.

Giesler, G., K. Paxton, and E. Millhollon. 1993. "A GSD Estimation of the Relative Worth of Cover Crops in Cotton Production Systems." *Journal of Agricultural and Resource Economics*, 18, 1:47-56.

Guidry, K.M., A. Bechtel, S. Hague, R. Hutchinson, and D. Boquet. 2001. "Profitability of Cotton Crop Rotation Systems in Northeast Louisiana". Louisiana Agriculture Magazine. 44,3: 22-25.

Hardaker, J.B., J.W. Richardson, G. Lien, and K.D. Schumann. 2004. "Stochastic Efficiency Analysis with Risk Aversion Bounds: A Simplified Approach." *The Australian Journal of Agricultural and Resource Economics* 48, 2:253-270.

Helmers, G.A., C.F. Yamoah, and G.E. Varvel. 2001. “Separating the Impacts of Crop Diversification and Rotations on Risk”. *Agronomy Journal* 93:1337-1340.

Hristovska, T., K.B. Watkins, and M.M. Anders. 2011. “An Economic Risk Analysis of No-Till Management for the Rice-Soybean Rotation System Used in Arkansas.” University of Arkansas. B.R. Wells Rice Research Studies.

Ifft, J., C. Nickerson, T. Kuethe, and C. You. 2012. “Potential Farm-Level Effects of Eliminating Direct Payments”. USDA ERS. Economic Information Bulletin No. 103.

Johnson, P. and J. Blackshear. 2004. “Economic Analysis of Roundup Ready versus Conventional Cotton Varieties in the Southern High Plains of Texas.” *The Texas Journal of Agriculture and Natural Resources* 17:87-96.

Karov, V., E.J. Wailes, and K.B. Watkins. 2012. “Assessment of STAX (Stacked Income Protection Plan) for Arkansas Representative Panel Farms”. University of Arkansas Division of Agriculture. Department of Agricultural Economics and Agribusiness.

Kipps, M.S. 1970. Production of Field Crops. McGraw-Hill Co., New York.

King, R.P. and L.J. Robison. 1981. “An Interval Approach to Measuring Decision Maker Preferences.” *American Journal of Agricultural Economics* 63, 3:510-520.

Kurtz, M.E., C.E. Snipes, and J.E. Street. 1990. “Influence of Rice Production on Subsequent Cotton Growth and Yield”. Mississippi State University Agricultural and Forestry Experiment Station. Bulletin 966.

Laughlin, D.H. and S.R. Spurlock. 2006. “User’s Guide for the Mississippi State University Budget Generator Version 6.0 for Windows”. Mississippi State University Department of Agricultural Economics.

Laws, F. 2011. “NCC Advocates Change in Course on Farm Policy Direction”. *Delta Farm Press*. Tuesday, September 6, 2011.

Louisiana State University Agricultural Center. 2013. “Louisiana Summary of Agriculture and Natural Resources, 2013. http://www.lsuagcenter.com/mcms/webtools/viewExternal.aspx?url=http://www.lsuagcenter.com/agsummary/home Date Assessed: May 23, 2014.

Luitel, K.P., T.O. Knight, and D. Hudson. 2015.“Evaluation of Crop Insurance Choices for Cotton Producers under the 2014 Farm Bill.” Selected paper from the Southern Agricultural Economics Association’s 2015 Annual Meeting. Atlanta, GA. January 31-Februrary3, 2015.

Martin, S.W., F. Cooke Jr., D. Parvin. 2002. "Economic Potential of a Cotton-Corn Rotation". Mississippi State University Agricultural and Forestry Experiment Station. Bulletin 1125.

Martin, S. and J. Hanks. 2009. "Economic Analysis of No Tillage and Minimum Tillage cotton-Corn Rotations in the Mississippi Delta." *Soil and Tillage Research* 102:135-137.

Maynard, L.J., J.K. Harper, and L.D. Hoffman. 1997. "Impact of Risk Preferences on Crop Rotation Choice." *Agricultural and Resource Economics Review*. pp. 107-114.

Meyer, J. 1977. "Choice Among Distributions". Journal of Economic Theory. 14, 326-336.

Mississippi State University. Department of Agricultural Economics. 2014. "Budget Generator". http://www.agecon.msstate.edu/whatwedo/budgets/generator/index.asp Date Accessed: June 2, 2014.

Mississippi State University Extension Service. 2014. "Mississippi Agricultural News". http://msucares.com/news/print/agnews/an13/20131219_overall.html Date Assessed: May 23, 2014.

Monke, J. 2008. "Farm Commodity Programs in the 2008 Farm Bill." Congressional Research Service. RL34594. September 30, 2008.

Monsanto. 2015. "Genuity® Bollgard II® with Roundup Ready® Flex Cotton". https://www.genuity.com/cotton/Pages/Genuity-Bollgard-II-Roundup-Ready-Flex.aspx Date Accessed: June 1, 2015.

National Crop Insurance Service. 2015. "Crop Insurance Plan Comparison". https://www.ag-risk.org/NCISPUBS/Training/insplancomp.pdf Updated: October, 2014. Date Accessed: April 13, 2015.

Nelson, F.J., and L.P. Schertz. 1996. "Provisions of the Federal Agriculture Improvement and Reform Act of 1996." United States Department of Agriculture Economic Research Service. Agriculture Information Bulletin No. 729.

Outlaw, J.L., J.W. Richardson, J.M. Raulston, G.M. Knapek, and B.K. Herbst. 2012. "Farm Level Analysis of Selected Provisions of the House Agriculture Committee and Senate Farm Bills Using FAPRI's Projected Prices in Their August 2012 Farm Bill Analysis." Texas A&M University Agricultural and Food Policy Center. AFPC Working Paper 12-3. August 2012.

Pioneer. 2015. "Weed Control Options". https://www.pioneer.com/home/site/us/products/corn/seed-traits-technologies/weed-control-options/ Date Accessed: June 1, 2015.

Paxton, K.W., K.M. Guidry, and S. Hague. 2003. "Assessing the Profit Potential of Alternative Crop Rotations in Northeast Louisiana". 2003 Beltwide Cotton Conference Proceedings. Nashville, TN. pp. 467-470.

Ray, D.E., J.W. Richardson, D.G. De La Torre Ugarte, and K.H. Tiller. 1998. "Estimating Price Variability in Agriculture: Implications for Decision Makers". *Journal of Agricultural and Applied Economics*. 30, 1:21-33.

Reddy, K., R. Zablotowiez, and L. Krutz. 2013. "Corn and Soybean Rotation under Reduced Tillage Management: Impacts on Soil Properties, Yield, and Net Returns." *American Journal of Plant Sciences* 4:10-17.

Richardson, J.W., S.L. Klose, and A.W. Gray. 2000. "An Applied Procedure for Estimating and Simulating Multivariate Empirical (MVE) Distributions in Farm-level Risk Assessment and Policy Analysis." *Journal of Agricultural and Applied Economics* 32: 299-315.

Richardson, J.W., J.L. Outlaw, G.M. Knapek, and J.M. Raulston. 2014a. "Climate Change Project- Texas Representative Feed Grain Farms." Texas A&M University Agricultural and Food Policy Center. AFPC Working Paper 14-1.

Richardson, J.W., J.L. Outlaw, G.M. Knapek, and J.M. Raulston. 2014b. "Climate Change Project- Nebraska Representative Feed Grain Farms." Texas A&M University Agricultural and Food Policy Center. AFPC Working Paper 14-2.

Richardson, J.W., J.L. Outlaw, G.M. Knapek, and J.M. Raulston. 2014c. "Climate Change Project- Iowa Representative Feed Grain Farms." Texas A&M University Agricultural and Food Policy Center. AFPC Working Paper 14-3.

Richardson, J.W., J.L. Outlaw, G.M. Knapek, J.M. Raulston, B.K. Herbst, D.P. Anderson, H.L. Bryant, S.L. Klose, and P. Zimmel. 2015. "Representative Farms Economic Outlook for the January 2015 FAPRI/AFPC Baseline." Texas A&M University Agricultural and Food Policy Center. AFPC Working Paper 15-1.

Richardson, J.W., K.D. Schumann, and P.A. Feldman. 2008. SIMETAR, Simulation & Econometrics to Analyze Risk. College Station: Agricultural and Food Policy Center Department of Agricultural Economics, Texas A&M University.

Salassi, M.E. 2012. "Analysis of the Agricultural Risk Coverage Program on Louisiana Rice Production Economics". Louisiana State University Agricultural Center. Department of Agricultural Economics and Agribusiness. Staff Report SP2012-05.

Salassi, M.E. and M.A. Deliberto. 2009. "Agricultural Cropland Lease Structures for Major Row Crops in Louisiana: Statewide Survey Results." Louisiana State University Agricultural Center. Department of Agricultural Economics and Agribusiness. Staff Report No. 2009-07.

Salassi, M.E., M.A. Deliberto, and K.M. Guidry. 2013. "Economically Optimal Crop Sequences Using Risk-Adjusted Network Flows: Modeling Cotton Crop Rotations in the Southeastern Unites States". *Agricultural Systems* 118:33-40.

Salassi, M.E., M.A. Deliberto, and B.M. Hilbun. 2014. "2014 Projected Commodity Costs and Returns for Rice, Soybeans, Wheat, and Grain Sorghum Production in Southwest Louisiana. Louisiana State University Agricultural Center. Department of Agricultural Economics and Agribusiness. A.E.A. Information Series No. 296.

Salassi, M.E., M.A. Deliberto, and E.P. Webster. 2009. "Enterprise Cost Assignment and Land Tenure Implications in Crop Rotation Systems: A Rice/Crawfish Rotation Case Study." *Journal of the American Society of Farm Managers and Rural Appraisers*. (2009). pp.43-50.

Shields, D.A. 2010. "A New Farm Program Option: Average Crop Revenue Election (ACRE)". Congressional Research Service. CRS Report R40422.

Schnepf, R. 2014. "Status of the WTO Brazil-U.S. Cotton Case". Congressional Research Service. CRS Report R43336.

Shields, D.A. and R. Schnepf. 2012. "Farm Safety Net Proposals in the 112th Congress". Congressional Research Service. CRS Report R42040.

Snipes, C.E., S.P. Nichols, D.H. Poston, T.W. Walker, L.S. Evans, and H.R. Robinson. 2005. "Current Agricultural Practices of the Mississippi Delta". Mississippi State University Agricultural and Forestry Experiment Station. Bulletin 1143.

Thomas, S.E., K.H. Coble, and J.C. Miller .2007. "The Effect of Changing Government Subsidy Programs: An Analysis of Revenue at the Farm Level." *Southern Agricultural Economics Association* Annual Meeting, Mobile, Alabama, February 4-6, 2007.

