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Investing in an Agricultural Legacy

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INVESTING IN AN AGRICULTURAL LEGACY

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By

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Abstract

America's agricultural producers continue to age. According to the U.S. Census of Agriculture, the average age of farm operators increased from 55.3 in 2002 to 57.1 in 2007. During the same period, the Census shows a thirty percent decrease in the number of farmers under age 25. Young and beginning producers (YBPs) entering agriculture face high startup costs and a shortage of land to own or rent.

With these concerns in mind, this manuscript details the impact of an innovative proposed loan program for YBPs in Arkansas, which would offer concessionary interest rates and loan fees by participating banks for adopting selections from a menu of practices that achieve environmental improvements along with maintaining or improving farm profits on cropland. The practices selected for this proposed loan program include: (1) conservation tillage; (2) integrated pest management; (3) buffers; (4) cover crops; (5) land leveling; (6) underground irrigation pipe; (7) crop rotations; (8) tailwater recovery systems; (9) planting seed varieties that require less water, fertilizer, chemicals, or other inputs; and (10) following the irrigation and planting standards in the Arkansas crop production handbooks. The proposed project would help these YBPs become more profitable producers, reduce FCS's risk on loaning to YBPs, and help create a new class of potential borrowers who need a little extra assistance to become more successful over the longer term.

To measure the loan program's impact, budgets were developed for corn, cotton, rice, soybeans, and wheat prior to loan program participation. Budgets were then developed and compared to determine the YBP profitability on these five crops from adoption of no-till, a crop rotation, or a no-till crop rotation and program participation. Results indicate YBP per acre profitability is improved from loan program participation and adopting program practices.

This thesis is approved for recommendation
to the Graduate Council.

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I would also like to thank Dr. Merle Anders, Dr. A. Rick Bennett, Mr. Tom Cox, Mr. Roger Cramer, Mr. Chuck Culver, Mr. Corey Farmer, Dr. Archie Flanders, Mr. Rich Joslin, Dr. Jason Kelley, Mr. John Lee, Dr. Richard J. Norman, Dr. Nathan Slaton, Mr. Nathan Wagnor, and Dr. K. Brad Watkins for providing feedback and helping in the design of the proposed loan program discussed in my thesis.

Finally, I would like to thank Twinings Tea and the Republic of Tea for providing me with drinks that got me through this process sanely.

Dedication

This thesis is dedicated to my parents for being understanding and supportive while I worked on this degree.

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I. Introduction

The average age of U.S. agricultural producers has increased from 51.7 in 1974 to 57.1 in 2007 (Census of Agriculture). In Arkansas, the average age of an agricultural producer has increased from 51.6 in 1974 to 56.5 in 2007 (Census of Agriculture). One reason for this aging of agriculture, in both the U.S. and Arkansas, is the declining number of producers under age 35 entering agriculture and the increasing number of producers over age 55 entering agriculture since the 1974 Census of Agriculture. In 1982, producers under the age of 35 made up 15.9 percent of producers in the United States and 13.4 percent of producers in Arkansas (Census of Agriculture). In 2007, the number of producers under the age of 35 only made up 5.3 percent of producers in the United States and 5.9 percent of producers in Arkansas (Census of Agriculture).

Barriers to entries that exist in agriculture are one reason for this decline in young and beginning producers (YBPs). Mishra, Wilson, and Williams (2009) point out that YBPs face large initial investments and large amounts of capital each year to begin and maintain an operation. Because of these barriers to entry, YBPs are unable to attain economies of size that older farmers experience. YBPs also face higher cost structures than older farmers. YBPs are looking for ways to reduce costs, increase profits, and reduce farming time to find ways to survive.

Research conducted by the University of Arkansas confirms YBPs from across the U.S. have lower survival rates in agriculture than older producers. 16.1 percent of YBPs' operating loans from the Farm Service Agency (FSA) were foreclosed for new loans made in fiscal years 1994 to 1996 (Nwoha, et al., 2005). This is a much higher rate than the 7.4 percent for established farmers and ranchers (Nwoha, et al., 2005). In addition, upon exiting the operating

loan program, 35.2 percent of YBPs using the program left agriculture voluntarily compared to 21.9 percent of regular operating loan users (Nwoha, et al., 2005).

This manuscript will focus on the potential effectiveness of an innovative pilot operating loan program (hereinafter "loan program") to be administrated by the three Farm Credit associations (FCBs) in Arkansas to increase the number of YBPs successfully operating in agriculture. The focus of the loan program will be on YBPs who choose to adopt practices designed to address societal environmental goals while simultaneously maintaining or increasing farm profits. It is proposed that YBPs will receive concessionary interest rates and/or fees from the FCBs. YBPs can select from a menu of production and management practices designed to result in improvements in (1) air quality, (2) water quality and quantity, or (3) soil fertility. The practices must also be demonstrated to maintain or improve farm profitability to be considered for inclusion in the loan program. Participating FCBs will reward YBPs adopting these good stewardship practices with concessionary loan rates and/or fees and terms to enhance their probability for future success, increase returns, and establish them as the next generation of farmers and ranchers and as stable and reliable future lending customers.

Design and implementation of the proposed loan program was outlined in *Investing in an Agricultural Legacy: Design and Implementation of a Targeted Young and Beginning Farmer Loan Program in Arkansas* (2012). Ten practices were selected for inclusion in the loan program that met the above stated criteria: (1) conservation tillage; (2) integrated pest management; (3) buffer strips; (4) use of cover crops; (5) precision land leveling; (6) underground irrigation pipe; (7) use of crop rotations; (8) tailwater recovery systems; (9) planting appropriate seed varieties; and (10) planting and irrigating according to the standards found in the Arkansas crop production handbooks for rice, wheat, corn, soybeans, and grain

sorghum. Each of these practices improves areas of environmental concern while maintaining or improving farm profitability.

Our goal is to launch the loan program as a three-year study with an initial subsample group of twenty YBP producers, randomly selected by the three FCBs in Arkansas, currently making their payments but falling short of breaking even. These FCBs will provide researchers with a sample group of at least forty current YBP borrowers meeting the criteria. Researchers will randomly select twenty participants for the subsample that will participate in the loan program and randomly select twenty participants for a control group that will not participate in the loan program. Researchers monitor the progress of the initial sample group over the three-year period and compare them to the control group comprised of YBPs not participating in the program but currently meeting their loan repayment obligations with profitable operations.

Impact of the proposed loan program will be analyzed in *Investing in an Agricultural Legacy: Impact of a Targeted Young and Beginning Farmer Loan Program in Arkansas* (2012). Two of the ten selected menu practices are analyzed to determine their impact on a hypothetical participating YBP's per acre profitability from adopting the practice and participating in the proposed loan program. To determine impact, a review of a hypothetical participating YBP's per acre profitability is shown through the development of crop budgets prior to participation and development of crop budgets for the practices implemented to determine the impact of the proposed loan program.

The development of the proposed loan program from concept to the loan program outlined in this thesis comes from the results of many meetings with professionals in plant sciences, crop sciences, agronomists, government officials, and Farm Credit representatives. Table 1 outlines who was consulted in the development of this manuscript. This table is

provided to give an overview of those consulted to help develop the proposed loan program into a working idea ready for implementation.

Table 1: Professionals and Experts Consulted With In the Development of The Proposed Loan Program

Name		Title
Dr. Merle Anders		Assistant Professor, Crop, Soil, and Environmental Sciences, Dale Bumpers College of Agricultural, Food & Life Sciences, University of Arkansas
Dr. A. Rick Bennett		Department Head, Department Plant Pathology, Dale Bumpers College of Agricultural, Food & Life Sciences, University of Arkansas
Mr. Tom Cox		Farm Credit Services of Western Arkansas
Mr. Roger Cramer		Senior Vice President of Risk Management for Northwest Farm Credit Services
Mr. Chuck Culver		Director of Development, Division of Agriculture, Dale Bumpers College of Agricultural, Food & Life Sciences
Mr. Corey Farmer		Resource Conservationist, USDA-Natural Resources Conservation Service, Arkansas State Office
Dr. Archie Flanders		Extension Assistant Professor, Department of Agricultural Economics and Agribusiness, Dale Bumpers College of Agricultural, Food & Life Sciences, University of Arkansas

Table 1 Continued

Name		Title
Mr. Rich Joslin		Resource Conservationist, USDA-Natural Resources Conservation Service, Arkansas State Office
Dr. Jason Kelley		Associate Professor, Crop, Soil, and Environmental Sciences, Dale Bumpers College of Agricultural, Food & Life Sciences, University of Arkansas
Mr. John Lee		Agronomist, USDA-Natural Resources Conservation Service, Arkansas State Office
Dr. Richard J. Norman		Professor, Crop, Soil, and Environmental Sciences, Dale Bumpers College of Agricultural, Food & Life Sciences, University of Arkansas
Dr. Nathan Slaton		Professor, Crop, Soil, and Environmental Sciences, Dale Bumpers College of Agricultural, Food & Life Sciences, University of Arkansas
Mr. Nathan Wagnor		AgHeritage Farm Credit Services
Dr. K. Brad Watkins		Research Assistant Professor, Department of Agricultural Economics and Agribusiness, Dale Bumpers College of Agricultural, Food & Life Sciences, University of Arkansas

II. INVESTING IN AN AGRICULTURAL LEGACY: DESIGN AND IMPLEMENTATION OF A TARGETED YOUNG AND BEGINNING FARMER LOAN PROGRAM IN ARKANSAS

A. Introduction

The average age of America's agricultural producers continues to increase. According to the Census of Agriculture (Census) data, the average age of farm operators increased from 55.3 in 2002 to 57.1 in 2007. In Arkansas, the average age of farm operators increased from 54.9 in 2002 to 56.5 in 2007. Figure 1 shows the rising average age of farm operators is not a new problem to agriculture. The average age of U.S. farm operators has increased in each Census since 1982. In Arkansas, the average age of farm operators has been increasing in each Census since 1978. Why does the average age of farm operators continue to rise?

One reason, both nationally and in Arkansas, is the increase in farm operators over the age of 65 over the last thirty-three years. It can be seen in Table 2 that between 1974 and 2007, the number of farming operations managed by operators over the age of 65 increased from 421,471 in 1974 to 655,654 in 2007 in the U.S. This represents a 55.6 percent increase over that thirty-three year period. In Arkansas, the number of farming operations managed by an operator over the age of 65 increased from 8,827 in 1974 to 14,227 in 2007 (Table 3), a 61.2 percent increase in farm operators over the age 65.

The erosion of a core group of producers (under 25 to 34 years of age) who will help to sustain U.S. agriculture into the future is another reason for the increasing average age of farm operators. Figure 2 and Figure 3 indicate that as farm operators continue to age, younger farmer operators are not entering at a rate high enough to sustain agricultural human capital; many are leaving agriculture altogether. Agriculture has experienced a large decline in producers between the ages of 25 to 34 (USDA, Census of Agriculture). Nationally in 1974, producers between the

ages of 25 to 34 made up 15.6 percent of all farm operators; in 2007, producers between the ages of 25 to 34 made up 5.3 percent (Figure 2). Between each Census the 25 to 34 age group has only experienced growth three times, between 1974 and 1978, 1978 and 1982, and 2002 and 2007, and percentage decreases between all other Census years (Figure 2). Although this age group increased from 2002 to 2007, it was not enough to undo the decreases since 1982. Over a thirty-three year period, the United States experienced a 55.5 percent decrease in this age group. During the same period in Arkansas, producers between the ages of 25 to 34 made up 12.2 percent of all farm operators in 1974, and in 2007, producers between the ages of 25 to 34 made up 5.9 percent (Figure 3). Arkansas also experienced large percentage decreases in this age group and experienced moderate growth only twice, between 1974 and 1978 and 2002 and 2007 (Figure 3). Although not as large as the decrease nationally, Arkansas still experienced a 48.7 percent decrease in this age group of farm operators.

Figure 1: Average Age of U.S. and Arkansas Farmers From 1974 to 2007, Source the 1974 – 2007 Census of Agriculture

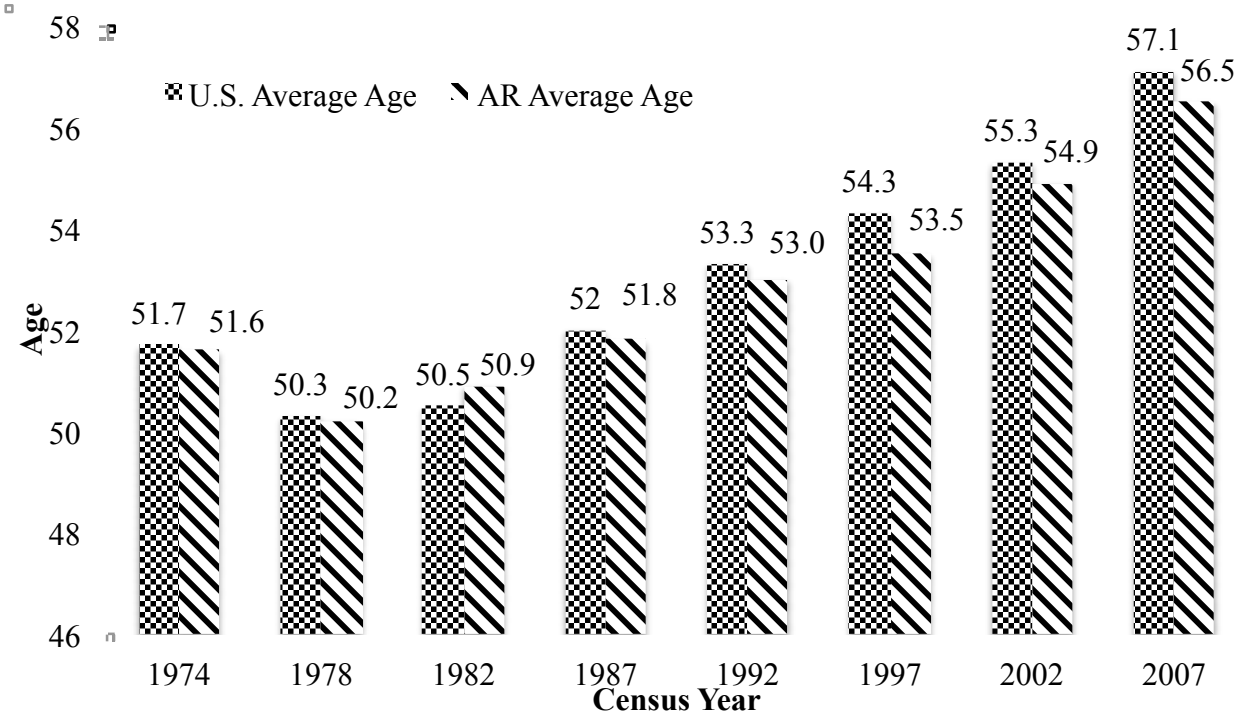


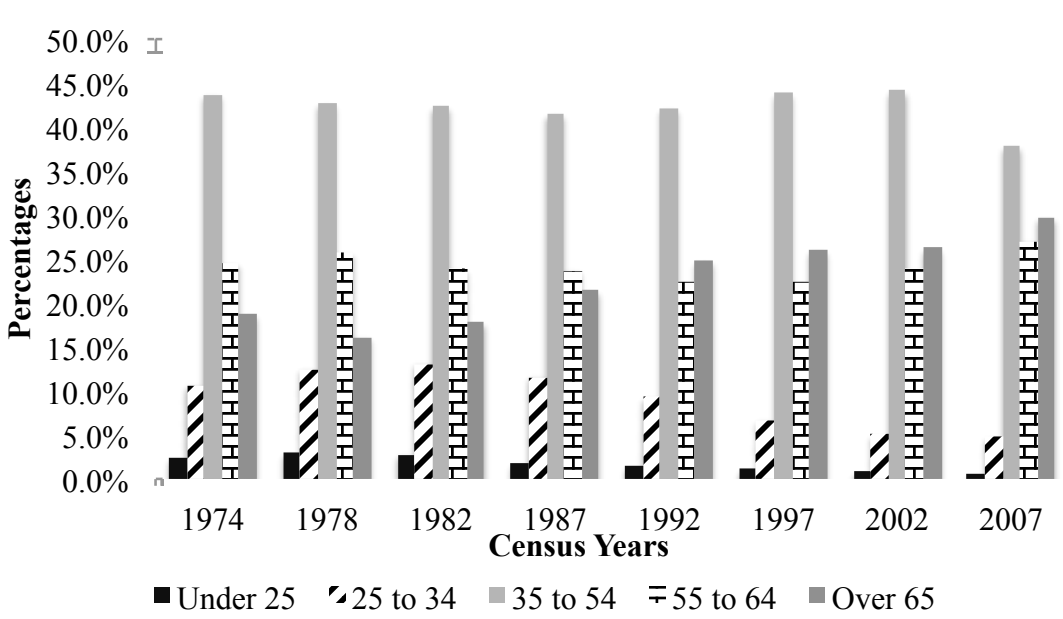
Table 2: Total Number of U.S. Agricultural Producers per Age Group by Census Year, Source the 1974 – 2007 Census of Agriculture