Wailes, E.J., V. Karov, and K.B. Watkins. 2012. "Impacts of ARC and Payment Limit Provisions of the *Agriculture Reform, Food, and Jobs Act of 2012* on Arkansas Representative Panel Farms". University of Arkansas Division of Agriculture. Department of Agricultural Economics and Agribusiness.

Wallander, S., R. Claassen, and C. Nickerson. 2011. "The Ethanol Decade: An Expansion of U.S. Corn Production, 2000-09." United States Department of Agricultural. Economic Research Service. Economic Information Bulletin No. 79.

Watkins, K.B., J.A. Hignight, P.A. Beck, M.A. Anders, D.S. Hubbell III, and S. Gadberry. 2010. "An Economic Risk Analysis of Stocker Grazing on Conservation Tillage Small Grains Forage in Arkansas." Selected paper presented at the Southern Agricultural Economics Association Annual Meeting, Orlando, FL, 2010.

Williams, J. 1988. "A Stochastic Dominance Analysis of Tillage and Crop Insurance Practices in a Semiarid Region." *American Journal of Agricultural Economics*, 70, 1:112-120.

Williams, J.R., M.J. Pachta, K.L. Roozeboom, R.V. Llewelyn, M.M. Claassen, and J.S. Bergtold. 2012. "Risk Analysis of Tillage and Crop Rotation Alternatives with Winter Wheat." *Journal of Agricultural and Applied Economics*, 44, 4:561-576.

United State Congress. 1996. *The Federal Agriculture Improvement and Reform Act of 1996*. Public Law 104-127. 104th Congress. April 4, 1996. U.S. Government Printing Office.

United State Congress. 2002. *Farm Security and Rural Investment Act of 2002*. Public Law 107-171. 107th Congress. May 13, 2002. U.S. Government Printing Office.

United State Congress. 2008. *Food, Conservation, and Energy Act of 2008*. Public Law 110-246. 110th Congress. June 18, 2008. U.S. Government Printing Office.

United State Congress. 2014. *The Agricultural Act of 2014*. Public Law 113-79. 113th Congress. February 7, 2014. U.S. Government Printing Office.

United States Congress. 2014. Congressional Budget Office. Cost Estimate of H.R.2642, the Agricultural Act of 2014. January, 28, 2014.

United States Department of Agriculture. Economic Research Service. 2009. "Farm and Commodity Policy: Program Provisions: Direct Payments." http://www.ers.usda.gov/Briefing/FarmPolic/DirectPayments.htm Updated: June 15, 2009. Date Accessed: June 16, 2011.

United States Department of Agriculture. Economic Research Service. 2012. "Farm and Commodity Policy: Program Provisions: Counter-Cyclical Payments." http://www.ers.usda.gov/Briefing/FarmPolicy/CounterCyclicalPay.htm Updated: June 15, 2009. Date Accessed: May 22, 2012.

United States Department of Agriculture. Economic Research Service. 2009. "Farm and Commodity Policy: Program Provisions: Marketing Assistance Loans and Loan Deficiency Payments." http://www.ers.usda.gov/Briefing/FarmPolicy/malp.htm Updated: June 15, 2009. Date Accessed: May 22, 2012.

United States Department of Agriculture. Economic Research Service. 2009. "Farm and Commodity Policy: Program Provisions: Average Crop Revenue Election (ACRE)." http://www.ers.usda.gov/Briefing/FarmPolicy/ACRE.htm Updated: June 15, 2009. Date Accessed: May 22, 2012.

United States Department of Agriculture. Farm Service Agency. 2008. "Direct and Counter-cyclical Payment (DCP) Program Fact Sheet."

United States Department of Agriculture. Farm Service Agency. 2009."2009 Average Crop Revenue Election (ACRE) Program Fact Sheet."

United States Department of Agriculture. Farm Service Agency. 2011."Nonrecourse Marketing Assistance Loan/Loan Deficiency Payments Fact Sheet."

United States Department of Agriculture. Farm Service Agency. 2013. "DCP/ACRE Enrollment Data". http://www.fsa.usda.gov/FSA/webapp?area=home&subject=dccp&topic=09cy Date Accessed: May 28, 2014.

United States Department of Agriculture. National Agricultural Statistics Service. 2014. "Data and Statistics Quick Stats Lite". http://www.nass.usda.gov Date Accessed: May 27, 2014.

United States Department of Agriculture. Risk Management Agency. 2015. "Crop Insurance Decision Tool." http://prodwebnlb.rma.usda.gov/apps/CIDT/ Date Assessed: April 13, 2015.

United State Department of Agriculture. Risk Management Agency. 2015. "Actuarial Information Browser (AIB) Landing Page". http://webapp.rma.usda.gov/apps/actuarialinformationbrowser/ Date Assessed: April 6, 2015.

United States Department of Agriculture. Risk Management Agency. 2015. "Rice Revenue Protection Coverage for 2015 Crop Year FAQs". http://www.rma.usda.gov/help/faq/ricerevenue.html Date Assessed: May 19, 2015.

University of Arkansas. Division of Agriculture. 2013. "Economic Contribution of Arkansas Agriculture in 2013." http://arkansasagnews.uark.edu/EconomicContributionArkAg2013.pdf Date Assessed: May 23, 2014.

Varian, H. R. Microeconomic Analysis, 3rd Ed. W.W. Norton and Company. New York. 1992

Young, E. 2008. "The 2002 Farm Bill: Provisions and Economic Implications." Department of Agriculture Economic Research Service. Administrative Publication No. 022.

Young, E. and P. Westcott. 1996. “The 1996 Farm Act Increases Market Orientation.” United States Department of Agriculture Economic Research Service. Agriculture Information Bulletin No. 726.

Zulauf, C. and D. Orden. 2010. “The Revenue Program Option in the 2008 U.S. Farm Bill: Evaluating Performance Characteristics of the ACRE Program”. Agricultural and Resource Economics Review. 39, 3:517-533.

APPENDIX A: ENTERPRISE BUDGETS FOR THE MISSISSIPPI RIVER DELTA REGION, 2014

Enterprise budgets published for selected crops in the Mississippi River delta region, 2014.

State	Corn	Cotton	Rice	Soybean
Arkansas	Stacked gene Furrow irrg. Stacked gene, Center pivot irrg. Stacked gene, Non-irrg.	B2RF, Furrow irrg. B2RF, Center pivot irrg. B2RF, Non-irrg. B2LL, Furrow irrg. B2LL, Center pivot irrg. B2LL, Non-irrg. Conv. Seed, Furrow irrg.	Conv. seed, Drill plant CL seed, Drill plant Hybrid seed, Drill plant CL Hybrid, Drill plant Conv. seed, Water plant	RR, Furrow irrg. RR, Center pivot irrg. RR, Non-irrg. RR, Flood irrg. LL, Furrow irrg. LL, Center pivot irrg. LL, Non-irrg. LL, Flood irrg. Conv. seed, Furrow irrg.
Louisiana	RR, Non-irrg RR, Irrg. BtRR, Non-irrg. BtRR, Irrg.	B2RF, Non-irrg. B2RF, Irrg.	Conv. seed, Water plant CL seed, Water plant Conv. seed Drill plant CL seed, Drill plant CL Hybrid, Drill plant	RR, Non-irrg. RR, Irrg.
Mississippi	BtRR, Furrow irrg. BtRR, Non-irrg. RR, Furrow irrg. RR, Non-irrg. BtRR, No-till	B2RF, Con-till B2RF, No-till B2RF, Skip-row LLB2, Con-till B2RF, Furrow irrg. B2RF, Center pivot irrg. LLB2, Con-till	Conv. seed, Contour levee Conv. seed, Straight levee Conv. seed, Multi-inlet Conv. seed, Zero grade CL seed, Contour levee CL seed, Straight levee CL seed, Multi-inlet CL seed, Zero grade CL Hybrid, Straight levee	RR, Non-irrg. RR, Furrow irrg. RR, Flood irrg. RR, Center pivot irrg. RR, Reduce-till RR, No-till

where: BtRR= Bt stacked gene Roundup Ready corn seed; irrg= irrigation practice; non-irrg= dryland production; furrow irrg= furrow irrigation system; flood irrg= flood irrigation system; B2RF= Bollgard II Roundup Ready Flex cotton seed; B2LL, LLB2= Bollgard II Liberty Link production system cotton seed; con-till= conservation tillage practice; no-till= no tillage in field; reduce till= reduced tillage in field; conv. seed= conventional seed technology; CL= CLEARFIELD® technology rice seed; plant= planting method for rice; multi-inlet= multiple inlet field irrigation practice; zero grade= precision graded field; contour/straight levee= levee system in field; RR= Roundup Ready seed technology; LL= Liberty Link seed technology.

APPENDIX B: FARM SIZES FOR SELECTED COUNTIES IN THE MISSISSIPPI RIVER DELTA REGION

Arkansas farm size for selected counties, 2012 Census of Agriculture data.

County	Number of Farms	Harvested Acres	Number of Farms	Harvested Acres	Number of Farms	Harvested Acres
	County	*County*	*1,000-1,999ac*	*1,000-1,999ac*	*2,000ac +*	*2,000ac +*
Chicot	189	245,278	42	55,890	59	171,244
Ashley	204	79,834	13	16,799	19	30,330
Drew	171	82,454	13	18,543	17	49,994
Lincoln	191	151,197	27	38,247	33	96,291
Desha	167	235,956	32	46,022	55	174,238
Arkansas	294	337,179	98	131,053	63	174,001
Monroe	164	238,957	38	52,016	51	165,104
Phillips	240	339,969	46	63,588	71	246,245
Lee	187	243,853	27	36,763	46	183,360
Cross	210	241,240	45	58,872	54	153,778
St. Francis	241	263,494	42	59,258	60	185,459
Crittenden	206	301,679	33	44,312	65	233,990
Mississippi	299	441,926	60	82,488	90	317,168
Lawrence	314	170,800	29	37,702	30	87,922

Source: USDA ERS, 2014.

Louisiana farm size for selected parishes, 2012 Census of Agriculture data.