Age Group	1974	1978	1982	1987	1992	1997	2002	2007
Under 25	52,418	66,575	62,336	35,851	27,906	20,850	16,962	11,878
25 to 34	239,674	285,420	293,810	242,688	178,826	128,455	106,097	106,735
35 to 54	983,059	977,123	948,832	866,063	811,079	838,171	938,970	834,219
55 to 64	552,175	588,584	536,402	495,816	429,839	427,354	509,123	596,306
Over 65	421,471	370,546	399,596	447,341	477,650	497,029	557,830	655,654
Total	2,248,797	2,288,248	2,240,976	2,087,759	1,925,300	1,911,859	2,128,982	2,204,792
Average Age	51.7	50.3	50.5	52	53.3	54.3	55.3	57.1

Table 3: Total Number of Arkansas Agricultural Producers per Age Group by Census Year, Source the 1974 – 2007 Census of Agriculture

Age Group	1974	1978	1982	1987	1992	1997	2002	2007
Under 25	808	951	947	739	560	493	384	222
25 to 34	5,338	6,502	5,816	4,995	3,924	3,361	2,599	2,736
35 to 54	22,098	23,830	22,775	21,599	19,316	20,175	20,633	18,655
55 to 64	13,198	12,177	12,121	11,330	10,082	10,922	12,144	13,506
Over 65	8,827	8,291	8,866	9,579	10,055	10,191	11,839	14,227
Total	50,269	51,751	50,525	48,242	43,937	45,142	47,599	49,346
Average Age	51.6	50.2	50.9	51.8	53.0	53.5	54.9	56.5

Figure 2: Percentage by Age Group of U.S. Producers by Census Year, Source the 1974 – 2007 Census of Agriculture



Another age group of farm operators in decline is those under the age of 25. In 1974, producers under the age of 25 made up 2.8 percent of all farm operators, and in 2007, this age group made up 0.5 percent nationally (Table 2); this age group experienced growth between Census years only once, between 1974 and 1978, and large decreases between each subsequent Census (Table 4). Over the thirty-three year period, this represents a 77.3 percent decrease of producers under the age of 25. In Arkansas, in 1974, producers in this under the age of 25 group represented 1.6 percent of all farm operators, and in 2007, this age group only represented 0.4 percent (Figure 3). Arkansas has only experienced growth in this age group in the 1974 to 1978 Census period and decreases between each following Census period (Table 5). The past thirty-three years of Census data clearly show what we all know – U.S. and Arkansas farmers are not getting younger.

So why has the number of young and beginning producers (YBPs) decreased over the past thirty-three years? Mishra, Wilson, and Williams (2009) point out one reason

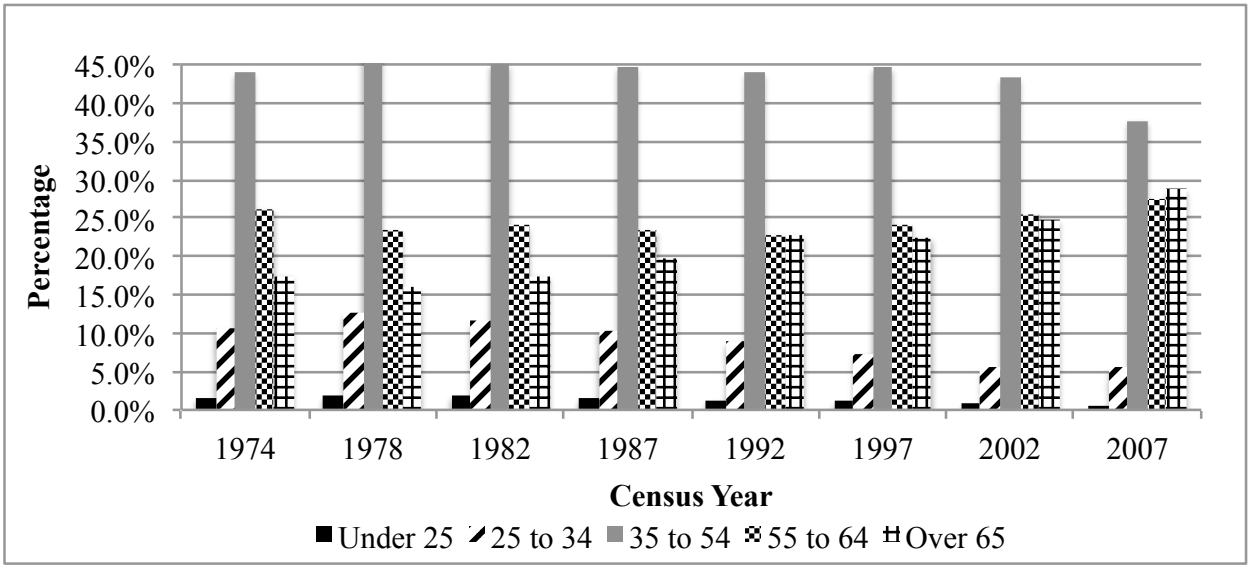
Table 4: Percentage Change in Age Groups For U.S. Producers Between Census Years by Census Year, Source the 1974 – 2007 Census of Agriculture

Age Group	1978	1982	1987	1992	1997	2002	2007
Under 25	27.0%	-6.4%	-42.5%	-22.2%	-25.3%	-18.6%	-30.0%
25 to 34	19.1%	2.9%	-17.4%	-26.3%	-28.2%	-17.4%	0.6%
35 to 54	-0.6%	-2.9%	-8.7%	-6.3%	3.3%	12.0%	-11.2%
55 to 64	6.6%	-8.9%	-7.6%	-13.3%	-0.6%	19.1%	17.1%
Over 65	-12.1%	7.8%	11.9%	6.8%	4.1%	12.2%	17.5%
Total	1.8%	-2.1%	-6.8%	-7.8%	-0.7%	11.4%	3.6%

Table 5: Percentage Change in Age Groups of Arkansas Producers Between Census Years by Census Year, Source the 1974 – 2007 Census of Agriculture

Age Group	1978	1982	1987	1992	1997	2002	2007
Under 25	17.7%	-0.4%	-22.0%	-24.2%	-12.0%	-22.1%	-42.2%
25 to 34	21.8%	-10.6%	-14.1%	-21.4%	-14.3%	-22.7%	5.3%
35 to 54	7.8%	-4.4%	-5.2%	-10.6%	4.4%	2.3%	-9.6%
55 to 64	-7.7%	-0.5%	-6.5%	-11.0%	8.3%	11.2%	11.2%
Over 65	-6.1%	6.9%	8.0%	5.0%	1.4%	16.2%	20.2%
Total	2.9%	-2.4%	-4.5%	-8.9%	2.7%	5.4%	3.7%

Figure 3: Percentage by Age Group of Arkansas Producers 1974-2007 by Census Year, Source the 1974 – 2007 Census of Agriculture



for the decline in YBPs are the barriers to entry. YBPs face large initial investments and may not have the lending history or face higher interest costs to secure the large yearly operating capital requirements each year compared to older experienced producers who may have a lending and business history that allows them access to cheaper capital. Because of these barriers to entry, YBPs are unable to gain the economies of size that older farmers experience and YBPs face higher cost structures than older farmers. YBPs are often looking for ways to reduce costs, increase profits, and reduce farming time in order to find ways to survive, such as taking off farm jobs. Some action must be undertaken to sustain and retain farm operators under the age of 35. This suggests there is a need to decrease financial pressures that may result in YBPs exiting agriculture or potentially forgoing enter into agriculture at all.

Research conducted by the University of Arkansas confirms YBPs from across the U.S. have lower survival rates in agriculture than older and experienced producers. 16.1 percent of YBPs' operating loans from the Farm Service Agency (FSA) were foreclosed for new loans made in fiscal years 1994 to 1996 (Nwoha, et al., 2005). This is a much higher rate than those of

established farmers and ranchers (Nwoha, et al., 2005). More YBPs voluntarily leave agriculture upon exiting the FSA operating loan program than older age groups. Upon exiting the operating loan program, 35.2 percent of YBPs using the program left agriculture voluntarily compared to 21.9 percent of regular operating loan users (Nwoha, et al., 2005).

This thesis will focus on the potential effectiveness of an innovative pilot operating loan program (loan program) to be administrated by the three Farm Credit associations (FCBs) in Arkansas to increase the number YBPs successfully operating in agriculture. The focus of the loan program will be on YBPs who wish to adopt practices designed to meet environmental goals, while simultaneously maintaining or increasing farm profits. YBPs can select from a menu of production and management practices designed to improve environmental areas of (1) air quality, (2) water quality, (3) water quantity, and (4) soil fertility. Participating FCBs will reward YBPs adopting these good stewardship practices with concessionary loan rates and/or fees and terms to enhance their probability for future success, increase returns, and establish themselves as the next generation of farmers and ranchers and as future lending customers.

This article focuses on the design and implementation of such a loan program. Organization of the manuscript will be a review of the current status of YBPs as of 2011 in areas such as financial performance and the type of farmland owned and rented compared to established producers. This is followed by a discussion of the proposed loan program design itself and an assessment of the actual loan program implementation.

B. Overview of Young and Beginning Producers

For FCB purposes, a young producer is defined as a producer under the age of 35. USDA defines a producer who has operated an agricultural operation for less than ten years as a beginning producer. Ahearn (2011) used the 2007 Agricultural Resource Management Survey (ARMS) data to determine the education level, ethnicity, and gender of beginning producers compared to established producers in the U.S. Compared to established producers, beginning producers are more likely to be ethnically and racially diverse and more likely to be young, college-educated women. The typical beginning producer is a white male with a high school education in the age group of 35 to 54. Outside the 35 to 54 age group, 14 percent of beginning producers are under the age of 35 and 32 percent of beginning producers are over the age of 55. (Ahearn and Newton 2009).

The following will provide a review of relevant literature on financial issues facing YBPs. USDA's Economic Research Service (ERS) has provided some basic information on YBPs. Ahearn and Newton (2009) found YBPs earn less income from their farms than established operations and are more likely to earn more income from off-farm employment. YBPs are more likely to be involved in livestock production than crop production and are more likely to specialize in beef cattle production. Ahearn and Newton found that YBPs account for 20 percent of total U.S. poultry production. They are also less likely to rent farmland and more likely to own their farmland. Their farmland is more likely to be purchased, which is consistent with their debt loads, than inherited or gifted to them by a family member.

As discussed earlier, Mishra, Wilson, and Williams (2009) point out one reason for the decline in YBPs is barriers to entry to agriculture. YBPs face large initial investments and do not have the established borrowing history, as an older experienced producer would have, to

easily borrow the necessary operating capital each year. YBPs are less able to gain the economies of size that older farmers experience and they face higher cost structures than older farmers because of these barriers to entry.

Studies have been conducted to examine factors indicating financial stress. D'Antoni, Mishra, and Chintawar (2009) analyzed the predictors of financial stress in YBPs. They found farm ownership played an important role in indicating financial stress in an operation. YBPs were 1.4 percent more likely to be financially distressed if they rented their farms than full owners; part owners were less likely to be financially stressed than full owners. Poultry and livestock operations are also more likely to be financially vulnerable compared to other operations. This study did not look at the effects of guaranteed loan programs and use of conservation practices or best management practices on YBPs' financial vulnerability.

Mishra, Wilson, and Williams (2009) examined factors affecting financial performance in YBPs. The results indicate that a college education and off the farm job have a negative impact on the financial performance on the farm. The authors theorize that this negative impact could be from the YBPs off-farm employment having higher returns and because of this, YBPs work off the farm, negatively impacting the farm's financial performance. Factors positively influencing YBPs financial performance include the YBP's being a part of a larger operation or a corporation and the farm processing its commodities to provide some value-added to their farming. Another positive factor is having a written business plan; this can increase the financial performance of YBPs. According to Mishra, et al., having a written business plan would have a positive impact because written business plans may help YBPs gain financing from banks and may show YBPs are determined to make the right business decisions. Another factor, participation in federal farm programs such as the Direct Payment Program, has a positive

impact on the financial performance of YBPs. This study was limited to the 2005 ARMS data and did not take into account the impact on the financial performance that a reduced interest rate program, such as the proposed loan program, could have on YBPs.

Katchova (2010) looked at beginning farmers and ranchers' financial performance and stress by analyzing the five major financial ratios. The results found that financial management strategies aimed at improving YBPs' liquidity and solvency would tend to improve this group's overall financial condition. Katchova found that YBPs are similar to other groups of farmers, except that YBPs are less likely to experience problems with liquidity and efficiency based on personal and farm characteristics. Compared to other groups of producers, YBPs have a different likelihood of experiencing financial stress based on the operation's characteristics, farm size, organization, and farm enterprise, such as being a crop farm, livestock farm, or hobby farm.

USDA and Farm Credit Services have dedicated loan programs to help increase the numbers of YBPs entering agriculture. Through the Farm Service Agency (FSA), USDA offers guaranteed and direct loan programs to qualifying YBPs when the operators cannot receive financing from commercial lenders at reasonable terms. Each year FSA sets aside a portion of its loan allocations for YBPs to use in the operating loan and guaranteed farm ownership programs. This set aside portion for YBPs is available on a first-come-first-served-basis. The requirements for the set aside portion for YBPs is no different than for regular operating loan and guaranteed farm loan programs, besides qualifying as an YBP. The 2008 Farm Bill grants FSA the authority to guarantee land contract sales between qualified beginning producers and private parties for up to 10 years up to $500,000.

Research conducted by the University of Arkansas also shows that beginning farmers and ranchers have lower survival rates in agriculture. In reviewing data from FSA's farm loan

programs, the researchers found that 47.5 percent of beginning farmers who received operating loans through FSA left farming voluntarily for reasons other than death or retirement upon exiting the program (Dixon, et al. 2007). This is compared to 34.6 percent of regular recipients of operating loans from FSA. Beginning farmers also have a higher percentage of FSA operating loans terminated due to foreclosure, bankruptcy, or debt write-off, 9.6 percent for one-year operating loans and 16.1 percent for seven-year loans (Nwoha, et al., 2005). Regular operating loan borrowers had only an 8.5 percent termination rate for one-year operating loans and 7.4 percent termination rate for seven-year loans.

USDA also offers limited resource rate loans for direct borrowers who cannot cash flow their repayments at the regular interest rate.[1] The limited resource rate loan rate is set at half the regular rate, but cannot be less than 5 percent. USDA may also reduce interest rates through the interest assistance program. Under the interest assistance program, USDA will reduce the interest on operating loans by four percentage points if the borrower is unable to generate a sufficient cash flow without the interest assistance. The limited resource rate loan and interest rate assistance programs can be used to assist YBPs meet their repayment obligations.

The 2008 Farm Bill provided for many new loan programs for FSA to help beginning producers enter agriculture. The Farm Bill authorized FSA to provide down payment assistance to beginning producers through direct loan financing a down payment when necessary. This assistance is provided by decreasing the beginning producer's contribution, increasing the maximum amount that may be borrowed, lengthening the repayment term, and allowing for a reduction in interest rate on the loan. (Ahearn and Newton 2009). A New Farmer Individual Development Account Pilot (NFIDAP), another new program, is a pilot program that allows

[1] The limited resource loan rate is not restricted to limited resource producers but to all qualifying producers.

qualified beginning producers apply for matching grants of up to $6,000 to help reduce startup costs, such as purchasing land or breeding stock. (Ahearn and Newton 2009). At this time, not much is known of the impact of these programs on YBP retention in agriculture.

The FCBs are also working to increase their YBP loan portfolio. In 1980, Congress established the FCBs' young and beginning producers' mission in amendments to the Farm Credit Act. Since that time, each of the FCBs have worked to develop flexible lending programs for young and beginning farmers and ranchers. For example, Farm Credit Services of Western Arkansas ("Western") operating loans to YBPs provide a reduction in the interest rate by 25 basis points and Western pays the fee for a FSA loan guarantee that may be required. For YBP first-time real estate buyers, Western provides a $500 credit. No published literature was found reviewing the effectiveness of these various YBP loan programs established by the FCBs.