County	Number of Farms	Harvested Acres	Number of Farms	Harvested Acres	Number of Farms	Harvested Acres
	Parish	*Parish*	*1,000-1,999ac*	*1,000-1,999ac*	*2,000ac +*	*2,000ac +*
Acadia	329	114,459	42	41,625	33	72,207
Evangeline	245	76,626	26	25,941	24	37,590
Jeff Davis	262	98,683	35	24,185	34	53,392
Vermilion	480	114,859	48	39,621	27	47,903
St. Landry	599	184,906	42	54,477	34	93,047
West Carroll	220	92,472	20	20,403	18	44,251
East Carroll	163	204,954	47	62,878	36	123,752
Morehouse	234	195,772	53	68,392	37	100,735
Tensas	105	156,494	19	23,319	32	119,523
Richland	369	154,085	49	49,801	24	61,792
Franklin	425	143,068	30	37,011	27	54,098
Madison	178	164,390	54	67,851	28	70,160
Concordia	216	151,957	28	36,317	33	90,391
Catahoula	227	138,677	34	36,494	28	82,782

Source: USDA ERS, 2014

Mississippi farm size for selected counties, 2012 Census of Agriculture data.

County	Number of Farms	Harvested Acres	Number of Farms	Harvested Acres	Number of Farms	Harvested Acres
	County	*County*	*1,000-1,999ac*	*1,000-1,999ac*	*2,000ac +*	*2,000ac +*
Washington	238	305,661	34	42,394	58	222,874
Bolivar	345	349,311	55	68,342	57	210,895
Coahoma	196	221,880	45	60,123	40	132,968
Sunflower	236	304,386	55	65,271	51	206,575
Leflore	180	218,731	39	49,439	39	141,280
Tallahatchie	269	236,433	38	47,637	43	160,227
Quitman	164	130,988	39	52,473	18	57,722
Tunica	80	179,519	14	15,985	33	153,310
Humphreys	145	147,537	21	25,299	27	94,858
Warren	85	37,037	9	8,188	6	18,698
Yazoo	253	169,205	37	37,844	32	105,974
Panola	312	108,759	30	24,066	22	57,210
Holmes	217	104,812	16	20,507	22	70,894
Issaquena	57	65,230	14	17,362	13	42,917
Sharkey	77	123,300	12	14,687	28	98,704

Source: USDA ERS, 2014

APPENDIX C: YIELD HISTORY FOR SELECTED COUNTIES IN THE MISSISSIPPI RIVER DELTA REGION

Historical production data for rice and soybeans produced in Arkansas County, Arkansas.

Year	Rice Yield (cwt/ac)	Soybean Yield (bu/ac)
1996	65.46	37.0
1997	62.30	38.7
1998	63.83	30.4
1999	65.90	41.0
2000	66.60	35.0
2001	70.00	40.0
2002	71.50	42.0
2003	73.40	45.0
2004	75.20	46.0
2005	72.50	41.0
2006	76.20	46.0
2007	77.70	46.0
2008	73.50	42.0
2009	73.50	45.0
2010	71.00	43.2
2011	74.00	44.3
2012	80.30	50.2
2013	80.60	51.8

Source: USDA NASS, 2014.

Historical production data for corn, cotton, and soybeans produced in Phillips County, Arkansas.

Year	Corn Yield bu/ac)	Cotton Yield (lbs/ac)	Soybean Yield (bu/ac)
1996	125.2	798	30.0
1997	142.3	951	29.9
1998	87.1	640	22.4
1999	144.0	727	26.0
2000	142.0	711	22.0
2001	154.0	763	30.0
2002	136.0	890	29.0
2003	127.0	966	38.0
2004	134.0	1,009	41.0
2005	141.0	1,116	35.0
2006	152.0	955	27.0
2007	176.0	1,065	39.0
2008	144.0	1,022	40.5
2009	149.0	769	42.0
2010	145.5	1,010	36.0
2011	141.7	980	39.5
2012	181.9	1.051	40.9
2013	187.9	1,115	41.8

Source: USDA NASS, 2014.

Historical production data for cotton and soybeans produced in Mississippi County, Arkansas.

Year	Cotton Yield (lbs/ac)	Soybean Yield (bu/ac)
1996	786	34.0
1997	753	32.1
1998	574	23.4
1999	597	26.0
2000	596	21.0
2001	858	28.0
2002	814	36.0
2003	846	41.0
2004	1,020	43.0
2005	914	36.0
2006	1,092	41.0
2007	971	35.0
2008	1,002	41.5
2009	846	43.0
2010	962	34.6
2011	840	39.0
2012	984	43.1
2013	1,077	41.5

Source: USDA NASS, 2014.

Historical production data for rice and soybeans produced in Acadia Parish, Louisiana.

Year	Rice Yield (cwt/ac)	Soybean Yield (bu/ac)
1996	49.00	30.4
1997	45.90	28.1
1998	44.60	22.1
1999	52.40	28.1
2000	51.50	25.4
2001	56.20	29.0
2002	57.0	34.2
2003	62.30	25.6
2004	54.90	20.9
2005	60.70	28.8
2006	58.50	39.2
2007	63.00	40.1
2008	61.20	35.0
2009	64.40	34.0
2010	63.50	32.9
2011	65.40	30.4
2012	65.30	36.4
2013	74.50	39.3

Source: USDA NASS, 2014.

Historical production data for corn, cotton, and soybeans produced in Morehouse Parish, Louisiana.

Year	Corn Yield bu/ac)	Cotton Yield (lbs/ac)	Soybean Yield (bu/ac)
1996	123.0	693	30.9
1997	138.5	754	27.1
1998	108.0	532	22.1
1999	151.2	678	23.9
2000	133.1	622	19.3
2001	157.9	520	29.3
2002	126.1	715	27.7
2003	139.9	901	27.9
2004	140.2	809	35.1
2005	157.8	803	30.9
2006	158.0	935	33.9
2007	179.0	1,012	41.1
2008	156.0	764	34.0
2009	158.0	745	44.0
2010	162.1	903	46.5
2011	162.0	976	48.4
2012	181.1	1,024	50.1
2013	173.1	1,204	56.9

Source: USDA NASS, 2014.

Historical production data for cotton and soybeans produced in Tensas Parish, Louisiana.

Year	Cotton Yield (lbs/ac)	Soybean Yield (bu/ac)
1996	762	31.5
1997	634	25.7
1998	851	25.7
1999	781	25.9
2000	615	23.5
2001	520	32.2
2002	854	36.7
2003	1,065	36.0
2004	935	41.0
2005	968	42.2
2006	1,010	35.5
2007	1,100	50.8
2008	513	33.0
2009	779	42.0
2010	794	36.4
2011	928	42.3
2012	1,085	53.8
2013	1,289	53.4

Source: USDA NASS, 2014.

Historical production data for rice and soybeans produced in Bolivar County, Mississippi.

Year	Rice Yield (cwt/ac)	Soybean Yield (bu/ac)
1996	61.30	33.3
1997	57.74	35.7
1998	58.82	26.0
1999	57.09	30.5
2000	58.38	31.3
2001	66.34	37.0
2002	64.70	38.5
2003	67.89	44.1
2004	69.31	41.4
2005	65.68	41.3
2006	70.91	27.5
2007	76.00	49.0
2008	68.10	42.0
2009	67.00	42.0
2010	71.20	45.0
2011	71.40	42.5
2012	72.30	46.3
2013	73.00	49.1

Source: USDA NASS, 2014.

Historical production data for corn, cotton, and soybeans produced in Leflore County, Mississippi.

Year	Corn Yield bu/ac)	Cotton Yield (lbs/ac)	Soybean Yield (bu/ac)
1996	106.5	817	31.6
1997	122.5	985	33.7
1998	104.2	813	23.8
1999	135.6	760	25.9
2000	119.5	731	27.5
2001	155.3	646	35.9
2002	120.8	857	35.6
2003	161.0	1,005	41.9
2004	143.0	1,125	39.8
2005	148.0	934	37.9
2006	149.0	959	31.5
2007	182.2	982	45.0
2008	168.0	900	43.0
2009	141.0	604	38.0
2010	164.0	1,156	46.0
2011	161.7	915	47.9
2012	190.7	1,012	54.8
2013	184.1	1,282	49.1

Source: USDA NASS, 2014.

Historical production data for cotton and soybeans produced in Coahoma County, Mississippi.

Year	Cotton Yield (lbs/ac)	Soybean Yield (bu/ac)
1996	904	31.8
1997	1,015	35.3
1998	708	25.2
1999	725	24.8
2000	668	22.8
2001	722	34.8
2002	915	37.7
2003	954	40.4
2004	1,034	39.5
2005	940	35.7
2006	829	26.1
2007	1,085	44.0
2008	1,103	43.0
2009	821	45.0
2010	1,091	38.0
2011	991	38.8
2012	1,163	44.0
2013	1,314	50.3

Source: USDA NASS, 2014.

APPENDIX D: UNITED STATES CODE ON AGRICULTURAL COMMODITY POLICY AND PROGRAMS

7 USC 9011. The term “covered commodity” means wheat, oats, barley, corn, grain sorghum, long grain rice, medium grain rice, pulse crops, soybeans, other oilseeds, and peanuts.

The term “generic base acres” means the number of base acres for cotton in effect under the Food, Conservation, and Energy Act of 2008, as in effect on September 30, 2013, subject to any adjustment or reduction under the Agricultural Act of 2014.

The “reference price” with respect to a covered commodity for a crop year, means the following: for wheat, $5.50 per bushel; for corn, $3.70 per bushel; for grain sorghum, $3.95 per bushel; for barley, $4.95 per bushel; for oats, $2.40 per bushel; for long grain rice, $14.00 per hundredweight; for medium grain rice, $14.00 per hundredweight; for soybeans, $8.40 per bushel; for other oilseeds, $20.15 per hundredweight; for peanuts, $535.00 per ton; for dry peas, $11.00 per hundredweight; for lentils, $19.97 per hundredweight; and for small chickpeas, $19.04 per hundredweight.

7 USC 9012. The USDA the Farm Service Agency provided notice to farm owners regarding their opportunity to make an election to retain base acres, including generic base acres; or in lieu retaining base acres, to reallocate base acres, other than any generic base acres. Generic base acres are automatically retained.

For the purpose of applying reallocation of all base acres of covered commodities on the farm, as in effect on September 30, 2013, among those covered commodities planted on the farm at any time during the 2009 through 2012 crop years. The reallocation of base acres among covered commodities on a farm is in proportion to the ratio of the four year average of the acreage planted on a farm to each covered commodity for the 2009 through 2012 crop years; and any acreage on the farm that the producers were prevented from planting during the 2009 through

2012 crop years to that covered commodity; to the four year average of the acreage planted on the farm to all covered commodities and any acreage on the farm that the producers were prevented from planting. Generic base acres are retained and may not be reallocated under the reallocation process. For the purpose of determining a four year acreage average for a farm, any crop year in which a covered commodity was not planted is not excluded.

If the acreage that was devoted to another covered commodity in the same crop year (other than a covered commodity produced under an established practice of double cropping), the farm owner may elect the commodity to be used for that crop year in determining the four year average, but may not include both the initial commodity and the subsequent commodity.

The reallocation of base acres among covered commodities on a farm cannot result in a total number of base acres (including generic acres) for the farm in excess of the number of base acres in effect for the farm on September 30, 2013.

7 USC 9013. At the sole discretion of the farm owner, the owner has a one-time opportunity to update, on a covered commodity-by-covered commodity basis, the payment yield that would otherwise be used in calculating any price loss coverage (PLC) payment for each covered commodity on the farm for which the election is made. If the farm owner elects to update yields, the payment yield for a covered commodity on the farm, for the purpose of calculating PLC payments only, is equal to 90 percent of the average of the yield per planted acre for the crop of the covered commodity on the farm for the 2008 through 2012 crop years, excluding any crop year in which the acreage planted to the crop of the covered commodity was zero. If the yield per planted acre for a crop of a covered commodity for a farm for any of the 2008 through 2012 crop years is less than 75 percent of the average of the 2008 through 2012 county yield for that commodity, a yield for that crop equal to 75 percent of the average of the 2008 through 2012

county yield is assigned by USDA FSA for the purpose s of determining the average yield for the PLC program.

7 USC 9014. For the purpose of PLC and agriculture risk coverage when county coverage (ARC-CO) has been selection, the payment acres for each covered commodity on a farm shall equal 85 percent of the base acres for the covered commodity on the farm. In the case of agriculture risk coverage when individual coverage (ARC-IC) has been selected, the payment acres for a farm shall be equal to 65 percent of the base acres for all covered commodities on the farm.

In the case of generic base acres, PLC payments and ARC payments are made only with respect to generic base acre planted to a covered commodity for the crop year. With respect to a farm containing generic base acres, generic base acres on the farm are attributed to a covered commodity in the following manner. If a single covered commodity is planted and the total acreage planted exceeds the generic base acre on the farm, the generic base acres are attributed to that covered commodity in the amount equal to the total number of generic base acres. If multiple covered commodities are planted and the total number of acres planted to all covered commodities on the farm exceeds the generic base acres on the farm, the generic base acre are attributed to each of the covered commodities on a pro rata basis to reflect the ratio of the acreage planted to a covered commodity on the farm to the total acreage planted to al commodities on the farm. If the total number of acre planted to all covered commodities on the farm does not exceed the generic base acres of the farm, the number of acres planted to a covered commodity is attributed to that covered commodity. When generic acres are planted to a covered commodity or acreage planted to a covered commodity is attributed to generic base acres, the generic base acres are in addition to other base acres on the farm.

7 USC 9015. For the 2014 through 2018 crop years, all of the producers on a farm will make a one-time, irrevocable election to obtain PLC on a covered commodity-by-covered commodity basis; or ARC. The producers on a farm that elect to obtain ARC will unanimously select whether to receive agriculture risk coverage payments based on county coverage (CO) applicable on a covered commodity-by-covered commodity basis; or individual coverage (IC) applicable to all covered commodities on the farm.

7 USC 9016. PLC payments are made to producers on the farm on a covered commodity-by-covered commodity basis if, that for any of the 2014 through 2018 crop years the effective price for the covered commodity for the crop is less than the reference price for the covered commodity for the crop year. The effective price for a covered commodity is the higher of the national average market price received by producers during the 12-month marketing year for the covered commodity; or the national average loan rate for a marketing assistance loan for the covered commodity in effect for such crop year. The payment rate equals the difference between the reference price for the covered commodity; and the effective price for the covered commodity. If price loss coverage payments are provided for any of the 2014 through 2018 crop years for a covered commodity, the amount of the PLC payment paid to producers on a farm for the crop year equals the product obtained by multiplying the payment rate for the covered commodity; the payment yield for the covered commodity; and the payment acres for the covered commodity. If PLC payments are required to be provided, the payment shall be made beginning October 1, or as soon as practicable thereafter, after the end of the applicable marketing year for the covered commodity.

7 USC 9017. If all of the producers on a farm make the election to obtain ARC, payments shall be made to producers on a farm for any of the 2014 through 2018 crop years the actual crop

revenue for the crop year is less than the agriculture risk coverage guarantee for the crop year. In the case of county coverage, the amount of the actual crop revenue for a county for a crop year of a covered commodity equals the product obtained by multiplying the actual average county yield per planted acre for the covered commodity and the higher of- the national average marketing year price received by producers during the 12-month marketing year for the covered commodity; or the national average loan rate for a marketing assistance loan for the covered commodity in effect for such crop year.

In the case of individual coverage, the amount of the actual crop revenue for a producer on a farm for a crop year shall be based on the producer's share of all covered commodities planted on all farms for which individual coverage has been selected and in which the producer has an interest as follows. For each covered commodity, the product obtained by multiplying the total production of the covered commodity on such farms; and the higher of the national average market price received by producers during the 12-month marketing year; or the national average loan rate for a marketing assistance loan for the covered commodity in effect for such crop year. The sum of the aforementioned amounts is determined for all covered commodities on such farms. The quotient obtained by dividing the summed amount by the total planted acres of all covered commodities on such farms.

The agriculture risk coverage guarantee for a crop year for a covered commodity equals 86 percent of the benchmark revenue. In the case of county coverage, the benchmark revenue shall be the product obtained by multiplying the average historical county yield for the most recent five crop years, excluding each of the crop years with the highest and lowest yields; and the national average market price received by producers during the 12-month marketing year for the most recent five crop years, excluding each of the crop years with the highest and lowest prices.

In the case of individual coverage, the benchmark revenue for a producer on a farm for a crop year shall be based on the producer's share of all covered commodities planted on all farms for which individual coverage has been selected and in which the producer as an interest to be determined as follows. For each covered commodity, for each of the most recent five crop years, the product obtained by multiplying the yield per planted acre for the covered commodity on such farms; by the national average market price received by producers during the 12-month marketing year. For each covered commodity, the average of the revenues for the most recent five crop years, exclude each of the crop years with the highest and lowest revenues. For each of the 2014 through 2018 crop years, the sum of the amounts is determined for all covered commodities on such farms, but adjusted to reflect the ration between the total number of acres planted on such farms to a covered commodity and the total acres of all covered commodities planted on such farms.

If the yield per planted acre for the covered commodity or historical county yield per planted acre for the covered commodity for any of the five most recent crop years is less than 70 percent of the transitional yield, the amounts used for any of those years shall be 70 percent of the transitional yield. If the national average market price received by producers during the 12-month marketing year for any of the five most recent crop years is lower than the reference price for the covered commodity, the reference price for any of those years.

The payment rate for a covered commodity, in the case of county coverage, or a farm, in the case of individual coverage, shall be equal to the lesser of the amount that the agriculture risk coverage guarantee for the crop year exceeds the actual crop revenue for the crop year; or 10 percent of the benchmark revenue for the crop year. If agriculture risk coverage payments are required to be paid for any of the 2014 through 2018 crop years, the amount of the agriculture risk coverage payment for the crop year shall be determined by multiplying the payment rate and the payment acres. If agriculture risk coverage payments are required to be provided for the covered commodity, payments shall be made beginning October 1, or as soon as practicable thereafter, after the end of the applicable marketing year for the covered commodity.

To the maximum extent practicable, the USDA Secretary shall provide calculation for a separate actual crop revenue and agriculture risk coverage guarantee for irrigated and non-irrigated covered commodities.

7 USC 9019. Transition assistance is provided to producers of upland cotton in light of the repeal of section 1103 of the Food, Conservation, and Energy Act of 2008 (7 USC 8713), the inapplicability of sections 116 and 117 of the Agricultural Act of 2014 to upland cotton, and the delayed implementation of the stacked income protection (STAX) plan required by section 508B of the Federal Crop Insurance Act (7 USC 1508b), as added by section 11017 of the Agricultural Act of 2014. Appendix B contains U.S. Code on selected Federal crop insurance provisions.

For the 2014 crop of upland cotton, transition assistance, pursuant to the terms and conditions of section 119 of the Agricultural Act of 2014, shall be provided to producers on a farm for which cotton base acres were in existence for the 2013 crop year. For the 2015 crop of upland cotton, transition assistance payment will be provided to producers on a farm for which cotton base acre were in existence for the 2013 crop year; and that is located in a county in which the SATX plan required by section 508B of the Federal Crop Insurance Act (7 USC 1508b) is not available to producers of upland cotton for the 2015 crop year.

The transition assistance rate is equal to the product obtained by multiplying: the June 12, 2013, midpoint estimate for the marketing year average price of upland cotton received by producers for the marketing year beginning August 1, 2013, minus the December 10, 2013, midpoint estimate for the marketing year average price of upland cotton received by producers for the marketing year beginning August 1, 2013, as contained in the applicable USDA World Agricultural Supply and Demand Estimates (WASDE) report; and the national program yield for upland cotton of 597 pounds per acre. The amount of transition assistance to be provided to producers on a farm for a crop year shall be equal to the product obtained by multiplying- for the 2014 crop year, 60 percent, and for the 2015 crop year, 36.5 percent, of the cotton base acres for the farm; the transition assistance rate in effect for the crop year; and the payment yield for upland cotton for the farm established for purposes of section 1103(c)(3) of the Food, Conservation, and Energy Act of 2008 (7 USC 817(c)(3)), divided by the national program yield for upland cotton of 597 pounds per acre.

Transition assistance payment for a crop year will not be made before October 1 of the calendar year in which the crop of upland cotton is harvested. Sections 1001 through 1001C of the Food Security Act of 1985 (7 USC 1308 through 1308C), as in effect on September 30, 2013, shall apply to the receipt of transition assistance under section 1119 of the Agricultural Act of 2014 in the same manner as such sections applied to section 1103 of the Food, Conservation, and Energy Act of 2008 (7 USC 8713).

7 USC 9031. For each of the 2014 through 2018 crops of each loan commodity on a farm, nonrecourse marketing assistance loans shall be made available for loan commodities produced on the farm.

7 USC 9032. For purposes of each of the 2014 through 2018 crop years, the loan rate for a marketing assistance loan under section 1201 of the Agricultural Act of 2014 for a loan commodity shall be equal to the following: in the case of wheat, $2.94 per bushel; in the case of corn, $1.95 per bushel; in the case of grain sorghum, $1.95 per bushel; in the case of barley,

$1.95 per bushel; in the case of oats, $1.39 per bushel; in the case of base quality upland cotton, for each of the 2014 through 2018 crop years, the simple average of the adjusted prevailing world price of the two immediately preceding marketing years, but in no case less than $0.45 per pound or more than $0.52 per pound; in the case of extra-long staple cotton, $0.7977 per pound; in the case of long grain rice, $6.50 per hundredweight; in the case of medium grain rice, $6.50 per hundredweight; in the case of soybeans, $5.00 per bushel; in the case of oilseeds, $10.09 per hundredweight; in the case dry peas, $5.40 per hundredweight; in the case of lentils, $11.28 per hundredweight; in the case of small chickpeas, $7.43 per hundredweight; in the case of large chickpeas, $11.28 per hundredweight; in the case of graded wool, $1.15 per pound; in the case of non-graded wool, $0.40 per pound; in the case of mohair, $4.20 per pound; in the case of honey, $0.69 per pound; in the case of peanuts, $355 per ton.