USDA-ERS has found evidence that suggests YBPs in Arkansas and other states in the Mississippi Delta are more likely to operate more environmentally sensitive farmland compared to other groups (Nickerson and Hand 2009). This study was limited to analyzing Environmental Quality Incentive Program (EQIP) contract data from 2006 in the Delta region of the U.S. Using EQIP contract data, ERS found evidence that suggests 54 percent of beginning producers' EQIP contracts were located in areas with a greater than average percentage of highly erodible land compared to 47 percent of other farm types. Because YBPs in Arkansas enroll a higher percentage of highly erodible cropland, it could be argued that YBPs in Arkansas would have a strong incentive to implement best management practices that properly manage their farmlands to insure productivity for years to come.

C. Program Design

The proposed loan program designed in this study has the goal of increasing the number of YBPs successfully operating in agriculture by increasing their financial stability and operating margins, simultaneously fulfilling certain identified environmental and social goals. The loan program will focus on a sample group of those YBPs currently falling slightly short of breaking even. The loan program is designed to help these producers select and implement practices from a menu of select activities, with a FCB simultaneously giving them concessionary interest rates and/or loan fees for implementing the practices. The loan program would help this sample group become profitable producers, reduce a single FCB's risk on lending to this group of producers, and create a new class of potential borrowers who need assistance to become successful.

1. Requirements to Enroll

Before enrolling in the loan program, each potential participant would need an existing and actionable conservation plan, irrigation water management plan, nutrient management plan, and pest management plan. First, the potential participant would need an existing actionable conservation plan on file with his or her local USDA-NRCS office. A conservation plan is "[a] combination of land uses and farming practices to protect and improve soil productivity and water quality and prevent deterioration of natural resources on all or part of a farm. Conservation plans must be both technically and economically feasible" (ERS Glossary 2009). In talking with state NRCS officials Corey Farmer, Resource Conservationist, Rich Joslin, Resource Conservationist, and John Lee, Agronomist, a YBP would become aware of conservation issues on their farmland and ways to address and improve these conservation issues over time. Being aware of the conservation issues and knowing how to address them increases the chances of the farmer successfully dealing with these conservation issues over time.

Potential participants would also need to work with their local county Extension agent, local NRCS officials, or a certified crop advisor to develop actionable irrigation water management, nutrient management, and pest management plans before enrolling in the loan program. An irrigation water management plan is used "to control the volume, frequency, and rate of water for efficient irrigation" (USDA-NRCS 2010). A nutrient management plan is defined as a plan to manage "the amount, source, placement, form, and timing of application of nutrients and soil amendments." (USDA-NRCS 2010). A pest management plan "is an ecosystem-based strategy that is a sustainable approach to manage pests using a combination of techniques such as a chemical tools, biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties." (USDA-NRCS 2010). Having each of these plans would also insure that a potential participant is serious about implementing practices from the menu. Potential participants would understand the importance of nutrient application timing and source, how to efficiently irrigate crops, and the uses of alternative pest management strategies before using costly chemicals. As will be discussed later, requiring these plans in addition to their conservation plans would also complement many of the menu of practices being considered for the loan program.

2. Menu of Practices

a. Technology Adoption Among YBPs

The adoption of menu practices for the loan program would require potential participants to adopt new forms of technologies in their operations. Factors that influence technology adoption in YBPs could be important because the same factors that influence technology adoption could influence adoption of best management practices. The following is a review of the relevant literature on technology adoption in YBPs. Mishra, Wilson, and Williams (2007)

conducted data analysis on the ARMS survey to determine the impact of the use of technology on the financial performance of YBPs. The researchers used a least squares method of estimation and limited their investigation of technology adoption to use of genetically modified (GM) corn and soybean seed. The analysis found that adoption of GM seed did lead to higher financial performance. However, since this analysis is limited to the adoption of GM seed, we cannot know if this increase in financial performance would hold true for adopting best management practices.

Adhikari, Mishra, and Chintawar (2009) used weighted regression analysis to evaluate technology adoption by YBPs and the effect of the technology on financial performance. The analysis was conducted using 2004-2006 ARMS data and again focused on adoption of GM seed. Adhikari, et al. (2009) found that younger YBPs and YBPs with more education were more likely to adopt technology. Tenants and part owners of farms are more likely to adopt GM seed. The results also indicated that YBPs with larger operations and more risk adverse operators are more likely to adopt GM seed. Again this study was limited to the adoption of only GM seed by YBPs; these results may not be the same for adoption of other technology and newer farming practices. From Adhikari, et al. (2009), we find factors impacting technology adoption being either a part owner or a tenant of farms and the more education the producer has. Using the 2007 Census data, 50.90 percent of Arkansas producers under the age of 25 were part owners or tenants and 33.09 percent of Arkansas producers between the ages of 35 to 54 are part owners or tenants of farmland (Table 6 and Table 7). Beginning producers are more likely to be college-educated compared to established producers (Ahearn 2011). Considering these two characteristics along with the results in Adhikari, et al. (2009), we would expect the potential

participants to be more likely to adopt technology or the best management practices being considered for this loan program.

Although the two mentioned studies dealt mainly with the adoption of GM seed, the results show that YBPs who adopt technology can see improved financial performance. In the coming sections of this paper, research results that demonstrate other technology and BMPs can be adopted that help improve financial performance of all producers, not just YBPs.

Table 6: Land Tenure by Age Group for Arkansas 2007, Source: 2007 Census of Agriculture

	Full Owners	Part Owners	Tenants	Total
Under 25	109	27	86	222
25 to 34	1,530	687	519	2,736
35 to 54	12,482	4,727	1,446	18,655
55 to 59	4,880	1,707	464	7,051
60 to 64	4,654	1,527	274	6,455
65 to 69	4,143	1,192	236	5,571
70 and Over	6,938	1,420	298	8,656

Table 7: Percentage of Land Tenure by Age Group for Arkansas 2007, Source: 2007 Census of Agriculture

	Full Owners	Part Owners	Tenants	Total
Under 25	49.10%	12.16%	38.74%	100.00%
25 to 34	55.92%	25.11%	18.97%	100.00%
35 to 54	66.91%	25.34%	7.75%	100.00%
55 to 59	69.21%	24.21%	6.58%	100.00%
60 to 64	72.10%	23.66%	4.24%	100.00%
65 to 69	74.37%	21.40%	4.24%	100.00%
70 and Over	80.15%	16.40%	3.44%	100.00%

b. Selection of Practices

Practices being considered for inclusion in the loan program must demonstrate two things. First, the practices must address one of four environmental concerns (1) water quality; (2) water quantity; (3) air quality; and (4) soil quality. Improving production practices connected with these areas of concern would help the loan program meet environmental goals. The public is

concerned about these areas, looking to agriculture and agriculture's impact. By working with program participants to positively address these areas of concern, the loan program would create a core group of producers using profitable best management practices to simultaneously produce food and improve the environment.

Second, the practices must be proven to either maintain or increase farm profits. It is not expected that potential participants not currently breaking even in their operations adopt practices that lowered their profit levels. To create a successful group of loan program participants, the menu of practices must focus only on those best management practices that either keep profitability of the operation at the same level as before entering the program or actually increase profitability.

Only practices relevant to row crop agriculture are considered for inclusion for the initial study. The decision was made to focus only on those practices that impact the four areas of concern, keep profitability of the operation the same or increase profitability, and can be implemented on cropland. The reason for this limitation was to limit the scope of the program initially and define practices for row crop and grain operations that meet our criteria. As this loan program expands, the FCBs would be able to look at including practices for pasture and rangeland.

The following is a relevant review of the literature on each practice considered for inclusion in the loan program. This initial group of practices was based on discussions with subject matter experts.

i. Conservation Tillage

The adoption of conservation tillage practices is one way to improve environmental quality. Studies have shown that the adoption of conservation tillage can positively impact water quality improvement in watersheds. Meyers-Aurich, et al. (2004) found that the use of conservation tillage practices and nutrient management plans can increase net returns and decrease greenhouse gas emissions.

Studies have also shown the impact on Arkansas's air from the emissions from burning crop residue. McCarty (2011) found that Arkansas was among the top seven states in emissions from burning crop residue. Arkansas was found to rank sixth in carbon monoxide (CO) emissions and fourth in particulate matter two point five ($PM_{2.5}$) and particulate matter ten (PM_{10}) emissions from burning crop residue. The study found that 25 percent of Arkansas's population lived in counties with highest emissions from the burning of crop residues. A switch to conservation tillage practices would reduce the state's CO, $PM_{2.5}$, and PM_{10} emissions, because these practices leave crop residue in place.

Conservation tillage is used to some extent in Arkansas. In 2009, 12 percent of Arkansas rice farmers utilized no-till and another 35 percent used some other form of conservation tillage (Wilson, Runsick, and Mazzanti, 2009). Using the ARMS data, Horowitz, Ebel, and Ueda (2010) found that 9.4 percent acres of cotton in Arkansas was grown using no-till in 2007. Using the same ARMS data, in 2006, 15.1 percent of soybean acres were grown using no-till. The exact number of wheat acres using conservation tillage is unavailable. Based on conversations with state NRCS officials, this low percentage of adoption could be based on the stigma associated with no-till in Arkansas; producers perceive that the lower yields resulting from no-till practices result in lower profits. As the following literature shows, the

implementation of conservation tillage can reduce the amount of irrigation water needed, reduce the amount of sediment runoff, reduce variability in returns, reduce costs of the operation, and increase profits for the operation.

Conservation tillage can potentially reduce the amount of irrigation water needed. Anders, et al. (2003) in their study, discussed in detail later, found that no-till rice plots required on average 23.6 inches of irrigation water compared to conventional tillage rice plots that required 26.3 inches of irrigation water.

The profitability of no-till and other conservation tillage practices has been intensely analyzed by various researchers. Nyakatawa, Reddy and Mays (2000) looked at implementing no-till cotton production with the use of poultry litter and the use of a cover crop of winter rye before planting. Unlike previous research, the cover crop was not fertilized but allowed to use excess nutrients from the previous cotton crop. The study's results found that the cotton yields and growth from the no-till cotton performed better than growth and yields for minimal till and conventional tillage cotton. The one drawback to their analysis was that the costs of no-till cotton with the cover crop of winter rye was not compared with the costs of minimal till cotton and conventional tillage cotton.

Matekole, Westra and Appelboom (2009) found that when comparing tillage systems producers would prefer no-till systems because of the higher returns per acre and the lower nitrogen runoff. Their research focused on one watershed in Louisiana that produced cotton, corn, rice, and grain sorghum. The model used crop yields, input price, government payments, tillage practices, nutrient management plans, soil type, and cropland effluents of nitrogen, phosphorus, and sediments to maximize net returns. Reduced tillage and no-till were compared to the baseline conventional tillage system. Both tillage systems produced higher net returns per

acre than the conventional tillage system. Both tillage systems also reduced nitrogen runoff compared to the conventional system.

Parsch, et al. (2001) compared the profitability of conventional tillage practices with conservation tillage practices on clayey soils in Eastern Arkansas. The research was conducted from 1986 to 1991 using plots of soybeans, grain sorghum, corn, and cotton. The experimental design consisted of eight plots grown with conventional tillage and eight plots grown with conservation tillage. Each practice used the same eight plots consisting of continuous soybeans with irrigation, continuous grain sorghum, two plots of soybean-grain sorghum rotation, two plots of soybean-corn rotation, continuous cotton, and continuous soybeans without irrigation. The two plots of the soybean-grain sorghum rotation and the soybean-corn rotation were grown so that each year there would be one record of soybeans and another for corn or grain sorghum to reduce any variability caused by weather. This study concluded that for clayey soils in Eastern Arkansas, conventional tillage was more profitable five out of six years than conservation tillage. It should be noted this study used data from 1986 to 1991 and many input costs have increased since then, so that these results could be different today.

Watkins, et al. (2010) compared the profitability of conventional tillage, reduced tillage, and no tillage on wheat pasture for grazing stocker steers. The data used was from the winter wheat forage production conducted by the University of Arkansas from 2002-2003 to 2008-2009. The study found that the no-till system produced the highest average total steer returns followed by reduced tillage and conventional tillage. The variability in returns was also smaller for the no-till system compared to the other two systems. The average cost of producing the winter wheat was also the lowest with the no-till and higher with the other two systems.

With cotton production, no-till has been found to be more profitable than conventional tillage. Hanks and Martin (2007) conducted a study that evaluated no-till, conventional tillage, and low-till sub-soiling each without a cover crop and no-till and low-till sub-soiling each with a cover crop of winter wheat. In comparing the tillage systems without the use of a cover crop, the study found the five year net returns were the highest using no-till followed by conventional tillage and low-till sub-soiling.

Evaluating production methods for soybeans in Arkansas, Popp, Keisling, Oliver, Dillon, and Manning (2001) ("*Popp I*") and Popp, Keisling, Manning, and Annis, Jr. (2001) ("*Popp II*") found that no-till soybeans in Arkansas performed better than pre-plant tillage soybeans on test plots in clayey soils located at Keiser, Arkansas. These studies did not look at the long-term impact of using no-till methods on clayey soils, but only focused on short-term profitability impacts. Recall no-till is one of ten practices available for a YBP to select; it may not work in all areas of Arkansas.

Verkler, et al. (2009) studied the impact of tillage, burning of residue, and irrigation on soybean yields in Eastern Arkansas. The study began in 2001, but the results published in this paper focus on 2005 and 2006. These years represented the period of time it took for no-till practices to become established. The study was designed so there would be one plot of each possible combination of conventional tillage or no-till, burned residue or no burning, high or low nitrogen in relation to the residue level, and irrigated or non-irrigated. The study found that no-till does have a positive impact on soybean growth but did not give an advantage in yield. In years 2005 and 2006, researchers found that neither tillage practice nor burning of wheat residue before soybean planting gave a yield advantage. This means that no-till and not burning crop residue could be viable alternatives to conventional tillage and burning. With irrigation, the

study found that as the no-till system became established it could potentially improve water conservation and increase soybean yields, particularly in difficult years. The greatest net returns were found with the irrigation, low nitrogen to residue level, no-till, and burned residue treatment. The researchers also looked at what would happen if energy costs continued to increase. The no-till treatment that produced the greatest returns would produce 168 percent greater returns than the irrigated, high nitrogen to residue levels, conventional tilled, and burned residue treatment, the prevailing practices in Arkansas.

Being located in the top rice producing state in the U.S., the University of Arkansas's Rice Research and Extension Center (ARREC) at Stuttgart has produced research on the profitability of no-till rice. Hignight, Watkins, and Anders (2010) analyzed the profitability of no-till (NT) compared to the profitability of conventional tillage (CT) on Arkansas Grand Prairie silt loam soil. The analysis used a stochastic model to empirically estimate the net returns of the two tillage systems on five different crop rotations: (1) continuous rice; (2) rice-soybean rotation; (3) rice-corn rotation; (4) rice-wheat rotation; and (5) rice-wheat-soybean-wheat rotation. The yield data from the rotations was based on long-term rotation studies conducted by the ARREC. Looking at the results on net returns, this analysis found that for the NT rotations, except for the NT rice-corn rotation, had higher net returns than the CT rotations. Looking at the probability of negative net returns, again the analysis found for the NT rotations, the rice-corn rotation was again the exception, had lower probabilities of negative net returns compared to the CT rotations. The CT rice-corn rotation was the only rotation that had higher net returns and a lower probability of negative net returns compared to the NT rice-corn rotation.

Watkins, Hill, and Anders (2008) looked at the profitability of NT rice compared to CT rice with regards to various rental arrangements in Arkansas. The study looked at five common

rental arrangements used in Arkansas: (1) 75/25 crop share agreement; (2) 80/20 crop share agreement; (3) 50/50 rice cost share and 75/25 soybean crop share agreement; (4) 50/50 rice cost share and 80/20 soybean crop share agreement; and (5) fixed cash rental agreement. The yields and price distributions were simulated using the "Simulation and Econometrics To Analyze Risk" (SIMETAR) program. The rice and soybean yields were simulated using the historic yields from the years 2000 to 2006.

The simulation found that NT rice had larger net return compared to CT rice for all five-rental agreements analyzed. The NT rice also had a lower return variability for all five rental arrangements compared to CT rice. Looking at the tenant, the most profitable agreement was NT rice with a cash rental arrangement and the agreement with the lowest return variability was the NT rice 80/20 crop share agreement. With the landlord, the simulation found that returns were relatively equal for NT management and CT management and the lowest return variability was with the NT rice rental agreements.

Watkins, Hignight, and Anders (2011) compared no-till and conventional tillage on rice-soybean farms of 1200, 2400, and 3600 acre sizes. The results found that for the three farm sizes NT had higher average net returns compared to CT. The relative variability of net returns was smaller for NT compared to CT for all farm sizes. Finally, the probability of achieving negative net returns is smaller for NT farms compared to CT farms.

Hignight, Watkins, and Anders (2009) studied the differences between a no-till rice-soybean rotation to a conventional tillage rice-soybean rotation. The study began in 2000 at the University of Arkansas Rice Research and Extension Center in Stuttgart, Arkansas comparing the impacts of conventional tillage and no-till on a rice-soybean rotation. Using eight years of data, results indicate yields for no-till rice and soybeans were lower than conventional tillage for

the first four to five years of the study, but after that the no-till yields for both surpassed conventional tillage yields. Looking at the rice-soybean rotations, the no-till rotation was found to be more profitable than the conventional tillage rotation. The no-till rotation had returns of $84 per acre, while the conventional tillage had returns at $54 per acre.

A producer adopting conservation tillage, such as no-till, would see increased profits per acre, less variability in net returns, and reduced nitrogen and sediment runoff. A FCB loaning to a YBP participating in the loan program could see additional opportunities to loan capital to a YBP for purchasing a large sprayer and specialized planting equipment for conservation tillage.

ii. Integrated Pest Management

Applicants to the loan program would be required to have developed an actionable integrated pest management plan. As the literature will show, development of a pest management plan can help to reduce chemical costs, limit chemical applications to when the applications are necessary, and promote the use of cheaper non-chemical pest management alternatives. Fernandez-Cornejo, Jans, and Smith (1998) provide a thorough literature review on the profitability of integrated pest management (IPM) practices. The use of IPM on cotton had twenty published studies that showed profits and yields increased generally with the implementation of IPM practices. With soybeans, seven studies have found the profits per acre and yields increase with the implementation of IPM practices. Corn has also been shown to increase profits and yields with the implementation of IPM practices.

These published studies reviewed by Fernandez-Cornejo, et al. (1998) demonstrated improved profitability and yields with the adoption of IPM plans. The development of an IPM plan may be a barrier to entry for a potential YBP to participate in the loan program. Development of an IPM plan can take time and require a YBP to work with an extension expert

or a crop advisor in the development of the plan. The additional time required to adopt an IPM plan could be one possible reason a YBP does not adopt this practice.

iii. Riparian Buffers

The effect on profitability from riparian buffers has received some attention in previous studies. Qiu and Prato (1998) evaluated the economic values of riparian buffers in an agricultural watershed. The researchers used Soil and Water Assessment Tool (SWAT) to simulate the water quality runoff impacts from land with and without riparian buffers. The simulations only looked at the impact on sediment yield, nitrogen levels in the stream, and atrazine levels in the stream. These simulations found that the total watersheds net returns, or the net returns for all farming practices in the watershed, were higher with riparian buffers than without riparian buffers.

This study does have some drawbacks. One is the study did not take into account establishment costs of the riparian buffers. The area studied, in Missouri, already had established forested riparian buffers and did not require the establishment of riparian buffers. If a YBP decides to use riparian buffers as a practice, the YBP would face establishment costs and the establishment costs would have impact on profitability of the farm. The other drawback is the study focused on the economic effect of riparian buffers and without riparian buffers on meeting certain water quality standards. Our focus is more on individual agricultural producer profitability in implementing riparian buffers as a best management practice. This study could become more relevant if Arkansas or the federal government implement water quality standards those YBPs would need to meet.

Bonham, Bosch, and Pease (2004) and (2006) analyzed the whole-farm impact of mandatory nutrient management plans and riparian buffers in the Chesapeake Bay region. The

analysis looked at two spatial scenarios, (1) farm-specific scenario that modeled different types of farms at specific locations in the watershed; and (2) the multi-representative farm scenario that looked at sets of major farm types in the watershed. The General Algebraic Modeling System (GAMS) was used to develop the profit maximizing solution for three policies: (1) a baseline with no riparian buffer or nutrient management plan required; (2) requiring riparian buffers when the field is adjacent to a stream; and (3) requiring nutrient management plans to reduce the phosphorus (P) to applying only the amount taken up by the crop. The best results came from the baseline with total gross margin of $787/acre. Requiring the use of riparian buffers only reduced total gross margins by $20/acre from the baseline to $767/acre. Requiring nutrient management plans that limited the use of P to amount of P removed by the crop reduced total gross margins to $702/acre from the baseline.

This analysis, unlike the Qiu and Prato (1998), took into account the establishment costs and annual maintenance costs of the riparian buffers. A limitation to this study would be that it was conducted on farms in Virginia that produce corn grain and silage, rye silage, alfalfa hay, and red clover/orchard grass hay and raise dairy and beef cattle. The total gross margins could be different when looking at the effects of riparian buffers on the gross margins of rice, soybeans, cotton, corn and wheat.

FSA offers the Conservation Reserve Enhancement Program (CREP), which is an addition to the Conservation Reserve Program (CRP). Like CRP, CREP is a voluntary land retirement program that targets high-priority conservation issues that impact water quality. The program encourages farmers to voluntarily retire lands or alter their usage and plant some form of vegetative cover near approved bodies of water. By enrolling in CREP, the farmer becomes eligible for annual payments for the land enrolled, cost-share for the establishment of

conservation practices, such as a buffer strip, a one-time signing incentive payment, and one-time practice incentive payment (this is in addition to the cost-share payment). Arkansas has some bodies of water that qualify for CREP; this could be one way for a beginning producer to implement riparian buffers.

Stull, Dillon, Shearer, and Isaac (2004) analyzed the economic impact of implementing riparian buffers, using yield monitors, and enrolling the buffers in CRP in Kentucky. The study had three test groups, 1) no buffer strips had been implemented, 2) buffer strips implemented on all management zones that met NRCS guidelines, and 3) buffer strips in areas that had the lowest yields and met NRCS guidelines. Each field was planted to a soybean/wheat and corn rotation. Two years of data from each field were used to make the comparisons. Looking at the results over the two years, the use of yield monitors, CRP enrollment, and buffer strips increased net returns by $373.25 compared to no strips and by $1,025.83 compared to enrolling all eligible strip areas in CRP for all three fields.

Because CREP and CRP are similar programs, this study is useful to us. The CRP annual payments, included in the data, would be similar to the CREP annual payments. CREP does have one difference from CRP that could potentially reduce establishment costs. CREP payments include two one-time payments that would help to reduce the producer's establishment costs of the buffers.

As the literature review has demonstrated adoption of buffer strips without participating in a government program has mixed results on the practice's impact on farm profitability, but could act as a filter to stop potential pollutants from entering into a body of water. A FCB loaning to a YBP adopting this practice could potentially see additional lending for establishment of buffer strips. Adoption of a buffer strip while participating in CRP or CREP

could see increased profits per acre, but with potential cuts to the conservation title of the next Farm Bill these programs may have fewer dollars to help establish buffer strips. A FCB lending to a YBP considering adopting buffer strips while participating in a federal program would also see increased lending opportunities for establishment of buffer strips.

iv. Cover Crops

Arkansas NRCS officials have found that Arkansas farmers are not likely to adopt cover crops based on a stigma associated with the practice (Lee, et al. 2011). Planting a cover crop can improve water infiltration rates and the moisture content of soils, breaking up soil compaction and improving soil quality, increasing soil organic matter, and reducing topsoil loss (Bergtold, et al., 2012). Cover crops can also protect water quality, reduce weeds, and improve the productivity of the traditional cash crops grown by a producer (Bergtold, et al., 2012). Regardless of the stigma associated with cover crops, Arkansas farmers should consider their adoption based on environmental benefits and increased returns associated with their adoption.

Gareau (2004) reviewed the literature on various plant nutrient management strategies; one included the use of cover crops. In one study, the research found that the highest average corn yields were found with a cover crop system using no-till. The cover crop system with no-till also produced the highest average gross margins in corn when compared to no-till without cover crop and manure based systems. Previous studies in Georgia with no-till corn compared the profitability with a cover crop. The study focused on the uses of hairy vetch, crimson clover, winter wheat, and winter fallow. The results found that the use of hairy vetch produced the largest average profit.

Lu, Teasdale, and Huang (2003) used data from the USDA's Agricultural Research Service's Sustainable Agricultural Demonstration site at Beltsville, Maryland to construct a 60-

year simulation to analyze the profitability and environmental consequences of six cropping practices: (1) No-till; (2) Cover Crop; (3) Organic system in a two-year rotation of corn-wheat/soybean; (4) Corn-soybean no-till rotation; (5) Cover Crop system were no nitrogen fertilizer is applied (CCZ); and (6) a three-year organic rotation of corn-soybean-wheat. The simulation was run using the Environmental Policy Integrated Climate (EPIC) crop growth model. In dealing with risk averse producers, CCZ had the highest gross margins compared to the other five systems. CCZ had lower nitrogen losses and less runoff, percolation, and sedimentation compared to the other cover crop system and the two no-till systems.

One drawback to this study is the lack of a conventional tillage simulation to compare to the alternative simulated systems. The study allows a producer to know which alternative system would be more profitable compared to other alternative management practices, but does not allow a producer to compare conventional tillage to alternative management practices.

As discussed earlier, Hanks and Martin (2007) evaluated net returns to cotton with the use of a winter wheat cover crop with no-till or low-till sub-soiling. The study found that net returns per hectare for cotton produced with a no-till system using a winter wheat cover crop were $12/hectare less than that of conventional tillage without the use of a cover crop. Cotton produced with low-till sub-soiling using a winter wheat cover crop produced net returns of $49/hectare less than conventional tillage without the use of cover crop.

Adoption of cover crops has mixed results on increasing a producer's profitability, depending on the type of cover crop adopted. One potential barrier for a YBP considering adopting this practice could be the additional operating capital required to prepare and plant a cover crop. A YBP may not have the credit history or relationship necessary with a lender to

gain the additional operating capital to plant a cover crop. A FCB would have to be willing to lend additional operating capital to a YBP adopting this practice.

v. Laser Leveling

Laser leveling is one practice that many Arkansas farmers would like to adopt, but it may be cost prohibitive. Laser leveling does have some benefits, particularly reducing irrigation water needs. The effects of precision leveling on cropland have been the focus of a few studies. Laser leveling impact in Eastern Arkansas on rice and soybean rotations has been the focus of Wailes, et al. (2003) (hereinafter "*Water Conservation"*), Popp, et al. (2003) (hereinafter "*On-Farm Reservoirs*"), and Popp, et al. (2004) (hereinafter "*Benefits*"). In *Water Conservation*, the modified Arkansas off-stream reservoir analysis (MARORA) was used to analyze two situations, one involving an adequate groundwater situation, which is a 50-ft initial saturated thickness and 0.5ft annual decline, and the other involving a relatively inadequate groundwater situation, which is a 30-ft initial saturated thickness and 1.0-ft. annual decline. The inadequate groundwater situation used a reservoir with tail-water recovery system and the adequate groundwater situation did not utilize a reservoir with tail-water recovery system. With the adequate groundwater situation, precision leveling was found to increase the net present value of returns per acre by $608 from a calculated baseline. With the inadequate groundwater situation, the precision leveling was found to increase the net present value of returns per acre from $535 to $674 from the calculated baseline. With the inadequate groundwater situation, leveling costs only $300/acre to install compared to increases in to returns per acre of $535 to $674 from the calculated baseline.

Watkins, Hill, and Anders (2007) studied the benefits and costs of switching from a contour-levee system to a precision leveling system. Looking at returns and production costs for

the two systems, a leveled rice system and leveled soybean system produced higher net returns per acre when compared to the contoured systems. Leveled rice had net returns per acre of $182.77 and leveled soybeans had net returns per acre of $67.55; the contour levee rice had net returns per acre of $59.21 and contour levee soybeans had net returns per acre of $18.70. The largest net returns per acre were seen in the leveled rice system. The reason for these higher returns with the precision-leveled system is due to less tillage required with the precision-leveled system and reduced irrigation costs.

Next, the researchers looked at the payback periods required for installing a precision-leveled management system. Because rice in the precision-leveled system had the highest returns, a continuous rice rotation was assumed to regain the initial investment in precision leveling the quickest. Because the initial cost of precision leveling is highly dependent on the amount of soil that must be moved, no precise results were found for the return on the initial investment. The paper instead focused on some examples of how long the return on the initial investment would take. If the farmer owns his own leveling equipment and has only 300 cubic yards of soil to move, with no loss in rice yields the payback period would be between 3 years and 7 years assuming losses in yields from the cuts in the soil. Another example would be if the farmer had to move 1000 cubic yards of soil, the payback period could take 6 to 8 years assuming no rice yield losses to as long as 15 years assuming some loss in rice yields. The decision to precision-level a field would depend on how heavily the amount of soil that would have to be moved.

Although laser leveling has been shown to increase a producer's profitability, adopting laser level may be prohibited for many YBPs because of the cost to laser level their farms. The large initial investment to laser level can be quickly recovered if a YBP experiences no yield loss,

but if a yield loss is experience the payback period could take years. Although some government conservation programs, such as the Environmental Quality Incentives Program, provide cost share money for a producer to adopt laser leveling, the level of funding in these programs maybe cut dramatically in the next Farm Bill and this cost share money may not be available to assist a YBP in adopting this practice. This high cost of adopting laser leveling is one huge potential barrier of entry for a YBP looking to adopt laser leveling. A FCB looking at loaning to a YBP participating in the loan program and adopting laser leveling could see additional lending opportunities for the costs of laser leveling.

vi. Underground Pipe

The impacts of the use of underground irrigation pipe were also analyzed in *Water Conservation*, *On-Farm Reservoirs*, and *Benefits*. In *Water Conservation*, the same two scenarios from the laser leveling were run using MARORA to determine the benefits from using underground irrigation pipe. With the adequate groundwater situation, the use underground irrigation pipe increased net present value of returns per acre by $103. In the inadequate groundwater situation, the underground irrigation pipe increased net returns per acre by $144 when used with a reservoir and tail-water recovery system. The benefit/cost ratio was calculated for the underground irrigation pipe in the adequate groundwater situation to be a 1.1 ratio. In the inadequate groundwater situation, the costs to install the irrigation pipe are $94/acre compared to the benefits of $144/acre.

Adoption of underground irrigation pipe can help to reduce losses from evaporation currently experienced with furrow irrigation. A YBP considering adopting this practice would see increased returns from production cost savings. One barrier to adopting this practice for a YBP is the large cost of implementing the practice. As previously stated, federal programs are

available to cost-share the adoption of underground irrigation pipe, but the levels of this cost-share funding are uncertain at this time. A FCB considering loaning to a YBP adopting this practice could see long-term lending opportunities in lending the necessary capital to implement underground irrigation pipes.

vii. Crop Rotations

Arkansas farmers do utilize crop rotations, but based on conversations with state NRCS officials, the rotations used by farmers in Arkansas are based on market prices and equipment available rather than agronomic or conservation considerations (Lee, et al., 2011). According to these officials, market price at the time of planting would dictate the crop the producer plants. Arkansas producers also plant based on availability of the necessary equipment. For example, if the farmer only has access to a combine and not a cotton stripper, the farmer is more than likely going to plant corn or soybeans and not cotton.

Getting farmers to adopt proper crop rotation systems would reduce impact of pests and diseases and increased returns per acre. Dillon, et al. (1997) studied various soybean production rotations and tillage practices in Arkansas. The study assessed seven crop rotations, involving soybeans, wheat, and grain sorghum, and eleven production management systems using either no-till, conventional tillage, or burning wheat stubble. The experiment was conducted from 1980 to 1984 at the Arkansas Cotton Branch Experiment Station. The best soybean yield results were found with in a rotation of soybeans following a full year of either wheat or grain sorghum. This rotation also reduced the likelihood of the soybean crop being attacked by the soybean cyst nematode parasite. The highest returns per acre were with conventionally produced, double-cropped wheat-soybean rotation at $136.99 per acre and the lowest returns were with continuous no-till soybeans at $39.44 per acre. The study points out that the highest returns for all crop

rotations were with a soybean-wheat continuous double crop, regardless of the tillage system or wheat stubble management. It should be noted that data from this experiment is thirty years old and changes in production costs may have changed the profitability of the crop rotations and tillage practices used in the experiment.