7 USC 9033. In the case of each loan commodity, a marketing assistance loan shall have a term of nine months beginning the first day of the first month after the month in which the loan is made.

7 USC 9034. Producers on a farm are permitted to repay a marketing assistance loan for a loan commodity (other than upland cotton, long grain rice, medium grain rice, extra-long staple cotton, peanuts, and confectionery sugar, and each other kind of sunflower seed) at a rate that is the lesser of- the loan rate established for the commodity plus interest (determined by the Federal Agricultural Improvement and Reform Act of 1996, 7 USC 7283; a rate that is- calculated based on the average market prices for the loan commodity during the preceding 30-day period; and will minimize discrepancies in marketing loan benefits across State boundaries and across county boundaries; or a rate that the Secretary may develop. The repayment rates for upland cotton, long grain rice, and medium grain rice shall be at a rate that is the lesser of- the loan rate, plus interest;

or the prevailing world market price for the commodity. The prevailing world market price for upland cotton, long grain rice, and medium grain rice shall be adjusted to U.S. quality and location.

7 USC 9035. Loan deficiency payments are available to producers on a farm that, although eligible to obtain a marketing assistance loan under section 1201 with respect to a loan commodity, agree to forgo obtaining the loan for the commodity in return for loan deficiency payments. A loan deficiency payment equals the product obtained by multiplying- the payment rate determined for the commodity; by the quantity of the commodity produced by eligible producers, excluding any quantity for which the producers obtain a marketing assistance loan. In the case of a loan commodity, the payment rate shall be the amount by which the loan rate exceeds the rate at which a marketing assistance loan for the loan commodity may be repaid under section 1204 of the Agricultural Act of 2014.

7 USC 9092. The total amount of payments received, directly or indirectly, by a person or legal entity for any crop year under sections 1116 and 1117 and as marketing loan gains or loan deficiency payments under Title I of the Agricultural Act of 2014 may not exceed $125,000.

APPENDIX E: UNITED STATES CODE ON THE FEDERAL CROP INSURANCE

Section 508(c) of the Federal Crop Insurance Act, 7 USC 1508(c), is amended by inserting the following. A producer shall have the option of purchasing additional coverage based on an individual yield and loss basis; or an area yield and loss basis; or an individual yield and loss basis, supplemented with coverage based on an area yield and loss basis to cover part of the deductible under the individual yield and loss policy. The level of coverage shall be dollar denominated; and may be purchased at any level not to exceed 85 percent of the individual yield or 95 percent of the area yield. In the case of the supplemental coverage option (SCO), the Corporation shall offer producers the opportunity to purchase coverage in combination with a policy or plan of insurance that would allow indemnities to be paid to a producer equal to a part of the deductible under the policy or plan of insurance- at a county-wide level to the fullest extent possible; or in counties that lack sufficient data, on the basis of larger geographical area as the Corporation determines to provide sufficient data for purposes of providing the coverage. Coverage is triggered only if the losses in the area exceed 14 percent of normal levels (as determined by the Corporation). Coverage offered shall not exceed the difference between 86 percent; and the coverage level selected by the producer for the underlying policy or plan of insurance.

Crops for which the producer has elected under section 1116 of the Agricultural Act of 2014 to receive agriculture risk coverage and acres that are enrolled in the stacked income protection plan under section 508B shall not be eligible for supplemental coverage.

The premium for coverage offered shall be sufficient to cover anticipated losses and a reasonable reserve; and include an amount for operating and administrative expenses. Section 508(e) (2) of the Federal Crop Insurance Act, 7 USC 1508(e) (2), is amended by adding the following. In the case of the supplemental coverage option, the amount shall be equal to the sum of 65 percent of the additional premium associated with coverage; and for the coverage of operating and administrative expenses.

7 USC 1508 note. The Federal Crop Insurance Corporation (FCIC) shall begin to provide additional coverage based on an individual yield and loss basis, supplemented with coverage based on area yield and loss basis, not later for the 2015 crop year.

Section 508(e) (5) of the Federal Crop Insurance Act, 7 USC 1508(e) (5), is amended by adding the following. Beginning with the 2015 crop year, the Corporation shall make available separate enterprise units for irrigated and non-irrigated acreage of crops in counties.

7 USC 1508b. Beginning not later than the 2015 crop of upland cotton, the Corporation shall make available to producers of upland cotton an additional policy (to be known as the 'Stacked Income Protection Plan'), which shall provide coverage consistent with the Group Risk Income Protection Plan (and the associated Harvest Revenue Option Endorsement) offered by the Corporation for the 2011 crop year.

STAX shall comply with the following requirements. Provide coverage for revenue loss of not less than 10 percent and not more than 30 percent of expected county revenue, specified in increments of 5 percent. The deductible shall be the minimum percent of revenue loss at which indemnities are triggered under the plan, not to be less than 10 percent of the expected county revenue. The plan is offered to producers of upland cotton in all counties with upland cotton production- at a county-wide level to the fullest extent practicable; or in counties that lack sufficient data, on the basis of such larger geographical area as the Corporation determines to provide sufficient data for purposes of providing the coverage. The plan can be purchased in addition to any other individual or area coverage in effect on the producer's acreage or as a stand-alone policy, except that if a producer has an individual or area coverage for the same acreage, the maximum coverage available under the STAX plan shall not exceed the deductible for the individual coverage.

Coverage is established based on the expected price established under existing Group Risk Income Protection (GRIP) or area wide policy offered by the Corporation for the applicable county (or area) and crop year; and an expected county yield established for the existing area-wide plans offered by the Corporation for the applicable county (or area) and crop year (or, in geographic area where area-wide plans are not offered, an expected yield determined in a manner consistent with those of area-wide plans); or the average of the applicable yield data for the county (or area) for the most recent five years, excluding the highest and lowest observations, from the USDA RMA or the USDA NASS (or both) or, if sufficient county data is not available, such other data considered appropriate by the Secretary.

The use of a multiplier factor to establish maximum protection per acre (protection factor) of not less than the higher of the level established on a program wide basis or 120 percent.

An indemnity is paid based on the amount that the expected county revenue exceeds the actual county revenue, as applied to the individual coverage of the producer. Indemnities under the STAX plan shall not overlap the amount of the deductible selected. In all counties for which data is available, establish separate coverage for irrigated and non-irrigated practices.

The premium shall be sufficient to cover anticipated losses and a reasonable reserve; and include an amount for operating and administrative expenses. The amount of premium paid by the Corporation for all qualifying coverage levels of the STAX plan shall be 80 percent of the amount of the premium established for the coverage level selected; and an amount to cover administrative and operating expenses.

APPENDIX F: SERF RESULTS FOR REPRESENTATIVE FARMS

Certainty equivalents of cumulative net returns above variable costs to the producer for a representative Arkansas County, Arkansas Farm.

Observation Number	Risk Aversion Coefficient (RAC)	Policy Option 1	Policy Option 2	Policy Option 3
0	0	$1,043.25	$1,361.55	$1,225.47
1	0.0001491	$1,025.03	$1,342.48	$1,210.45
2	0.0002983	$1,006.96	$1,323.52	$1,195.52
3	0.0004474	$989.02	$1,304.70	$1,180.67
4	0.0005965	$971.25	$1,286.02	$1,165.92
5	0.0007457	$953.64	$1,267.47	$1,151.26
6	0.0008948	$936.21	$1,249.06	$1,136.69
7	0.0010439	$918.95	$1,230.79	$1,122.21
8	0.0011931	$901.89	$1,212.67	$1,107.83
9	0.0013422	$885.02	$1,194.70	$1,093.55
10	0.0014913	$868.35	$1,176.88	$1,079.36
11	0.0016405	$851.90	$1,159.23	$1,065.28
12	0.0017896	$835.65	$1,141.74	$1,051.30
13	0.0019387	$819.63	$1,124.42	$1,037.42
14	0.0020879	$803.84	$1,107.28	$1,023.65
15	0.002237	$788.28	$1,090.32	$1,010.00
16	0.0023861	$772.95	$1,073.55	$996.45
17	0.0025353	$757.86	$1,056.97	$983.02
18	0.0026844	$743.01	$1,040.59	$969.72
19	0.0028335	$728.40	$1,024.41	$956.53
20	0.0029826	$714.04	$1,008.45	$943.47

Certainty equivalents of cumulative net returns above variable costs to the producer for a representative Acadia Parish, Louisiana Farm.

Observation Number	Risk Aversion Coefficient (RAC)	Policy Option 1	Policy Option 2	Policy Option 3
0	0	$540.42	$727.45	$667.24
1	0.0003101	$530.75	$720.59	$660.89
2	0.0006201	$521.16	$713.82	$654.61
3	0.0009302	$511.66	$707.13	$648.40
4	0.0012402	$502.23	$700.51	$642.26
5	0.0015503	$492.87	$693.97	$636.19
6	0.0018603	$483.58	$687.49	$630.18
7	0.0021704	$474.35	$681.07	$624.23
8	0.0024805	$465.18	$674.71	$618.33
9	0.0027905	$456.05	$668.40	$612.48
10	0.0031006	$446.96	$662.15	$606.68
11	0.0034106	$437.91	$655.94	$600.91
12	0.0037207	$428.88	$649.77	$595.19
13	0.0040308	$419.88	$643.64	$589.50
14	0.0043408	$410.89	$637.55	$583.83
15	0.0046509	$401.90	$631.48	$578.20
16	0.0049609	$392.92	$625.45	$572.58
17	0.005271	$383.93	$619.44	$566.98
18	0.005581	$374.94	$613.45	$561.40
19	0.0058911	$365.92	$607.49	$555.83
20	0.0062012	$356.90	$601.54	$550.27

Certainty equivalents of cumulative net returns above variable costs to the producer for a representative Bolivar County, Mississippi Farm.