Anders, et al. (2002) studied the impacts of rice yields on various tillage practices and crop rotations in 2001 and 2002. The study used ten crop rotations with each rotation having a conventional tillage and no-till treatment. The ten crop rotations used were continuous rice, rice-soybeans, soybean-rice, rice-corn, corn-rice, rice (wheat)-rice (wheat), rice (wheat)-soybeans (wheat), soybeans (wheat)-rice (wheat), rice-corn-soybeans, and rice-corn (wheat)-soybeans. In 2001, the highest net returns per acre were found with the no-till corn-rice rotation at $246.21 per acre, and the conventional version of this rotation had net returns near the bottom at $116.37 per acre. Results given for 2002 focus only on the rice-grain bushels per acre with full season rice. The rice-corn-soybean rotation had the highest bushels per acre of rice-grain and the continuous rice rotation had the lowest bushels per acre. Short season rice was also used in 2002 with the rice (wheat)-rice (wheat) and rice (wheat)-soybeans (wheat) rotations. Here the results showed the rice (wheat)-soybean (wheat) rotation to outperform the rice (wheat)-rice (wheat) rotation by 20 bushels per acre.

Selecting the right crop rotation can help to improve crop yields and returns. Adoption of a crop rotation would present smaller barriers of entry compared to other practices reviewed. A YBP would just have to plant different crops in successive growing seasons, but would need to have access to the proper equipment to harvest the crops. For example, if a YBP is rotating corn and cotton then a YBP would need access to both a combine to harvest the corn and a cotton stripper to harvest the cotton. A FCB lending to a YBP adopting this practice would see

additional lending opportunities for a YBP to gain the additional equipment, either through direct purchasing or leasing the equipment.

vii. Irrigation

Another pre-requisite to the loan program would be the existence of an actionable irrigation water management plan. This would allow farmers to efficiently use their available water. Along with the irrigation water management plan, applicants would also be asked to use either the *Checkbook User's Guide* or the *Irrigation Scheduling* computer program to efficiently schedule their irrigation water applications. Both of these are available through the Arkansas Cooperative Extension Service.

Research has identified profitable and efficient ways to apply irrigation water. Truman and Nuti (2010) found that the use of furrow diking could reduce supplemental irrigation, increase water capture, and reduce sedimentation losses and rainfall runoff. The study was conducted on two different farms in Georgia in a cotton-peanut rotation. Each farm contained one plot that used strip tillage and furrow dikes, strip tillage and no furrow dikes, conventional tillage and furrow dikes, and conventional tillage and no furrow dikes. One of the farms had been using strip tillage for the past 10 years, and the other farm only recently adopted strip tillage. The study simulated the 30-year average monthly rainfall in May and the 35 year average rainfall intensity for the spring months. The runoff and sediment yields were then measured from each plot. For conventional tillage, the study found that the use of furrow diking could increase rainfall infiltration, reduce runoff, and reduce soil loss compared to the conventional tillage plots that did not use furrow dikes. Use of furrow dikes did not have an impact on soil loss or runoff in the farm that had been in strip tillage for the past 10 years. This management system would also reduce use of irrigation water by 8 percent to 13 percent

regardless of the adoption of furrow dikes compared to the conventional tillage system without furrow dikes. Use of furrow dikes did have an impact on the recently adopted strip tillage system in terms of rainwater infiltration and runoff. But for the most part, the recently adopted strip tillage system had results comparable to the conventional tillage results, but this would change as the system became more established. Looking at the results, the study found that for areas of the Southeast with runoff producing rains during crop growing seasons, the implementation of furrow dikes could be a cost effective practice from a financial and natural resource conservation standpoints, especially in operations that recently adopted conservation tillage.

Adoption of certain irrigation practices can help to reduce production costs which in return increase a producer's profitability. Using either the *Checkbook User's Guide* or the *Irrigation Scheduling* computer program would allow a YBP to efficiently apply irrigation water when needed by the crop. Adoption of either the *Checkbook User's Guide* or the *Irrigation Scheduling* computer program would present low barriers to entry with a YBP only needing a computer and the ability to keep records of daily temperatures and rainfall amounts. Adoption of other irrigation practices, such as furrow dikes, would present barriers to entry from the cost of adoption. With the adoption of other irrigation practices, a FCB could see additional lending opportunities for the operating capital necessary to implement the practice.

ix. Nutrient Management

Another prerequisite to enroll in the loan program is the existence of an actionable nutrient management plan to allow the farmer to better understand what nutrients each farm needs and optimal times to apply the nutrients to aid in plant growth. One form of nutrient management that potentially could be used is the use of variable rate technology (VRT) to apply

nutrients, or varying the amount of inputs, such as fertilizers and seed, to match the yield potential of the field (Precision Agriculture Terminology).

Gandonou and Dillon (2007) modeled the impact of VRT applications of fertilizers compared to uniform application rates of fertilizers in the production of soybean, wheat, and corn. Crop yields for a model corn and double-cropped wheat and soybean farm in Kentucky were simulated using EPIC using varying fertilizer application rates of nitrogen (N), phosphorus (P), and potassium (K) based on the rotations and the soil types found in the county and a uniform application based on optimal cropping practices for Kentucky. The yield results were then used to analyze the economic performance of VRT fertilizer application and uniform fertilizer application with regard to profitability. Results indicate VRT did improve comparative profitability as fertilizer and/or fuel prices increased compared to uniform application.

In Arkansas, use of VRT with regards to P applications on a rice-soybean rotation has been studied (Popp and Griffin, 2002). VRT applications of P were found to be more profitable compared to a uniform application of P when the farm contained a majority of silt loam soils, a majority of clay soils, or a silt loam-clay soil (Popp and Griffin, 2002).

If fertilizer prices and fuel prices increase, a YBP may consider adopting some form of VRT/nutrient management to participate in the loan program. One barrier to entry would be the time necessary to complete a nutrient management plan each year to ensure that nutrients are applied in the right levels on a YBP's fields. Other barriers to entry include finding applicators in the area with the necessary technology and training to properly apply nutrients according to the nutrient management plan. A FCB could see potential lending opportunities here in additional lending for a YBP to purchase their own sprayer and equipment necessary to adopt

VRT, this could be something a YBP considers if they are purchasing a sprayer to use in a no-till operation.

x. Carbon Sequestration

The Chicago Climate Exchange could create an extra stream of income for not only agricultural producers but their landlords to choose tillage practices that sequester carbon. Some researchers have analyzed the impact of the price per ton of carbon sequestered on farm profitability. Watkins, Hignight, and Anders (2009) evaluated the profitability and risk efficiency of adopting no-till rice cultivation and the impact of carbon credits from the landlord's perspective. Using similar rental agreements to those in Watkins et al. (2008), the analysis suggests net carbon credit values on the Chicago Climate Exchange would need to be from $0.54 per metric ton for an 80/20 crop share agreement to $3.99 per metric ton for 50/50 rice cost share and 80/20 soybean crop share agreement. The carbon credit shifts the no-till risk premium line upward for every rental agreement. This shifting would make no-till management more attractive to risk-adverse landlords.

Nalley and Popp (2010) modeled the effects of an emissions cap policy and a carbon-offset policy on farm income. The model developed a baseline for current agricultural production in Arkansas and its current carbon footprint and imposed an emissions cap on the state's agriculture production. A carbon-offset scenario was then added to the emissions cap model to see if compensating producers for their income losses, from the baseline, would increase carbon sequestration. The modeling found that with an emissions cap program, harvested acres declines by 3.1 percent from the baseline and farm income declines by 2.8 percent from the baseline. When solely a carbon-offset program is used, the modeling results indicate that at the current price of $0.20 per ton of carbon, farm income changes are negligible

and there is little change in GHG emissions compared to the emissions cap program. The carbon-offset program modeling found that even at $15 per ton of carbon there was little change to farm income and cropping patterns compared to the cap and trade. When the price per ton of carbon increases to $100, state farm income levels return to pre-emission restriction levels.

As of the writing of this manuscript, the Chicago Climate Exchange has ceased to trade carbon credits. Without a market for the trading of carbon credits, adoption of carbon sequestering practices by themselves will not be a viable option for producers. Certain practices, such as no-till, that sequester carbon and reduce production costs and increase profitability, will still be considered by a participating YBP. Other carbon sequestration practices that rely on a carbon market to be profitable would not currently be considered without the creation of a new carbon trading market in the U.S.

xi. Urea

Norman, et al. (2004) studied the impact of four different nitrogen sources on ammonia volatilization loss and yields based on application time and delays in flooding rice in 2002 and 2003. The four sources of nitrogen were urea, Agrotain urea, ammonium sulfate, and urea/ammonium sulfate blend. Each was applied to a test plot pre-flood and measurements of ammonia volatilization were taken 2, 5, 10, 15, and 20 days after the application. The 15 and 20 days represent 5 and 10 days after the rice was flooded. The results found that 5 days after application, 20 percent of the urea had volatilized as ammonia in 2002, and 15 percent in 2003. With ammonium sulfate, in 2002, only 5 percent was lost to ammonia volatilization, and in 2003, only 3 percent was lost to ammonia volatilization. With Agrotain urea, in 2002, only 2 percent was lost to volatilization, and in 2003, only 1 percent. With the ammonium sulfate/urea blend, in 2002, 13 percent was lost by ammonium volatilization, and in 2003, 10 percent was lost. By

ten days the losses had leveled off for all applications. Urea losses were 25 percent in 2002 and 17 percent in 2003, ammonium sulfate losses 5 percent in 2002 and 3 percent in 2003, Agrotain urea losses of 10 percent in 2002 and 4 percent in 2003, and the urea/ammonium sulfate blend losses of 15 percent in 2002 and 11 percent in 2003. At 10 days after application, the rice was flooded and all ammonium volatilization stopped. Rice yields declined the longer the time frame was from application to flooding when using urea. The urea/ammonium sulfate blend produced the next lowest yields when flooding was delayed by 10 days after application, but had yields similar to Agrotain urea and ammonium sulfate when flooding occurred from 1 to 5 days after application. The use of Agrotain urea or ammonium sulfate produced the highest yields in both years when flooding was delayed from 5 to 10 days after application.

Golden, et al. (2009) studied the impacts on rice yield and nitrogen uptake of rice with the use of polymer-coated urea (PCU) fertilizers in a delayed-flood, direct-seeded production system. If PCU works similar to traditional sources of nitrogen, such as urea and ammonium sulfate, rice farmers would be able to use cheaper ground application systems and forego more expensive aerial applications used to currently apply nitrogen post-flood. The study used two types of PCU, one designed for the turf industry, known as D5, and the other for corn production, known as Environmentally Smart Nitrogen (ESN). Twenty days after application, D5 lost 41 percent of its nitrogen content and ESN had lost 62 percent of its nitrogen content. Nitrogen lost during this 20 day time period would be lost to de-nitrification before the rice is flooded. The PCU fertilizers tests indicate PCUs are not viable alternatives in direct-seeded, delayed-flood rice, but the article does point out it may have uses as a pre-plant nitrogen source for water-seeded rice.

Proper applications of urea or other nitrogen sources could have potential impacts on a participating YBP's profitability. A YBP considering adopting either of these nitrogen sources would face low barriers of entry, just a dealer in their area that supplies these sources of urea. A FCB could see more operating capital lending from the higher cost urea sources. A FCB would see little for additional lending opportunities for new equipment or improvements to farmland with the adoption of differing urea sources.

c. Arkansas Crop Production Handbooks

The University of Arkansas Cooperative Extension Service has produced crop production handbooks for producing wheat, corn, rice, grain sorghum, and soybeans in Arkansas. Each production handbook provides proven agronomic and economic management practices for growing that specific crop. Common management decisions included across the five handbooks are use of the *Checkbook User's Guide* or the *Irrigation Scheduling* computer program to efficiently schedule irrigation, proper planting dates depending on the area of Arkansas in which the producer lives, proper seeding and spacing rates for planting, and seed selection for insect resistance among others. Each handbook suggests practices that only relate to that crop, such as with rice using the DD50 rice management program to time nitrogen deliveries, pest management, and other production decisions.

No published literature was found to show the economic benefits or losses from adopting certain management practices found in each handbook. Because no studies have been conducted testing the economic benefits of each practice suggested, many of the practices suggested by the handbooks were not included in this pilot program. Discussions with Dr. Richard Norman of the University of Arkansas's Department of Crop, Soil, and Environmental Sciences did assure us

that the practices recommended for each handbook would not decrease producers' profitability or the practices would not have been recommended.

For the loan program, it was decided to use a limited number of common practices and gauge their results. The common handbook practices considered had to improve one of the four environmental goals of (1) water quality; (2) water quantity; (3) air quality; and (4) soil quality. The first practice considered was following the irrigation standards in each crop handbook. Using the checkbook procedures provided through Arkansas Extension can help schedule irrigation water when it is necessary and reduces the chances of overwatering or under watering. Both the *Checkbook User's Guide* and the *Irrigation Scheduling* program use maximum daily temperature data and rainfall data measured by the producer to help the producer identify the optimal irrigation time.

The other practice considered was selecting the best seed variety. Seed varieties for each of the major crops grown in Arkansas have been developed to effectively adapt to various conditions. Seed varieties can be selected to be resistant to various diseases and insects reducing the need for chemical applications and could, in some cases, improve water quality. Seed varieties can also be selected to use less water, decreasing the irrigation water necessary to grow that variety. In most cases, these varieties produce similar yields to traditional varieties. Because picking a proper seed variety has the potential to reduce input costs by reducing chemical applications and irrigation water and keep yields the same, proper seed variety was considered for inclusion in the loan program.

3. Recommended Practices Chosen for Menu

The literature review and review of the crop production handbooks gave us many potential practices to consider for inclusion in the initial program. Based on the reviewed

research and literature, ten menu practices were chosen from which qualified participants choose from the initial loan program. Environmental impact of the practices were considered in selecting the practices. From interviews with Arkansas USDA-NRCS personnel, the Conservation Practice Physical Effects (CPPE) scores developed by NRCS were used to determine the environmental impact. The CPPE is a value given for the effect each practice would have on a natural resource concern area and is used by NRCS in EQIP rankings. A CPPE is a value between -5 to +5, and this value for a practice can change depending on the natural resource concern. The natural resource concern areas were narrowed down from seventy-four areas to nineteen areas that met the environmental areas of concern in this study. CPPE values available for program practices were then found for each practice and the points totaled. The practices with the highest total CPPE score were considered for inclusion in the program (Table 8).

The ten practices which maintained or increased farm profitability, had the largest environmental impact, based on the practice's total CPPE score, and to be included in the menu of practices for the initial loan program are: (1) conservation tillage; (2) integrated pest management; (3) buffer strips; (4) use of cover crops; (5) precision land leveling; (6) underground irrigation pipe; (7) use of crop rotations; (8) tailwater recovery systems; (9) planting appropriate seed varieties; and (10) planting and irrigating according to the standards found in the Arkansas crop production handbooks for rice, wheat, corn, soybeans, and grain sorghum. As previously discussed, these practices have undergone prior study to determine the practice does not impact or actually increase farm profits. These ten practices also work to achieve the societal and environmental goals of (1) water quality; (2) water quantity; (3) air quality; and (4) soil quality.

4. Concessionary Interest Rates and Loan Fees

For adopting these selected practices, the qualified participant would be rewarded by the FCBs with concessionary interest rates and loan fees. By reducing loan fees and interest rates, the FCBs would be working to insure the financial stability of YBPs and create new long-term costumers for the FCBs. Creating a group of new and successful long-term borrowers would also insure in the future success of FCBs as experienced producers voluntarily leave agriculture through retirement.

This loan program would complement many of the programs already in place for YBPs by the various FCBs. Many FCBs are already doing concessionary interest rates and loan fees on operating loans being made to YBPs to help get their start in agriculture. For example, Western already provides qualifying YBPs with a concessionary interest rate by twenty-five basis points and would pay the fee on any FSA loan guarantee that might be required. Our proposed loan program would perfectly complement what Western or any other FCB is already doing. In many cases, the FCBs could use their already established concessionary interest rate operating loan programs for YBPs and simply add a requirement of adopting practices from the menu of practices.

Implementing this loan program would also give the FCBs another flexible program to help meet their YBP mandates from the Farm Credit Administration (FCA). Discussions with various officials from the FCBs make it clear that the FCBs can 'pigeonhole' many borrowers into the FCA's YBP mandates, but this program would be geared towards YBPs and help meet the mandates without 'pigeonholing.' This loan program could be used to draw in a new pool of YBPs who currently may not be borrowing from the FCBs but are looking for a new lender that can help this new pool of YBPs become more financially competitive through the loan program.

By potentially bringing in new YBP borrowers and creating successful producers, the FCBs would be expanding their customer base and potentially creating new long-term borrowers.