Observation Number	Risk Aversion Coefficient (RAC)	Policy Option 1	Policy Option 2	Policy Option 3
0	0	$444.19	$637.39	$586.82
1	0.0003596	$435.79	$630.44	$580.14
2	0.0007193	$427.55	$623.61	$573.56
3	0.0010789	$419.49	$616.92	$567.09
4	0.0014385	$411.60	$610.35	$560.72
5	0.0017981	$403.87	$603.91	$554.46
6	0.0021578	$396.31	$597.59	$548.31
7	0.0025174	$388.91	$591.39	$542.25
8	0.002877	$381.67	$585.30	$536.29
9	0.0032367	$374.58	$579.33	$530.43
10	0.0035963	$367.64	$573.46	$524.65
11	0.0039559	$360.83	$567.70	$518.97
12	0.0043155	$354.17	$562.04	$513.37
13	0.0046752	$347.64	$556.48	$507.85
14	0.0050348	$341.24	$551.02	$502.41
15	0.0053944	$334.97	$545.65	$497.04
16	0.0057541	$328.82	$540.37	$491.75
17	0.0061137	$322.78	$535.17	$486.53
18	0.0064733	$316.86	$530.07	$481.38
19	0.0068329	$311.05	$525.04	$476.30
20	0.0071926	$305.35	$520.10	$471.28

Certainty equivalents of cumulative net returns above variable costs to the producer for a representative Mississippi County, Arkansas Farm.

Obs Number	Risk Aversion Coefficient (RAC)	Policy Option 1	Policy Option 2	Policy Option 3	Policy Option 4	Policy Option 5
0	0	$255.58	$174.97	$202.65	$206.86	$220.36
1	0.000943	$240.89	$160.73	$188.33	$192.78	$207.58
2	0.0018861	$226.88	$147.14	$174.66	$179.38	$195.38
3	0.0028291	$213.54	$134.17	$161.62	$166.65	$183.73
4	0.0037722	$200.85	$121.80	$149.18	$154.53	$172.63
5	0.0047152	$188.78	$110.01	$137.32	$143.00	$162.03
6	0.0056582	$177.30	$98.75	$125.99	$132.02	$151.91
7	0.0066013	$166.37	$87.98	$115.16	$121.56	$142.24
8	0.0075443	$155.97	$77.69	$104.80	$111.57	$132.99
9	0.0084874	$146.04	$67.82	$94.88	$102.03	$124.12
10	0.0094304	$136.57	$58.36	$85.37	$92.91	$115.62
11	0.0103734	$127.51	$49.27	$76.23	$84.18	$107.46
12	0.0113165	$118.83	$40.53	$67.45	$75.81	$99.62
13	0.0122595	$110.51	$32.10	$58.99	$67.79	$92.08
14	0.0132026	$102.51	$23.98	$50.84	$60.08	$84.82
15	0.0141456	$94.81	$16.12	$42.98	$52.68	$77.83
16	0.0150886	$87.39	$8.52	$35.39	$45.55	$71.09
17	0.0160317	$80.22	$1.15	$28.04	$38.67	$64.59
18	0.0169747	$73.28	-$5.99	$20.93	$32.04	$58.31
19	0.0179178	$66.55	-$12.93	$14.04	$25.64	$52.25
20	0.0188608	$60.03	-$19.67	$7.36	$19.44	$46.39

Certainty equivalents of cumulative net returns above variable costs to the producer for a representative Phillips County, Arkansas Farm.

Obs Number	Risk Aversion Coefficient (RAC)	Policy Option 1	Policy Option 2	Policy Option 3	Policy Option 4	Policy Option 5
0	0	$243.85	$160.81	$216.72	$207.99	$242.99
1	0.0009325	$226.98	$142.32	$197.16	$188.77	$225.03
2	0.0018651	$210.90	$124.84	$178.69	$170.71	$208.19
3	0.0027976	$195.60	$108.29	$161.22	$153.69	$192.35
4	0.0037301	$181.01	$92.59	$144.65	$137.62	$177.41
5	0.0046627	$167.12	$77.65	$128.87	$122.39	$163.26
6	0.0055952	$153.85	$63.40	$113.80	$107.91	$149.82
7	0.0065277	$141.19	$49.77	$99.36	$94.11	$137.00
8	0.0074603	$129.08	$36.68	$85.46	$80.92	$124.72
9	0.0083928	$117.49	$24.10	$72.05	$68.28	$112.91
10	0.0093253	$106.38	$11.98	$59.08	$56.15	$101.50
11	0.0102578	$95.73	$0.27	$46.49	$44.49	$90.44
12	0.0111904	$85.50	-$11.06	$34.25	$33.27	$79.68
13	0.0121229	$75.67	-$22.03	$22.32	$22.45	$69.16
14	0.0130554	$66.21	-$32.66	$10.70	$12.03	$58.86
15	0.013988	$57.09	-$42.98	-$0.65	$1.98	$48.73
16	0.0149205	$48.30	-$53.00	-$11.72	-$7.71	$38.76
17	0.015853	$39.82	-$62.73	-$22.52	-$17.06	$28.93
18	0.0167856	$31.62	-$72.18	-$33.05	-$26.07	$19.23
19	0.0177181	$23.69	-$81.35	-$43.31	-$34.76	$9.68
20	0.0186506	$16.01	-$90.25	-$53.27	-$43.14	$0.27

Certainty equivalents of cumulative net returns above variable costs to the producer for a representative Morehouse Parish, Louisiana Farm.

Obs Number	Risk Aversion Coefficient (RAC)	Policy Option 1	Policy Option 2	Policy Option 3	Policy Option 4	Policy Option 5
0	0	$674.65	$613.64	$640.23	$627.18	$672.93
1	0.0003097	$653.68	$593.33	$620.11	$607.79	$654.34
2	0.0006195	$633.18	$573.48	$600.46	$588.89	$636.24
3	0.0009292	$613.16	$554.11	$581.29	$570.47	$618.61
4	0.0012389	$593.64	$535.22	$562.62	$552.55	$601.47
5	0.0015486	$574.61	$516.82	$544.43	$535.12	$584.81
6	0.0018584	$556.05	$498.88	$526.73	$518.17	$568.62
7	0.0021681	$537.96	$481.40	$509.49	$501.70	$552.89
8	0.0024778	$520.32	$464.36	$492.71	$485.68	$537.60
9	0.0027875	$503.10	$447.75	$476.37	$470.11	$522.75
10	0.0030973	$486.29	$431.54	$460.44	$454.96	$508.31
11	0.003407	$469.88	$415.73	$444.93	$440.23	$494.27
12	0.0037167	$453.85	$400.29	$429.80	$425.90	$480.61
13	0.0040265	$438.17	$385.21	$415.03	$411.94	$467.33
14	0.0043362	$422.84	$370.47	$400.63	$398.36	$454.40
15	0.0046459	$407.85	$356.07	$386.57	$385.13	$441.81
16	0.0049556	$393.18	$341.99	$372.84	$372.24	$429.55
17	0.0052654	$378.83	$328.22	$359.42	$359.69	$417.61
18	0.0055751	$364.79	$314.75	$346.32	$347.45	$405.98
19	0.0058848	$351.06	$301.57	$333.52	$335.54	$394.65
20	0.0061945	$337.63	$288.69	$321.02	$323.93	$383.61

Certainty equivalents of cumulative net returns above variable costs to the producer for a representative Tensas Parish, Louisiana Farm.

Obs Number	Risk Aversion Coefficient (RAC)	Policy Option 1	Policy Option 2	Policy Option 3	Policy Option 4	Policy Option 5
0	0	$452.03	$382.31	$409.06	$398.20	$442.99
1	0.0004797	$428.13	$359.39	$386.31	$376.49	$422.24
2	0.0009594	$404.98	$337.16	$364.25	$355.49	$402.18
3	0.0014391	$382.56	$315.61	$342.85	$335.20	$382.81
4	0.0019188	$360.88	$294.73	$322.11	$315.60	$364.11
5	0.0023985	$339.89	$274.48	$301.98	$296.66	$346.04
6	0.0028783	$319.56	$254.81	$282.43	$278.34	$328.57
7	0.003358	$299.84	$235.66	$263.40	$260.61	$311.66
8	0.0038377	$280.68	$216.99	$244.84	$243.42	$295.28
9	0.0043174	$262.04	$198.76	$226.73	$226.73	$279.38
10	0.0047971	$243.89	$180.91	$209.02	$210.50	$263.93
11	0.0052768	$226.19	$163.41	$191.67	$194.71	$248.91
12	0.0057565	$208.91	$146.24	$174.67	$179.33	$234.30
13	0.0062362	$192.05	$129.39	$158.01	$164.32	$220.07
14	0.0067159	$175.59	$112.84	$141.66	$149.68	$206.20
15	0.0071956	$159.53	$96.59	$125.64	$135.40	$192.70
16	0.0076753	$143.87	$80.64	$109.93	$121.45	$179.56
17	0.008155	$128.61	$65.01	$94.56	$107.84	$166.76
18	0.0086348	$113.75	$49.70	$79.52	$94.55	$154.30
19	0.0091145	$99.29	$34.74	$64.82	$81.59	$142.19
20	0.0095942	$85.25	$20.12	$50.48	$68.96	$130.42

Certainty equivalents of cumulative net returns above variable costs to the producer for a representative Coahoma County, Mississippi Farm.

Obs Number	Risk Aversion Coefficient (RAC)	Policy Option 1	Policy Option 2	Policy Option 3	Policy Option 4	Policy Option 5
0	0	$770.94	$671.12	$688.42	$685.94	$704.31
1	0.000284	$755.27	$655.85	$673.18	$671.29	$690.47
2	0.0005681	$740.05	$641.02	$658.37	$657.07	$677.05
3	0.0008521	$725.26	$626.61	$643.98	$643.28	$664.03
4	0.0011361	$710.89	$612.61	$630.00	$629.89	$651.39
5	0.0014202	$696.92	$598.99	$616.40	$616.89	$639.13
6	0.0017042	$683.33	$585.75	$603.17	$604.27	$627.22
7	0.0019882	$670.10	$572.85	$590.28	$591.99	$615.64
8	0.0022722	$657.21	$560.29	$577.73	$580.05	$604.38
9	0.0025563	$644.63	$548.04	$565.48	$568.42	$593.42
10	0.0028403	$632.36	$536.08	$553.53	$557.10	$582.75
11	0.0031243	$620.36	$524.40	$541.85	$546.05	$572.34
12	0.0034084	$608.63	$512.98	$530.42	$535.27	$562.19
13	0.0036924	$597.13	$501.80	$519.24	$524.75	$552.27
14	0.0039764	$585.87	$490.85	$508.28	$514.46	$542.58
15	0.0042605	$574.81	$480.11	$497.54	$504.39	$533.11
16	0.0045445	$563.95	$469.57	$486.99	$494.53	$523.83
17	0.0048285	$553.28	$459.22	$476.63	$484.88	$514.74
18	0.0051125	$542.78	$449.05	$466.44	$475.41	$505.83
19	0.0053966	$532.43	$439.05	$456.42	$466.12	$497.09
20	0.0056806	$522.24	$429.20	$446.56	$457.01	$488.50

Certainty equivalents of cumulative net returns above variable costs to the producer for a representative Leflore County, Mississippi Farm.

Obs Number	Risk Aversion Coefficient (RAC)	Policy Option 1	Policy Option 2	Policy Option 3	Policy Option 4	Policy Option 5
0	0	$727.59	$636.46	$660.04	$645.26	$683.31
1	0.0002983	$710.15	$619.40	$643.02	$628.91	$667.58
2	0.0005965	$693.18	$602.80	$626.46	$613.01	$652.30
3	0.0008948	$676.69	$586.65	$610.37	$597.57	$637.46
4	0.0011931	$660.65	$570.97	$594.72	$582.58	$623.05
5	0.0014914	$645.08	$555.72	$579.52	$568.01	$609.07
6	0.0017896	$629.95	$540.91	$564.74	$553.87	$595.49
7	0.0020879	$615.26	$526.51	$550.38	$540.12	$582.30
8	0.0023862	$600.98	$512.52	$536.42	$526.77	$569.49
9	0.0026844	$587.11	$498.91	$522.84	$513.79	$557.04
10	0.0029827	$573.62	$485.66	$509.62	$501.16	$544.93
11	0.003281	$560.51	$472.77	$496.76	$488.87	$533.16
12	0.0035793	$547.75	$460.21	$484.22	$476.90	$521.69
13	0.0038775	$535.33	$447.97	$472.00	$465.23	$510.53
14	0.0041758	$523.24	$436.03	$460.08	$453.85	$499.65
15	0.0044741	$511.45	$424.38	$448.45	$442.75	$489.04
16	0.0047723	$499.97	$413.00	$437.09	$431.91	$478.69
17	0.0050706	$488.76	$401.89	$425.99	$421.31	$468.59
18	0.0053689	$477.84	$391.02	$415.14	$410.96	$458.73
19	0.0056672	$467.17	$380.40	$404.53	$400.84	$449.09
20	0.0059654	$456.76	$370.01	$394.15	$390.93	$439.68

APPENDIX G: ECONOMIC RETURNS TO REPRESENTATIVE FARMS PER CROP ENTERPRISE

Whole farm mean net returns above variable costs per enterprise and policy alternative for a representative Arkansas County, Arkansas farm.

Policy Option	Year	Rice Returns	Soybeans Returns	Whole Farm Returns
1	2014	$327,114.94	$74,500.43	$401,615.36
	2015	$339,790.68	$52,666.54	$392,457.22
	2016	$379,695.00	$127,632.69	$507,327.69
	2017	$392,344.81	$83,480.58	$475,825.39
	2018	$405,723.63	$103,913.64	$509,637.27
Option 1 Total				$2,286,862.92
2	2014	$427,563.79	$98,337.59	$525,901.37
	2015	$435,098.13	$78,700.01	$513,798.14
	2016	$465,246.25	$187,640.46	$652,886.70
	2017	$479,341.24	$110,192.65	$589,533.89
	2018	$498,123.08	$125,720.63	$623,843.71
Option 2 Total				$2,905,963.82
3	2014	$407,235.13	$77,811.67	$485,046.80
	2015	$416,799.04	$58,463.93	$475,262.97
	2016	$446,953.97	$146,387.15	$593,341.12
	2017	$458,800.74	$89,434.50	$548,235.24
	2018	$477,061.11	$104,827.76	$581,888.87
Option 3 Total				$2,683,775.01

Whole farm mean net returns above variable costs per enterprise and policy alternative for a representative Acadia Parish, Louisiana farm.

Policy Option	Year	Rice Returns	Soybeans Returns	Whole Farm Returns
1	2014	$187,372.03	$14,743.73	$202,115.75
	2015	$201,558.84	$7,707.48	$209,266.32
	2016	$237,915.90	$8,647.28	$246,563.18
	2017	$242,062.44	$11,824.15	$253,886.59
	2018	$257,154.79	$16,601.69	$273,756.48
Option 1 Total				$1,185,588.32
2	2014	$266,950.46	$26,057.71	$293,008.17
	2015	$277,156.57	$11,593.29	$288,749.85
	2016	$311,087.82	$12,066.59	$323,154.40
	2017	$316,086.08	$16,122.03	$332,208.11
	2018	$334,130.56	$22,177.75	$356,308.31
Option 2 Total				$1,593,428.85
3	2014	$227,573.13	$14,936.11	$242,509.24
	2015	$272,420.89	$1,149.00	$273,569.89
	2016	$303,272.15	$2,493.12	$305,765.27
	2017	$304,170.22	$5,653.06	$309,823.29
	2018	$320,432.42	$11,218.56	$331,650.98
Option 3 Total				$1,463,318.67

Whole farm mean net returns above variable costs per enterprise and policy alternative for a representative Bolivar County, Mississippi farm.

Policy Option	Year	Rice Returns	Soybeans Returns	Whole Farm Returns
1	2014	$168,327.62	$116,944.63	$285,272.25
	2015	$171,303.70	$70,418.86	$241,722.56
	2016	$183,653.40	$106,023.70	$289,677.11
	2017	$188,560.65	$107,227.88	$295,788.53
	2018	$195,411.59	$152,219.79	$347,631.38
Option 1 Total				$1,406,091.83
2	2014	$269,905.38	$147,311.04	$417,216.43
	2015	$264,153.77	$104,999.03	$369,152.79
	2016	$267,784.95	$147,061.69	$414,846.64
	2017	$269,845.02	$149,247.63	$419,092.65
	2018	$279,370.91	$192,620.94	$471,991.86
Option 2 Total				$2,092,300.37
3	2014	$253,374.26	$120,994.07	$374,368.33
	2015	$262,307.98	$78,330.38	$340,638.36
	2016	$264,906.52	$119,788.69	$384,695.20
	2017	$266,768.85	$122,246.90	$389,015.76
	2018	$273,537.79	$164,944.26	$438,482.06
Option 3 Total				$1,927,199.70

Whole farm mean net returns above variable costs per enterprise and policy alternative for a representative Mississippi County, Arkansas farm.

Policy Option	Year	Corn Returns	Cotton Returns	Soybeans Returns	Whole Farm Returns
1	2014	$60,774.56	$100,821.53	$122,930.28	$284,526.36
	2015	$60,724.37	$44,119.78	$86,191.35	$191,035.50
	2016	$26,888.51	$33,356.33	$76,029.68	$136,274.53
	2017	$96,666.10	$27,445.88	$116,416.24	$240,528.22
	2018	$120,146.94	$29,626.54	$114,080.81	$263,854.29
Option 1 Total					$1,116,218.89
2	2014	$39,532.16	$100,821.53	$96,199.45	$236,553.14
	2015	$38,850.17	$11,736.03	$59,662.23	$110,248.43
	2016	$3,506.35	$17,104.18	$49,066.01	$69,676.55
	2017	$55,210.35	$12,229.32	$88,690.28	$156,129.95
	2018	$90,713.58	$13,022.18	$86,151.80	$189,887.56
Option 2 Total					$762,495.62
3	2014	$39,532.16	$100,821.53	$96,199.45	$236,553.14
	2015	$38,850.17	$41,099.07	$59,662.23	$139,611.48
	2016	$3,506.35	$47,313.72	$49,066.01	$99,886.09
	2017	$55,210.35	$44,631.96	$88,690.28	$188,532.60
	2018	$90,713.58	$43,888.61	$86,151.80	$220,753.99
Option 3 Total					$885,337.29
4	2014	$39,532.16	$100,821.53	$81,728.20	$222,081.90
	2015	$38,850.17	$41,099.07	$65,293.26	$145,242.50
	2016	$3,506.35	$47,313.72	$54,468.40	$105,288.48
	2017	$55,210.35	$44,631.96	$96,984.42	$196,826.74
	2018	$90,713.58	$43,888.61	$101,508.33	$236,110.52
Option 4 Total					$905,550.14
5	2014	$47,961.14	$100,821.53	$96,199.45	$244,982.12
	2015	$59,898.58	$41,099.07	$59,662.23	$160,659.89
	2016	$24,996.11	$47,313.72	$49,066.01	$121,375.84
	2017	$60,068.97	$44,631.96	$88,690.28	$193,391.22
	2018	$112,558.77	$43,888.61	$86,151.80	$242,599.18
Option 5 Total					$963,008.25

Whole farm mean net returns above variable costs per enterprise and policy alternative for a representative Phillips County, Arkansas farm.

Policy Option	Year	Corn Returns	Cotton Returns	Soybeans Returns	Whole Farm Returns
1	2014	$59,697.63	$14,065.04	$150,419.92	$224,182.60
	2015	$82,648.47	-$47,213.93	$138,289.50	$173,724.03
	2016	$66,538.36	-$42,936.23	$126,102.67	$149,704.79
	2017	$135,282.57	-$56,092.83	$154,183.88	$233,373.63
	2018	$195,096.67	-$63,757.09	$158,070.81	$289,410.39
Option 1 Total					$1,070,395.44
2	2014	$38,519.36	$3,678.32	$109,291.05	$151,488.73
	2015	$61,508.98	-$76,845.20	$97,282.34	$81,946.12
	2016	$39,044.75	-$48,287.04	$84,663.69	$75,421.41
	2017	$141,412.98	-$61,271.66	$112,057.75	$192,199.07
	2018	$162,074.26	-$68,868.58	$114,455.44	$207,661.13
Option 2 Total					$708,716.46
3	2014	$38,519.36	$14,065.04	$109,291.05	$161,875.45
	2015	$61,508.98	-$20,836.23	$97,282.34	$137,955.09
	2016	$39,044.75	$11,383.20	$84,663.69	$135,091.65
	2017	$141,412.98	-$749.77	$112,057.75	$252.720.96
	2018	$162,074.26	-$8,140.98	$114,455.44	$268,388.72
Option 3 Total					$956,031.87
4	2014	$38,519.36	$14,065.04	$90,035.78	$142,620.17
	2015	$61,508.98	-$20,836.23	$79,935.02	$120,607.77
	2016	$39,044.75	$11,383.20	$81,580.91	$132,008.87
	2017	$141,412.98	-$749.77	$107,283.45	$247,946.66
	2018	$162,074.26	-$8,140.98	$122,805.83	$276,739.11
Option 4 Total					$919,922.59
5	2014	$55,591.01	$14,065.04	$109,291.05	$178,947.10
	2015	$84,442.19	-$20,836.23	$97,282.34	$160,888.30
	2016	$56,152.22	$11,383.20	$84,663.69	$152,199.12
	2017	$173,838.44	-$749.77	$112,057.75	$285,146.42
	2018	$188,088.01	-$8,140.98	$114,455.44	$294,402.47
Option 5 Total					$1,071,583.40

Whole farm mean net returns above variable costs per enterprise and policy alternative for a representative Morehouse Parish, Louisiana farm.