Table 8: Model Conservation Practice Physical Effects Ranking System for Arkansas. Source the Arkansas USDA-NRCS

Natural Resource Concern	Conservation Crop Rotation	Residue Management, Seasonal
Aquifer Overdraft - Water Quantity	1	1
Inefficient Water Use on Non-irrigated Land - Water Quantity	2	1
Reduced Storage of Water Bodies by Sediment - Water Quantity		2
Excessive Nutrients & Organics in Groundwater - Water Quality	2	-1
Execessive Nutrients & Organics in Surface Waters - Water Quality	2	1
Excessive Suspended Sediment & Turbidity in Surface Water - Water Quality	2	1
Harmful Levels of Pesticidies in Groundwater - Water Quality	2	-1
Harmful Levels of Pesticidies in Surface Waters - Water Quality	2	
Soil Erosion: Irrigation - Induced - Soil Erosion	3	2
Soil Erosion: Sheet & Rill - Soil Erosion	4	2
Compaction - Soil Condition	2	
Contaminants - Residual Pesticide - Soil Condition	3	
Contaminants - Salts and Other Chemicals - Soil Condition	2	1
Organic Matter Depletion - Soil Condition	4	1
Contaminants: Commercial Fert. - N - Soil Condition	4	
Productivity, Health, & Vigor - Plant Condition	4	2
Habitat Fragmnetation - Fish & Wildlife	2	
Chemical Drift - Air Quality	2	
Particulate Matter Less than PM 10 - Air Quality	2	2
Total Points	45	14

Table 8 Continued

Natural Resource Concern	Filter Strip	Irrigation Land Leveling
Aquifer Overdraft - Water Quantity		1
Inefficient Water Use on Non-irrigated Land - Water Quantity		5
Reduced Storage of Water Bodies by Sediment - Water Quantity	5	1
Excessive Nutrients & Organics in Groundwater - Water Quality	3	2
Execessive Nutrients & Organics in Surface Waters - Water Quality	5	2
Excessive Suspended Sediment & Turbidity in Surface Water - Water Quality	5	1
Harmful Levels of Pesticidies in Groundwater - Water Quality	1	2
Harmful Levels of Pesticidies in Surface Waters - Water Quality	3	2
Soil Erosion: Irrigation - Induced - Soil Erosion	1	3
Soil Erosion: Sheet & Rill - Soil Erosion	1	1
Compaction - Soil Condition	5	-1
Contaminants - Residual Pesticide - Soil Condition	2	
Contaminants - Salts and Other Chemicals - Soil Condition	1	-1
Organic Matter Depletion - Soil Condition	5	-1
Contaminants: Commercial Fert. - N - Soil Condition	2	
Productivity, Health, & Vigor - Plant Condition	5	2
Habitat Fragmnetation - Fish & Wildlife	1	
Chemical Drift - Air Quality		
Particulate Matter Less than PM 10 - Air Quality	1	
Total Points	46	19

Table 8 Continued

Natural Resource Concern	Irrigation System, Sprinkler
Aquifer Overdraft - Water Quantity	
Inefficient Water Use on Non-irrigated Land - Water Quantity	5
Reduced Storage of Water Bodies by Sediment - Water Quantity	3
Excessive Nutrients & Organics in Groundwater - Water Quality	1
Execessive Nutrients & Organics in Surface Waters - Water Quality	2
Excessive Suspended Sediment & Turbidity in Surface Water - Water Quality	
Harmful Levels of Pesticidies in Groundwater - Water Quality	2
Harmful Levels of Pesticidies in Surface Waters - Water Quality	2
Soil Erosion: Irrigation - Induced - Soil Erosion	3
Soil Erosion: Sheet & Rill - Soil Erosion	
Compaction - Soil Condition	-1
Contaminants - Residual Pesticide - Soil Condition	
Contaminants - Salts and Other Chemicals - Soil Condition	
Organic Matter Depletion - Soil Condition	1
Contaminants: Commercial Fert. - N - Soil Condition	
Productivity, Health, & Vigor - Plant Condition	3
Habitat Fragmnetation - Fish & Wildlife	
Chemical Drift - Air Quality	
Particulate Matter Less than PM 10 - Air Quality	2
Total Points	23

Table 8 Continued

Natural Resource Concern	Irrigation System, Surface and Subsurface	Nutrient Management
Aquifer Overdraft - Water Quantity	1	
Inefficient Water Use on Non-irrigated Land - Water Quantity	3	
Reduced Storage of Water Bodies by Sediment - Water Quantity	1	
Excessive Nutrients & Organics in Groundwater - Water Quality	1	5
Execessive Nutrients & Organics in Surface Waters - Water Quality	1	5
Excessive Suspended Sediment & Turbidity in Surface Water - Water Quality		
Harmful Levels of Pesticidies in Groundwater - Water Quality	1	
Harmful Levels of Pesticidies in Surface Waters - Water Quality	1	
Soil Erosion: Irrigation - Induced - Soil Erosion	-1	-1
Soil Erosion: Sheet & Rill - Soil Erosion		
Compaction - Soil Condition	-1	-2
Contaminants - Residual Pesticide - Soil Condition	2	
Contaminants - Salts and Other Chemicals - Soil Condition		2
Organic Matter Depletion - Soil Condition		2
Contaminants: Commercial Fert. - N - Soil Condition		2
Productivity, Health, & Vigor - Plant Condition	3	3
Habitat Fragmnetation - Fish & Wildlife		
Chemical Drift - Air Quality		
Particulate Matter Less than PM 10 - Air Quality	2	2
Total Points	14	18

Table 8 Continued

Natural Resource Concern	Irrigation System, Tailwater Recovery	Pest Management
Aquifer Overdraft - Water Quantity	3	
Inefficient Water Use on Non-irrigated Land - Water Quantity	5	1
Reduced Storage of Water Bodies by Sediment - Water Quantity	3	1
Excessive Nutrients & Organics in Groundwater - Water Quality		
Execessive Nutrients & Organics in Surface Waters - Water Quality	2	
Excessive Suspended Sediment & Turbidity in Surface Water - Water Quality	2	2
Harmful Levels of Pesticidies in Groundwater - Water Quality	2	5
Harmful Levels of Pesticidies in Surface Waters - Water Quality	2	5
Soil Erosion: Irrigation - Induced - Soil Erosion		3
Soil Erosion: Sheet & Rill - Soil Erosion		3
Compaction - Soil Condition		2
Contaminants - Residual Pesticide - Soil Condition		3
Contaminants - Salts and Other Chemicals - Soil Condition		
Organic Matter Depletion - Soil Condition		2
Contaminants: Commercial Fert. - N - Soil Condition		
Productivity, Health, & Vigor - Plant Condition	3	5
Habitat Fragmnetation - Fish & Wildlife		
Chemical Drift - Air Quality		5
Particulate Matter Less than PM 10 - Air Quality		2
Total Points	22	39

Table 8 Continued

Natural Resource Concern	Irrigation Water Conveyance, High Pressure Underground	Irrigation Water Management
Aquifer Overdraft - Water Quantity		4
Inefficient Water Use on Non-irrigated Land - Water Quantity	4	5
Reduced Storage of Water Bodies by Sediment - Water Quantity	1	3
Excessive Nutrients & Organics in Groundwater - Water Quality		3
Execessive Nutrients & Organics in Surface Waters - Water Quality	1	3
Excessive Suspended Sediment & Turbidity in Surface Water - Water Quality	1	3
Harmful Levels of Pesticidies in Groundwater - Water Quality		3
Harmful Levels of Pesticidies in Surface Waters - Water Quality		3
Soil Erosion: Irrigation - Induced - Soil Erosion	2	3
Soil Erosion: Sheet & Rill - Soil Erosion		
Compaction - Soil Condition		
Contaminants - Residual Pesticide - Soil Condition		
Contaminants - Salts and Other Chemicals - Soil Condition		
Organic Matter Depletion - Soil Condition		1
Contaminants: Commercial Fert. - N - Soil Condition		
Productivity, Health, & Vigor - Plant Condition	3	3
Habitat Fragmnetation - Fish & Wildlife		
Chemical Drift - Air Quality		
Particulate Matter Less than PM 10 - Air Quality		3
Total Points	12	37

Table 8 Continued

Natural Resource Concern	Irrigation Water Conveyance, Low Pressure Underground	Cover Crop	Field Border
Aquifer Overdraft - Water Quantity		1	
Inefficient Water Use on Non-irrigated Land - Water Quantity	4	2	1
Reduced Storage of Water Bodies by Sediment - Water Quantity	1	2	2
Excessive Nutrients & Organics in Groundwater - Water Quality		2	2
Execessive Nutrients & Organics in Surface Waters - Water Quality	1	3	3
Excessive Suspended Sediment & Turbidity in Surface Water - Water Quality	1	3	3
Harmful Levels of Pesticidies in Groundwater - Water Quality	1	2	2
Harmful Levels of Pesticidies in Surface Waters - Water Quality		3	3
Soil Erosion: Irrigation - Induced - Soil Erosion	2		
Soil Erosion: Sheet & Rill - Soil Erosion		5	4
Compaction - Soil Condition		3	3
Contaminants - Residual Pesticide - Soil Condition		2	2
Contaminants - Salts and Other Chemicals - Soil Condition		1	1
Organic Matter Depletion - Soil Condition		3	4
Contaminants: Commercial Fert. - N - Soil Condition		2	2
Productivity, Health, & Vigor - Plant Condition	3	2	5
Habitat Fragmnetation - Fish & Wildlife			2
Chemical Drift - Air Quality			
Particulate Matter Less than PM 10 - Air Quality		3	1
Total Points	13	39	40

Implementing this loan program would also give the FCBs another flexible program to help meet their YBP mandates from the Farm Credit Administration (FCA). Discussions with various officials from the FCBs make it clear that the FCBs can 'pigeonhole' many borrowers into the FCA's YBP mandates, but this program would be geared towards YBPs and help meet the mandates without 'pigeonholing.' This loan program could be used to draw in a new pool of YBPs who currently may not be borrowing from the FCBs but are looking for a new lender that can help this new pool of YBPs become more financially competitive through the loan program. By potentially bringing in new YBP borrowers and creating successful producers, the FCBs would be expanding their customer base and potentially creating new long-term borrowers.

One issue in having YBPs adopt practices as a part of receiving their operating loan is monitoring and policing to make sure the practices are being adopted. Because the majority of the practices included in the loan program qualify for funding under NRCS conservation programs, each FCB could work with the local NRCS personnel in their area to help monitor to ensure the practices are being properly implemented. Working with NRCS to monitor the practice implementation could reduce costs for FCBs by using existing experts to monitor the YBPs implementation.

D. Program Implementation

Researchers at the University of Arkansas would work with representatives from Farm Credit Services of Western Arkansas, AgHeritage, and Delta Farm Credit to initially implement the loan program as a three-year study. The three-year study would allow researchers to assess the loan program as it operates and the loan program's impact on the participating YBPs. Working with the FCBs to implement the loan program would give the researchers the necessary

data to determine success or failure of the loan program and obtain feedback from the participating YBPs and FCBs to make necessary changes to improve effectiveness of the loan program in improving the profitability and retaining YBPs in agriculture. The goal is to use the three-year study period as a time to fully develop a more effective program that truly benefits YBPs and helps them succeed.

To implement the loan program as a three-year study, researchers would allow the three FCBs to randomly select forty YBPs for possible inclusion in the program. YBPs that would be included are those YBPs currently making their payments but falling short of breaking even would potentially be eligible for the initial sample group. The researches would then randomly select twenty of the forty YBPs for inclusion in the initial sample group. These twenty randomly selected YBPs would then be given concessionary interest rates and fees in return for adopting practices from the menu. The goal is to make this group of twenty YBPs into more profitable producers by the end of the three-year study. The remaining twenty YBPs would be placed in a control group that would not participate in the loan program to allow researchers to compare the results from two groups.

The FCBs would be allowed to pick the forty YBPs because the FCBs are in a much better position to know which of their current YBP borrowers are falling short of making a profit. In many cases for their respective YBP lending programs, the FCB may require YBPs to annually present their financial statements to the FCB and be able to judge each YBP's profitability from those financial statements. The FCBs would also be in a better position to determine which YBPs meeting the profitability criteria will be serious about participating in the loan program for three years. To truly judge the effectiveness of the loan program, we would want to include only those YBPs serious about implementing the menu of practices.

After the initial three-year study, the researchers and the three FCBs would be able to determine which portions of the loan program were successful in transforming the sample group into successful producers. Portions that did not work successfully could be modified to make the program operate more effectively. The initial study would allow both the researchers and the three FCBs to work together and make changes necessary for the loan program to continue and be a successful program for YBPs in each of the three FCBs service areas for many years into the future.

After the initial pilot is completed, and if the loan program is determined to be a success, each FCBs could consider including more YBPs. To select YBPs beyond those in the initial pilot, the FCBs could use a variety of criteria to select willing YBP participants. YBPs could be included based on criteria similar to the initial sample group or the FCBs could accept all creditworthy YBPs borrowers into this program.

The FCBs could also select for the program based on environmental impact from implementation of the menu of practices. This would present some challenges for a FCB that decided to use environmental impact as criteria; a FCB's expertise would be in financial analysis and not in environmental analysis. One approach that could aid a FCB taking this approach is through use of the CPPE scores. To use the CPPE values, a FCB could simply determine those natural resource concerns for their region and those practices that would have the largest impact on those natural resource concerns. The FCB could then add up those CPPE values for each practice under the selected natural resource concern to get the points that would be awarded for the adoption of each practice.

If the loan program proves successful in increasing YBP profitability and retention in agriculture, the next goal would be to seek national adoption of the loan program by either

individual FCBs in other states or through the FCA. The researchers would present the results from the three-year pilot at various agricultural economic professional meetings, to the FCA, and to FCBs in other states. Success of the loan program and how a similar loan program could be modified for each state or FCB lending region could be presented. To implement the loan program in another state, each FCB would need to consider including practices for crops grown in that state, practices shown to improve their selected areas of concern, and practices shown to maintain or increase profitability of the operation.

E. Summary and Conclusion

Agricultural producers, both nationwide and in Arkansas, are getting older with the average age of U.S. producers increasing in each Census since 1982 and the average age of Arkansas producers increasing in each Census since 1978, due in part to the growing number of producers over the age of 65 from 1974 to 2007. At the same time the number of older producers increased, U.S. and Arkansas producers under the age of 25 and between the ages of 25 to 34 both experienced large declines from 1974 to 2007.

Research has shown that one reason for the decline in YBPs is due to barriers to entry due to large initial investments and higher costs to the large yearly operating loan requirements, compared to older more established producers. The initial loan program has the potential to be successful in helping reduce lending costs and improving profitability for YBPs. This article has solely focused on the design and implementation of the loan program. Future works will focus on the impact on farm profitability from implementation of the program and on the costs of implementation to the lender. The discussed loan program, although not reducing the large initial investment required to enter agriculture, would focus on reducing some of the costs for

yearly capital requirements through concessionary interest rates and loan fees for adoption of selected best management practices.

Producers in the loan program would be rewarded through concessionary interest rates and/or fees for adopting selected best management practices that focused on improving one of three areas of societal concern: (1) water quality; (2) water quantity; (3) air quality; and (4) soil quality. The best management practices selected for inclusion in the program must demonstrate that the practice maintains or increases farm profitability. Based up on a review of the literature and interviews with subject matter experts, ten practices were selected that met the above criteria: (1) conservation tillage; (2) integrated pest management; (3) buffer strips; (4) use of cover crops; (5) precision land leveling; (6) underground irrigation pipe; (7) use of crop rotations; (8) tailwater recovery systems; (9) planting appropriate seed varieties; and (10) planting and irrigating according to the standards found in the Arkansas crop production handbooks for rice, wheat, corn, soybeans, and grain sorghum.

YBPs implementing a mix of these 10 practices would receive concessionary interest rates and loan fees from their FCB. The concessionary interest rate and loan fees would be similar in nature to those currently being offered to YBPs through current lender programs. The main difference from current YBP programs offered by the FCBs would be the requirement of adopting practices to help increase YBPs' profitability. The reduction in interest rates and loan fees along with practices to increase profitability would work to increase a YBP participants profitability and work as an incentive to retain them in production agriculture.

The loan program would first be run as an initial three-year study with the three FCBs located in Arkansas. The FCBs would select twenty potential participants who are making their loan payments but currently not making a profit in their operation. The goal of the pilot is to turn

this initial sample group into profitable producers. Monitoring of practices implementation would be done by NRCS, as many of the practices are approved for EQIP or other conservation programs. Finally, at the end of the three-year study, the loan program would be reviewed and adjusted for potential adoption by other state's FCBs to implement with their YBPs lending program.

III. Investing in an Agricultural Legacy: Impact of a Targeted Young and Beginning Farmer Loan Program in Arkansas

A. Introduction

As discussed in the previous article, *Envesting in an Agricultural Legacy: Design and Implementation of a Targeted Young and Beginning Farmer Loan Program in Arkansas* (2011), both the United States and Arkansas are experiencing aging of agricultural producers. The average age of U.S. agricultural producers has increased from 51.7 in 1974 to 57.1 in 2007 (Census of Agriculture). In Arkansas, the average age of an agricultural producer has increased from 51.6 in 1974 to 56.5 in 2007 (Census of Agriculture). One reason for this aging of agriculture, in both the U.S. and Arkansas, is the declining number of producers under age 35 entering agriculture and the increasing number of producers over age 55 entering agriculture since the 1974 Census of Agriculture (Table 9 – Table 10).

Barriers to entry that exist in agriculture are one reason for this decline in young and beginning producers (YBPs). Mishra, Wilson, and Williams (2009) point out that YBPs face large initial investments and large amounts of capital each year to begin and maintain an operation. Because of these barriers to entry, YBPs are unable to attain the economies of size that older farmers experience. YBPs also face higher cost structures than older farmers. YBPs are looking for ways to reduce costs, increase profits, and reduce farming time to find ways to survive. Mishra, et al. (2009) indicate that by 2014, 50 percent of current farmers are likely to retire. As Census data reveal, there is a declining number of YBPs to replace them.

Table 9: Percentage per Age Group For Agricultural Producers in the U.S., Source: Ag Census 1974 – 2007

Age Group	1974	1978	1982	1987	1992	1997	2002	2007
Under 25	2.3%	2.9%	2.8%	1.7%	1.4%	1.1%	0.8%	0.5%
25 to 34	10.7%	12.5%	13.1%	11.6%	9.3%	6.7%	5.0%	4.8%
35 to 54	43.7%	42.7%	42.3%	41.5%	42.1%	43.8%	44.1%	37.8%
55 to 64	24.6%	25.7%	23.9%	23.7%	22.3%	22.4%	23.9%	27.0%
Over 65	18.7%	16.2%	17.8%	21.4%	24.8%	26.0%	26.2%	29.7%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 10: Percentage per Age Group For Agricultural Producers in Arkansas, Source: Ag Census 1974 - 2007

Age Group	1974	1978	1982	1987	1992	1997	2002	2007
Under 25	1.6%	1.8%	1.9%	1.5%	1.3%	1.1%	0.8%	0.4%
25 to 34	10.6%	12.6%	11.5%	10.4%	8.9%	7.4%	5.5%	5.5%
35 to 54	44.0%	46.0%	45.1%	44.8%	44.0%	44.7%	43.3%	37.8%
55 to 64	26.3%	23.5%	24.0%	23.5%	22.9%	24.2%	25.5%	27.4%
Over 65	17.6%	16.0%	17.5%	19.9%	22.9%	22.6%	24.9%	28.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

This manuscript will focus on the potential effectiveness of an innovative pilot operating loan program (hereinafter "loan program") to be administrated by the three Farm Credit associations (FCBs) in Arkansas to increase the number of YBPs successfully operating in agriculture. The focus of the loan program will be on YBPs who choose to adopt practices designed to address societal environmental goals, while simultaneously maintaining or increasing farm profits. It is proposed that YBPs will receive concessionary interest rates and/or fees from the FCBs. YBPs can select from a menu of production and management practices designed to result in improvements in (1) air quality, (2) water quality and quantity, or (3) soil fertility. The practices must also be demonstrated to maintain or improve farm profitability to be considered for inclusion in the loan program. Participating FCBs will reward YBPs adopting these good stewardship practices with concessionary loan rates and/or fees and terms to enhance their probability for future success, increase returns, and establish them as the next generation of farmers and ranchers and as stable and reliable future lending customers.

Design and implementation of the proposed loan program was outlined in *Envesting in an Agricultural Legacy: Design and Implementation of a Targeted Young and Beginning Farmer Loan Program in Arkansas* (2012). Ten practices were selected for inclusion in the loan program that met the above stated criteria: (1) conservation tillage; (2) integrated pest management; (3) buffer strips; (4) use of cover crops; (5) precision land leveling; (6) underground irrigation pipe; (7) use of crop rotations; (8) tailwater recovery systems; (9) planting appropriate seed varieties; and (10) planting and irrigating according to the standards found in the Arkansas crop production handbooks for corn, rice, soybeans, and wheat. Each one of these practices improves areas of environmental concern while at the same time maintaining or improving farm profitability.

Our goal is to launch the loan program as a three-year study with an initial subsample group of twenty YBP producers in Arkansas that are currently making their payments but falling short of breaking even in their operations. The three FCBs will provide researchers with a sample group of at least forty current YBP borrowers meeting the criteria. The researchers will randomly select twenty participants for the subsample that will participate in the loan program and randomly select twenty participants for a control group not participating in the loan program. Researchers would monitor the progress of the initial sample group over the three-year period and compare them to the control group comprised of YBPs not selected to participate in the program.

This article will focus on the impact of the loan program on profitability of a hypothetical participating YBP. Organization of this manuscript will be: a review of the baseline budget development showing assumed YBP profitability before participation in the loan program; a discussion of the development of crop budgets for the practices implemented by a hypothetical, participating YBP and a discussion of governmental programs available to help reduce some of the costs of selected practice implementation.

B. Discussion

1. Development of Baseline Budgets

Before examining the potential impact the loan program could have on participating YBPs' profitability, we first need to determine the baseline profit levels for each of the five main crops: 1) corn, 2) cotton, 3) rice, 4) soybeans, and 5) wheat. To determine the baseline profit, we looked at the *2011 Crop Enterprise Budgets for Arkansas Field Crops Planted in 2011* (hereinafter "extension budgets") developed and updated annually by University of Arkansas's Cooperative Extension Service. These extension budgets were developed to show net profits of

traditional production practices used in Arkansas for the five crops considered for the loan program. Many of these extension budgets are minimal tillage budgets that have not included the practices from the loan program's menu. Using the extension budgets will give us a clear picture of a participating YBP's costs, revenues, and profit per acre prior to enrolling into the loan program.

Various rice seed varieties were considered in our budgets. Hybrid rice seed varieties are higher yielding rice seed varieties developed from crossbreeding of rice varieties. Clearfield rice seed varieties are varieties that have tolerance to Newpath and Clearpath herbicides used to control red rice. Clearfield hybrid rice seed varieties are those varieties that have the high yielding tendencies of a hybrid rice and tolerance to Newpath or Clearpath herbicides for the control of red rice. Conventional rice seed varieties are those varieties not crossbred for higher yields or not developed to be resistant to Newpath or Clearpath herbicides.

Water-seeding rice was not considered in the budgets. Water-seeding rice is a method where a conventional, hybrid, Clearfield, or Clearfield hybrid rice seed is sown by a plane into standing water. The problem with this method is that it requires a near zero grade field to ensure that rice seeds do not float to one end of the field. The other problem is that water-seeded rice does not have good seed-to-soil contact, due to the seed being sown into standing water on a field (Saichuk, 2012). Because of those problems and only two percent of rice in Arkansas being water-seeded, budgets for water-seeding rice were not included.

A baseline budget for each of the five crops considered for the loan program was then developed for the three following scenarios: 1) YBP owning farmland[2]; 2) YBP cash renting farmland; and 3) YBP crop-share renting farmland. The rental rate per acre for irrigated cropland was taken from looking at the National Ag Statistic Service's website and selecting a county for each of the five crops with a history of producing that crop. Although a wide-variety of crop-share rental arrangements can be used in Arkansas, based on conversations with Dr. Bobby Coats, an Extension Economist with the University of Arkansas, we decided to use a 75-25 crop share arrangement. Under this crop share arrangement a YBP would pay 75 percent of the grain drying expenses and would receive 75 percent of the crop produced. For corn, soybeans, rice, and wheat, the landlord pays the other 25 percent of the drying expenses and receives 25 percent of the crop produced. For cotton, the landlord would pay 25 percent of the chemical costs and receive 25 percent of the crop in return for the use of the farmland by a YBP.

The amount of each 6-month operating loan necessary for each crop was calculated based on conversations with Drs. Archie Flanders and Brad Watkins, University of Arkansas. In calculating the size of the operating loan, all items listed in the budget above the "Interest and Loan Fee" item were included in the operating loan size calculation. The only exception to this in the budget is for a YBP cash renting farmland; all items listed above "Cash Rent" are considered in calculating the operating loan size.

Interest rate and loan fees used for the operating loan were based on conversations with Nathan Wagner of AgHeritage Farm Credit of Central Arkansas. The interest rate used for baseline budgets is 5.45 percent APR with a loan fee of $250 for 2011. Interest rate and loan

[2] Here we define "owning farmland" to mean situations where a YBP would hold legal title to the farmland where the crop is grown or uses the land in such a way that it does not cost him rent.

fees could be higher or lower based on the borrower's credit history, available collateral, loan size, how competitive the local interest rate market is, and the bank's cost of funds.

Nutrient levels for each crop were also modified in the extension budgets to aid our analysis. Many of the nutrient levels in the extension budgets are based on traditional crop rotations used in Arkansas, such as a soybean-wheat-rice rotation. In our baseline budgets, all nutrient levels were modified according to the crop production handbooks for simple crop non-rotation production nutrient levels. For example, 30 pounds per acre of both phosphate and potash are recommended when wheat is grown by itself. When wheat is grown in rotation with soybeans, 40 pounds per acre of phosphate and 80 pounds per acre of potash are recommended. The additional phosphate and potash can be stored in the soil as excess and reduces producer costs associated with additional nutrient application on subsequent crops. These modifications were made to give a better idea of cost impacts of including practices such as crop rotations or cover crops. The other aspects of our baseline budgets were left untouched from the original extension budgets.

The final aspect we changed was market price. For our initial set of baseline budgets we left the market price for corn, cotton, rice, soybeans, and wheat as the estimate originally made in the extension budgets. We created a second set of baseline budgets for each of the five crops for each of three scenarios using a FWMAP. To get the FWMAP, we used the yearly average market price compiled by NASS from 2000 to 2011 (Table 14). These yearly average market prices were then used to compute a FWMAP for each of the five crops (Table 15). The first FWMAP computed was used in our second set of baseline budgets to determine the impact of the loan program when market prices change.

2. Selection of Practices for Review

As the literature review of practices from the previous article demonstrates, practices included in the loan program have a positive impact on farm income, in many cases it was not clear what specific impacts on production costs or yield were needed to appropriately alter our baseline budgets feasibility to show the true impact of adopting the practice and participating in the loan program (Goeringer, 2012). For that reason, we limited our analysis to those practices where literature showed specific impacts on production costs and yields that we could use to adjust our baseline budgets. This adjustment would allow us to see the impact on a YBP's income from adopting the practice compared to the baseline. We focus on two practices: (1) no-till and (2) crop rotations. Focusing on these two practices provides an example of the impacts implementing this loan program can have on YBP's profitability and provides possible incentive to retain these YBPs in agriculture in the future.

Adopting no-till may not be possible in all areas of Arkansas because the soil may be too clayey. Producers in areas where no-till is not feasible still have the option of other practices from the menu. The following analysis is to show the potential impact of the loan program on a model participating YBP adopting a practice from the menu of practices. Future research will assess the impact of the remaining eight practices impacts on a participating YBP's profitability.

3. Development of No-till and Crop Rotation Budgets

No-till was chosen for comparisons with the baseline budgets because the production costs of no-till versus conventional tillage have been well documented in Arkansas and neighboring states. The University of Arkansas's yearly *Enterprise Budgets* at one time included no-till budgets for cotton, rice, and soybeans with the conventional budgets; recent editions have not included no-till budgets. Mississippi State University, University of Missouri, and

Oklahoma State University provide some budgets for no-till production of certain crops. Based on the wealth of data on production cost impacts with no-till, we assumed a YBP would be more likely to consider the adoption of no-till through the loan program.

Baseline budgets were converted to no-till budgets by first comparing baseline budgets to previous no-till budgets developed by the University of Arkansas to remove unnecessary operations and include necessary operations for no-till production. We also compared these no-till budgets to current no-till budgets developed by Mississippi State University's Department of Agricultural Economics (MSU) (Mississippi State University No-Till Budgets). In comparing the baseline budgets to the no-till budgets, all tillage operations not called for in a true no-till operation for each crop were removed. Changes in chemical and nutrient applications were made based on those seen in the MSU No-Till Budgets.

No-till rice yields were kept the same as conventional rice yields in the no-till rice budgets. Research in Arkansas and Louisiana has indicated that no-till rice yields are not significantly different from conventional yields (Watkins, et al. 2006). Based on this the decision was made to keep no-till rice yields the same as conventional rice yields. Long-term no-till studies in Arkansas have found no-till soybean yields to be slightly better than conventionally tilled soybeans (Watkins, et al., 2011). The same long-term studies have shown no-till wheat yields to fluctuate two to ten bushels per acre, depending on rotation used, with no discussion of the statistical significance of this variation (Hignight et al., 2010). No-till yields for soybeans and wheat were held constant based on these studies. Based on the Miss. State No-Till Budgets for no-till cotton and no-till corn, yields for no-till cotton and corn were held constant to their respective conventional yields.

In Arkansas, the crop rotations examined were: 1) rice-wheat-soybean(RWSB); 2) soybean-rice (SBR); 3) soybean-wheat (SBW); and 4) corn-cotton (CC). When the rotation includes wheat, the wheat crop is traditionally double-cropped with the proceeding rice or soybean crop. Modification of the baseline budgets to include the impact of adopting the crop rotations was based on information found in the *Crop Production Handbooks*. A set of budgets was then created to show the impact of no-till and crop rotation adoption combined.

The interest rate from our baseline budgets was then lowered to the interest rate based on participation in the loan program. In the baseline budgets, a 5.45 percent interest rate had been used. For participating in the loan program, the participant received a twenty-five basis point reduction in interest rate to 5.20 percent. The twenty-five basis point interest rate reduction was chosen because many Farm Credit Banks (FCBs), such as Farm Credit Services of Western Arkansas (Western), already have YBP programs in place that give an interest rate concession of twenty-five basis points to YBPs and show the impact of the loan program on a participating YBP's profitability.

For each practice analyzed, we created a budget for each of the three scenarios discussed with our baseline budgets: 1) YBP owning farmland; 2) YBP cash renting farmland; and 3) YBP crop-share renting farmland. Finally, a second set of no-till and crop rotation budgets were then created and modified using the same five-year weighted moving average for market price as used in the second set of baseline budgets. This was repeated to determine the impact of the loan program when market prices fluctuate.

4. Program Impact

a. Impact of Adopting No-Till

To analyze the impact of participating in the loan program and adopting no-till, we analyzed a variety of seed varieties and irrigation methods currently utilized in Arkansas. Table 11 shows each of the crops, irrigation methods, and seed varieties options investigated in our no-till adoption with loan program participation analysis. For example, with corn we examined no-till adoption with furrow and center-pivot irrigation. Adoption of no-till, with center-pivot irrigation, and loan program participation had the best results.

The adoption of no-till and participation in the loan program increases profits per acre and decreases production and interest costs for corn, cotton, rice, soybeans, and wheat, regardless of irrigation method or seed used (Table 12 and Table 13). With farmland rented, either under a crop-share arrangement or cash rent, the adoption of no-till and participation in the loan program increases profits per acre and decreases production or interest costs for the majority of the crops analyzed (Table 12 and Table 13).

With a few exceptions, changes from the baseline budgets to a budget showing adoption of no-till and participating in the loan program are consistent regardless of whether land is owned by the YBP or rented under a cash lease or a crop share lease (Table 12 and Table 13). Profits per acre are smaller and production costs per acre increase with farmland rented on a cash basis compared to owning the farmland. This is because operating expenses include additional rent expenses (Table 12). With a crop-share lease, profits, revenues, and operating expenses per acre decrease compared to an owned farmland situation because the landlord is taking a percentage of the revenue and paying a percentage of certain production expenses (Table 13).

With farmland owned by a YBP or cash renting, participating in the loan program and adopting no-till could potentially increase profits per acre from 4.72 percent to 26.64 percent depending on the crop grown, the irrigation method used, and seed variety used (Table 12). If a YBP is growing soybeans, using flood irrigation, adopts no-till, and participating in the loan program, they could experience a profit per acre increase of $16.30 or a 4.72 percent increase, operating expenses would decrease by $7.38, ownership costs would decrease by 8.40 (Table 12). A YBP could see greater increases to profits per acre with loan program participation, adopting no-till and using a conventional rice seed variety. With a conventional rice seed variety, a YBP could see profit increases of $70.52 per acre, a decrease of operating expenses by $27.43 per acre, and interest costs by $1.31 per acre (Table 12).