Policy Option	Year	Corn Returns	Cotton Returns	Soybeans Returns	Whole Farm Returns
1	2014	$65,564.23	$92,052.77	$144,049.36	$301,666.36
	2015	$62,405.99	$86,238.50	$132,738.25	$281,382.75
	2016	$46,906.27	$114,776.93	$158,175.51	$319,858.72
	2017	$72,178.74	$145,483.06	$202,020.35	$419,682.15
	2018	$92,017.87	$205,655.20	$238,982.27	$536,655.34
Option 1 Total					$1,859,245.31
2	2014	$63,771.70	$92,052.77	$131,732.24	$287,556.70
	2015	$60,781.40	$55,256.04	$120,557.14	$236,594.58
	2016	$44,158.49	$95,101.73	$145,176.89	$284,437.41
	2017	$70,211.31	$125,315.12	$189,058.31	$384,584.73
	2018	$88,464.47	$183,959.42	$225,967.15	$498,391.04
Option 2 Total					$1,691,564.47
3	2014	$63,771.70	$92,052.77	$131,732.24	$287,556.70
	2015	$60,781.40	$75,780.48	$120,557.14	$257,119.02
	2016	$44,158.49	$113,984.37	$145,176.89	$303,320.05
	2017	$70,211.31	$143,264.06	$189,058.31	$402,533.68
	2018	$88,464.47	$200,076.70	$225,967.15	$514,508.33
Option 3 Total					$1,765,037.79
4	2014	$63,771.70	$92,052.77	$130,488.26	$286,312.73
	2015	$60,781.40	$75,780.48	$115,765.16	$252,327.04
	2016	$44,158.49	$113,984.37	$132,572.04	$290,715.20
	2017	$70,211.31	$143,264.06	$179,504.87	$392,980.24
	2018	$88,464.47	$200,076.70	$217,988.42	$506,529.60
Option 4 Total					$1,728,864.81
5	2014	$77,762.73	$92,052.77	$131,732.24	$301,547.74
	2015	$77,718.66	$75,780.48	$120,557.14	$274,056.29
	2016	$60,472.93	$113,984.37	$145,176.89	$319,634.19
	2017	$90,465.19	$143,264.06	$189,058.31	$422,787.56
	2018	$110,784.70	$200,076.70	$225,967.15	$536.828.55
Option 5 Total					$1,854,854.33

Whole farm mean net returns above variable costs per enterprise and policy alternative for a representative Tensas Parish, Louisiana farm.

Policy Option	Year	Corn Returns	Cotton Returns	Soybeans Returns	Whole Farm Returns
1	2014	$12,567.81	$97,485.64	$94,866.87	$204,920.33
	2015	$24,679.32	$64,408.81	$70,417.51	$159,505.63
	2016	$51,974.24	$82,612.45	$100,722.94	$235,309.63
	2017	$49,609.52	$113,571.82	$115,405.56	$278,586.79
	2018	$63,290.60	$151,182.98	$154,060.35	$368,533.93
Option 1 Total					$1,246,856.32
2	2014	$16,706.56	$97,485.64	$71,214.85	$185,407.05
	2015	$26,523.79	$47,922.06	$47,001.54	$121,447.39
	2016	$49,814.51	$65,773.22	$76,745.70	$192,333.44
	2017	$47,763.83	$95,021.91	$91,506.50	$234,292.25
	2018	$59,916.41	$131,479.06	$129,864.14	$321,259.61
Option 2 Total					$1,054,739.74
3	2014	$16,706.56	$97,485.64	$71,214.85	$185,407.05
	2015	$26,523.79	$67,929.13	$47,001.54	$141,454.46
	2016	$49,814.51	$85,850.82	$76,745.70	$212,411.04
	2017	$47,763.83	$112,781.90	$91,506.50	$252,052.24
	2018	$59,916.41	$147,536.07	$129,864.14	$337,316.62
Option 3 Total					$1,128,641.41
4	2014	$16,706.56	$97,485.64	$66,458.15	$180,650.36
	2015	$26,523.79	$67,929.13	$43,008.94	$137,461.86
	2016	$49,814.51	$85,850.82	$68,355.73	$204,021.06
	2017	$47,763.83	$112,781.90	$84,028.70	$244,574.44
	2018	$59,916.41	$147,536.07	$124,711.13	$332,163.61
Option 4 Total					$1,098,871.34
5	2014	$23,608.63	$97,485.64	$71,214.85	$192,309.13
	2015	$46,324.85	$67,929.13	$47,001.54	$161,255.53
	2016	$69,061.41	$85,850.82	$76,745.70	$231,657.94
	2017	$70,459.65	$112,781.90	$91,506.50	$274,748.06
	2018	$85,066.34	$147,536.07	$129,864.14	$362,466.55
Option 5 Total					$1,222,437.20

Whole farm mean net returns above variable costs per enterprise and policy alternative for a representative Coahoma County, Mississippi farm.

Policy Option	Year	Corn Returns	Cotton Returns	Soybeans Returns	Whole Farm Returns
1	2014	$176,112.92	$279,980.82	$168,827.72	$624,921.46
	2015	$206,003.70	$227,682.54	$134,509.01	$568,195.26
	2016	$173,523.58	$257,724.26	$158,785.92	$589,533.77
	2017	$257,830.74	$278,696.98	$187,771.38	$724,299.10
	2018	$327,696.27	$327,294.37	$224,224.64	$879,215.27
Option 1 Total					$3,386,164.86
2	2014	$160,859.76	$279,980.82	$124,035.12	$564,875.71
	2015	$190,712.70	$182,405.07	$89,978.20	$463,095.97
	2016	$157,200.90	$230,665.62	$113,581.11	$501,447.63
	2017	$239,967.55	$252,186.18	$142,406.67	$634,560.40
	2018	$305,751.57	$300,292.80	$178,611.37	$784,655.74
Option 2 Total					$2,948,635.46
3	2014	$160,859.76	$279,980.82	$124,035.12	$564,875.71
	2015	$190,712.70	$201,791.16	$89,978.20	$482,482.06
	2016	$157,200.90	$249,955.03	$113,581.11	$520,737.05
	2017	$239,967.55	$271,403.45	$142,406.67	$653,777.67
	2018	$305,751.57	$319,084.68	$178,611.37	$803,447.62
Option 3 Total					$3,025,320.11
4	2014	$160,859.76	$279,980.82	$112,156.67	$562,997.26
	2015	$190,712.70	$201,791.16	$94,208.45	$486,712.31
	2016	$157,200.90	$249,955.03	$107,432.97	$514,588.90
	2017	$239,967.55	$271,403.45	$137,440.38	$648,811.38
	2018	$305,751.57	$319,084.68	$176,246.99	$801,083.24
Option 4 Total					$3,014,193.09
5	2014	$178,987.09	$279,980.82	$124,035.12	$583,003.03
	2015	$202,498.84	$201,791.16	$89,978.20	$494,268.20
	2016	$164,368.17	$249,955.03	$113,581.11	$527,904.32
	2017	$257,560.87	$271,403.45	$142,406.67	$671,371.00
	2018	$320,411.57	$319,084.68	$178,611.37	$818,107.62
Option 5 Total					$3,094,654.17

Whole farm mean net returns above variable costs per enterprise and policy alternative for a representative Leflore County, Mississippi farm.

Policy Option	Year	Corn Returns	Cotton Returns	Soybeans Returns	Whole Farm Returns
1	2014	$183,419.11	$156,985.26	$251,722.22	$592,126.59
	2015	$192,062.54	$106,183.49	$216,840.64	$515,086.67
	2016	$157,282.60	$123,048.39	$245,239.17	$525,570.16
	2017	$240,325.32	$163,517.31	$298,236.19	$702,078.82
	2018	$293,873.98	$220,129.77	$349,871.54	$863,875.29
Option 1 Total					$3,198,737.54
2	2014	$172,313.08	$156,985.26	$216,575.73	$545,874.08
	2015	$173,263.12	$57,866.75	$181,773.43	$412,903.30
	2016	$139,500.42	$95,240.90	$209,669.71	$444,411.03
	2017	$222,080.64	$134,094.37	$262,728.44	$618,903.46
	2018	$273,106.74	$189,678.68	$314,038.35	$776,824.26
Option 2 Total					$2,798,916.14
3	2014	$172,313.08	$156,985.26	$216,575.73	$545,874.08
	2015	$173,263.12	$85,410.55	$181,773.43	$440,447.10
	2016	$139,500.42	$122,545.07	$209,669.71	$471,715.21
	2017	$222,080.64	$159,339.33	$262,728.44	$644,148.42
	2018	$273,106.74	$213,930.28	$314,038.35	$801,075.86
Option 3 Total					$2,903,260.66
4	2014	$172,313.08	$156,985.26	$213,861.31	$543,159.66
	2015	$173,263.12	$85,410.55	$170,518.24	$429,191.91
	2016	$139,500.42	$122,545.07	$191,368.15	$453,413.65
	2017	$222,080.64	$159,339.33	$244,379.12	$625,799.10
	2018	$273,106.74	$213,930.28	$299,157.78	$786,194.79
Option 4 Total					$2,837,759.11
5	2014	$188,472.26	$156,985.26	$216,575.73	$562,033.26
	2015	$191,035.61	$85,410.55	$181,773.43	$458,219.59
	2016	$154,160.21	$122,545.07	$209,669.71	$486,374.99
	2017	$250,043.20	$159,339.33	$262,728.44	$672,110.97
	2018	$299,050.30	$213,930.28	$314,038.35	$827,019.42
Option 5 Total					$3,005,758.23

VITA

Michael A. Deliberto Jr. was born in Hammond, Louisiana in December of 1981 to Michael and Debbie Deliberto. He attended Holy Ghost Catholic School and later graduated with honors from St. Thomas Aquinas Regional Catholic High School in May of 2000. Michael then went on to complete the requirements for a B.S.F. from Louisiana State University in 2004 and began his graduate studies in agricultural economics under the direction of Dr. Steven A. Henning in August of 2005, receiving a M.S. degree in 2007. Upon graduation, Michael worked as a Research Associate in the Department of Agricultural Economics and Agribusiness studying areas of farm management and agricultural policy while pursuing his doctor of philosophy degree with Dr. Michael E. Salassi serving as his advisor.