If a YBP is using a crop-share leasing arrangement, no-till would increase profits per acre for all but center-pivot irrigated cotton. A YBP adopting no-till, participating in the loan program, and growing cotton using center-pivot irrigation would actually experience a decrease in their profits per acre by $2.24, operating expenses increase by $11.72 per acre, but interest costs would decrease by $0.27 per acre (Table 13). This is easily explained because adopting no-till requires increased chemical usage and this increase is not offset enough by the fuel and labor savings to create a savings in operating expenses and a rise in net revenue.

With the other cropping and irrigation options, a YBP crop-sharing renting farmland, adopting no-till, and participating in the loan program could see profit increases from 1.68 percent to 360.14 percent per acre (Table 13). Considering furrow irrigated corn in Table 13, a YBP would only increase net revenue by $2.15 per acre from participating in the loan program and experience a $9.01 per acre decrease in operating expenses. A YBP producing center-pivot irrigated corn, adopting no-till and participating in the loan program could potentially see a

360.14 percent increase in their profits per acre. Center-pivot corn's profits per acre increase from $5.37 per acre prior to adoption and the loan program, but jumps up to $24.70 per acre from the operation expense savings and interest cost savings a YBP would experience from adopting no-till and participating in the loan program with crop-share rented farmland (Table 13).

When considering adopting no-till and participating in the loan program, a YBP would want to take into account equipment changes that would be necessary to effectively adopt no-till. For example, adopting no-till would require purchasing a no-till grain drill or a no-till air seeder. A conventional grain drill would not be able to handle planting a crop in no-till conditions. A twenty-foot wide no-till grain drill can cost upwards of $51,992 to purchase and no-till air seeder costs upwards of $137,500 to purchase compared to a conventional drill costing $23,957 to purchase and a conventional air seeder costing $105,000 to purchase (Epplin, 2007). A FCB and YBP would want to consider these equipment upgrades before adopting this practice to participate in the loan program.

Table 11: Overview of Crops and Irrigation Systems Reviewed in No-Till Analysis

	Corn	Cotton	Rice-Conventional	Rice-Clearfield
Rainfed				
Conventional	–	–	–	–
No-Till	–	–	–	–
Irrigation System				
Furrow:				
Conventional	✔	✔	–	–
No-Till	✔	✔	–	–
Center-Pivot:				
Conventional	✔	✔	–	–
No-Till	✔	✔	–	–
Flood:				
Conventional	–	–	✔	✔
No-Till	–	–	✖ ☒	✔

✔ = Analysis complete
☒ = Best results for that crop
✖ = Best Overall Results For All Crops
– = No Analysis

Table 11 Continued

	Rice-Hybrid	Rice-Clearfield Hybrid	Soybeans	Wheat
Rainfed				
Conventional	–	–	–	✔
No-Till	–	–	–	✔
Irrigation System				
Furrow:				
Conventional	–	–	✔	–
No-Till	–	–	✔	–
Center-Pivot:				
Conventional	–	–	✔	–
No-Till	–	–	✔	–
Flood:				
Conventional	✔	✔	✔	–
No-Till	✔	✔	✔	–

✔ = Analysis complete
☒ = Best results for that crop
✖ = Best Overall Results For All Crops
– = No Analysis

Table 12: Comparison of Conventional Practices to Loan Program Participation and No-Till Adoption for Five Major Crops in Arkansas Using 2011 Enterprise Budgets Across Ownership and Cash Rent Assuming Constant Revenues. Numbers Represent $ per Acre.

		Crop	**Corn**	**Corn**
Own or Cash Rent	Production Methods	Irrigation Type	Furrow	CP
		Seed Variety	RR	RR
		Tillage	Conv.	Conv.
	Financial Performance	Revenue	$ 910.00	$ 910.00
		Operating Expenses[a]	$ 520.40	$ 559.37
		Operating Interest	$ 12.66	$ 13.72
		Ownership Charges[b]	$ 69.87	$ 112.35
		NRAT[c]	$ 307.07	$ 224.56
		Cash Rent	$ 116.00	$ 116.00
	Change	Tillage	No-Till	No-Till
	Modified Financial Performance	Modified Operating Expenses	$ 511.82	$ 550.10
		Modified Operating Interest	$ 11.88	$ 12.87
		Modified Ownership Charges	$ 61.08	$ 103.14
		Modified Ownership Charges	$ 325.23	$ 243.89
		Changes in Interest Costs[d]	$ (0.78)	$ (0.85)
		Change in NRAT	$ 18.16	$ 19.33
		Change in Ownership Charges[e]	$ (8.79)	$ (9.21)
		% Increase/Decrease in NRAT	5.91%	8.61%

Table 12 Continued

		Crop	Cotton	Cotton
		Irrigation Type	Furrow	CP
	Production Methods	Seed Variety	RR-Flex	RR-Flex
		Tillage	Conv.	Conv.
Own or Cash Rent	Financial Performance	Revenue	$ 1,119.60	$ 1,119.60
		Operating Expenses[a]	$ 621.60	$ 652.98
		Operating Interest	$ 13.19	$ 14.05
		Ownership Charges[b]	$ 123.36	$ 156.93
		NRAT[c]	$ 361.45	$ 295.65
		Cash Rent	$ 116.00	$ 116.00
	Change	Tillage	No-Till	No-Till
	Modified Financial Performance	Modified Operating Expenses	$ 612.61	$ 644.31
		Modified Operating Interest	$ 12.37	$ 13.19
		Modified Ownership Charges	$ 112.55	$ 147.71
		Modified Ownership Charges	$ 382.07	$ 314.39
		Changes in Interest Costs[d]	$ (0.83)	$ (0.86)
		Change in NRAT	$ 20.62	$ 18.74
		Change in Ownership Charges[e]	$ (10.81)	$ (9.22)
		% Increase/Decrease in NRAT	5.70%	6.34%

Table 12 Continued

		Crop	Rice	Rice
		Irrigation Type	Flood	Flood
	Production Methods	Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
Own or Cash Rent	Financial Performance	Revenue	$ 957.10	$ 900.80
		Operating Expenses[a]	$ 574.77	$ 603.80
		Operating Interest	$ 13.53	$ 14.48
		Ownership Charges[b]	$ 104.03	$ 104.03
		NRAT[c]	$ 264.77	$ 178.48
		Cash Rent	$ 100.00	$ 100.00
	Change	Tillage	No-Till	No-Till
	Modified Financial Performance	Modified Operating Expenses	$ 547.34	$ 594.44
		Modified Operating Interest	$ 12.23	$ 13.60
		Modified Ownership Charges	$ 62.24	$ 89.27
		Modified Ownership Charges	$ 335.29	$ 203.49
		Changes in Interest Costs[d]	$ (1.31)	$ (0.88)
		Change in NRAT	$ 70.52	$ 25.00
		Change in Ownership Charges[e]	$ (41.79)	$ (14.76)
		% Increase/Decrease in NRAT	26.64%	14.01%

Table 12 Continued

		Crop	Rice	Rice
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Hybrid	Clearfield Hybrid
		Tillage	Conv.	Conv.
	Financial Performance	Revenue	$ 1,069.70	$ 1,069.70
		Operating Expenses[a]	$ 590.63	$ 639.10
		Operating Interest	$ 13.65	$ 14.97
		Ownership Charges[b]	$ 104.03	$ 104.03
		NRAT[c]	$ 361.39	$ 311.60
		Cash Rent	$ 100.00	$ 100.00
	Change	Tillage	No-Till	No-Till
	Modified Financial Performance	Modified Operating Expenses	$ 597.22	$ 636.89
		Modified Operating Interest	$ 13.22	$ 14.25
		Modified Ownership Charges	$ 82.02	$ 82.02
		Modified Ownership Charges	$ 377.24	$ 336.54
		Changes in Interest Costs[d]	$ (0.43)	$ (0.72)
		Change in NRAT	$ 15.85	$ 24.94
		Change in Ownership Charges[e]	$ (22.01)	$ (22.01)
		% Increase/Decrease in NRAT	4.39%	8.00%

Table 12 Continued

		Crop	Soybeans	Soybeans
		Irrigation Type	Furrow	CP
	Production Methods	Seed Variety	RR	RR
		Tillage	Conv.	Conv.
Own or Cash Rent	Financial Performance	Revenue	$ 687.00	$ 687.00
		Operating Expenses[a]	$ 280.13	$ 310.28
		Operating Interest	$ 7.59	$ 8.41
		Ownership Charges[b]	$ 57.80	$ 91.36
		NRAT[c]	$ 341.48	$ 276.95
		Cash Rent	$ 100.00	$ 100.00
	Change	Tillage	No-Till	No-Till
	Modified Financial Performance	Modified Operating Expenses	$ 267.39	$ 299.10
		Modified Operating Interest	$ 6.93	$ 7.75
		Modified Ownership Charges	$ 44.02	$ 79.22
		Modified Ownership Charges	$ 368.66	$ 300.93
		Changes in Interest Costs[d]	$ (0.66)	$ (0.66)
		Change in NRAT	$ 27.18	$ 23.98
		Change in Ownership Charges[e]	$ (13.78)	$ (12.14)
		% Increase/Decrease in NRAT	7.96%	8.66%

Table 12 Continued

		Crop	Soybeans	Wheat
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Rainfed
		Seed Variety	RR	Conv.
		Tillage	Conv.	Conv.
	Financial Performance	Revenue	$ 687.00	$ 330.00
		Operating Expenses[a]	$ 280.09	$ 243.16
		Operating Interest	$ 7.59	$ 6.97
		Ownership Charges[b]	$ 53.81	$ 39.30
		NRAT[c]	$ 345.51	$ 40.57
		Cash Rent	$ 100.00	$ 50.00
	Change	Tillage	No-Till	No-Till
	Modified Financial Performance	Modified Operating Expenses	$ 272.71	$ 241.66
		Modified Operating Interest	$ 7.07	$ 6.77
		Modified Ownership Charges	$ 45.41	$ 33.50
		Modified Ownership Charges	$ 361.81	$ 43.29
		Changes in Interest Costs[d]	$ (0.52)	$ (0.20)
		Change in NRAT	$ 16.30	$ 2.72
		Change in Ownership Charges[e]	$ (8.40)	$ (5.80)
		% Increase/Decrease in NRAT	4.72%	6.71%

Table 12 Continued

Notes:

[a] Inclues seed, fertilizer, chemicals, custom work, repair, maintenance, fuel, and irrigation supplies

[b] Annualized ownership charges includes tax, insurance, housing, as well as capital recovery on equipment

[c] Net returns above total specified expenses may be interpreted as returns to owner labor, land and capital employed. Subtracting cash rent would remove returns to land

[d] Operation's interest savings due to loan program participation

[e] Change in equipment ownership charges per acre may be multiplied by 5.5835 to arrive at change in loan volume per acre at 6% capital recovery rate assuming a 7 year average equipment loan and applies across ownership, cash rental or crop share arrangements

Table 13: Comparison of Conventional Practices to Loan Program Participation and No-Till Adoption for Five Major Crops in Arkansas Using 2011 Enterprise Budgets Across a 75/25 Crop-Share Arrangement Assuming Constant Revenues. Numbers Represent $ per Acre.

		Crop	Corn	Corn
Crop Share Rent		Seed Variety	RR	RR
		Tillage	Conv.	Conv.
		Irrigation Type	Furrow	CP
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance	Revenue	$ 682.50	$ 682.50
		Operating Expenses	$ 512.09	$ 551.06
		Operating Interest	$ 12.66	$ 13.72
		Ownership Charges	$ 69.87	$ 112.35
		NRAT	$ 87.88	$ 5.37
	Change	Tillage	No-Till	No-Till
	Tenant Modified Financial Performance	Modified Operating Expenses	$ 503.50	$ 541.79
		Modified Operating Interest	$ 11.88	$ 12.87
		Modified Ownership Charges	$ 61.08	$ 103.14
		Modified NRAT	$ 106.04	$ 24.70
		Changes in Interest Costs	$ (0.78)	$ (0.85)
		Change in NRAT	$ 18.16	$ 19.33
		Change in Ownership Charges	$ (8.79)	$ (9.21)
		% Increase/Decrease in NRAT	20.66%	360.14%

Table 13 Continued

		Crop	Cotton	Cotton
Crop Share Rent		Seed Variety	RR-Flex	RR-Flex
		Tillage	Conv.	Conv.
		Irrigation Type	Furrow	CP
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Chemical (25/75)	Chemical (25/75)
	Tenant Financial Performance	Revenue	$ 839.70	$ 839.70
		Operating Expenses	$ 577.09	$ 605.05
		Operating Interest	$ 10.98	$ 12.74
		Ownership Charges	$ 123.36	$ 156.93
		NRAT	$ 128.27	$ 64.98
	Change	Tillage	No-Till	No-Till
	Tenant Modified Financial Performance	Modified Operating Expenses	$ 568.08	$ 616.77
		Modified Operating Interest	$ 11.65	$ 12.48
		Modified Ownership Charges	$ 112.55	$ 147.71
		Modified NRAT	$ 130.42	$ 62.74
		Changes in Interest Costs	$ 0.67	$ (0.27)
		Change in NRAT	$ 2.15	$ (2.24)
		Change in Ownership Charges	$ (10.81)	$ (9.22)
		% Increase/Decrease in NRAT	1.68%	-3.45%

Table 13 Continued

		Crop	Rice	Rice
Crop Share Rent		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Irrigation Type	Flood	Flood
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance	Revenue	$ 717.83	$ 675.60
		Operating Expenses	$ 589.89	$ 589.80
		Operating Interest	$ 13.53	$ 14.48
		Ownership Charges	$ 104.03	$ 104.03
		NRAT	$ 40.37	$ (32.72)
	Change	Tillage	No-Till	No-Till
	Tenant Modified Financial Performance	Modified Operating Expenses	$ 532.47	$ 586.97
		Modified Operating Interest	$ 12.23	$ 13.60
		Modified Ownership Charges	$ 62.24	$ 89.27
		Modified NRAT	$ 110.89	$ (7.71)
		Changes in Interest Costs	$ (1.31)	$ (0.88)
		Change in NRAT	$ 70.52	$ 25.00
		Change in Ownership Charges	$ (41.79)	$ (14.76)
		% Increase/Decrease in NRAT	174.71%	76.42%

Table 13 Continued

		Crop	Rice	Rice
Crop Share Rent		Seed Variety	Hybrid	Clearfield Hybrid
		Tillage	Conv.	Conv.
		Irrigation Type	Flood	Flood
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance	Revenue	$ 802.28	$ 802.28
		Operating Expenses	$ 574.00	$ 622.47
		Operating Interest	$ 13.65	$ 14.97
		Ownership Charges	$ 104.03	$ 104.03
		NRAT	$ 110.59	$ 60.80
	Change	Tillage	No-Till	No-Till
	Tenant Modified Financial Performance	Modified Operating Expenses	$ 580.59	$ 620.26
		Modified Operating Interest	$ 13.22	$ 14.25
		Modified Ownership Charges	$ 82.02	$ 82.02
		Modified NRAT	$ 126.44	$ 85.74
		Changes in Interest Costs	$ (0.43)	$ (0.72)
		Change in NRAT	$ 15.85	$ 24.94
		Change in Ownership Charges	$ (22.01)	$ (22.01)
		% Increase/Decrease in NRAT	14.33%	41.02%

Table 13 Continued

		Crop	Soybeans	Soybeans
Crop Share Rent		Seed Variety	RR	RR
		Tillage	Conv.	Conv.
		Irrigation Type	Furrow	CP
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance	Revenue	$ 515.25	$ 515.25
		Operating Expenses	$ 280.13	$ 310.28
		Operating Interest	$ 7.59	$ 8.41
		Ownership Charges	$ 57.80	$ 91.36
		NRAT	$ 169.73	$ 105.20
	Change	Tillage	No-Till	No-Till
	Tenant Modified Financial Performance	Modified Operating Expenses	$ 267.39	$ 299.10
		Modified Operating Interest	$ 6.93	$ 7.75
		Modified Ownership Charges	$ 44.02	$ 79.22
		Modified NRAT	$ 196.91	$ 129.18
		Changes in Interest Costs	$ (0.66)	$ (0.66)
		Change in NRAT	$ 27.18	$ 23.98
		Change in Ownership Charges	$ (13.78)	$ (12.14)
		% Increase/Decrease in NRAT	16.01%	22.79%

Table 13 Continued

		Crop	Soybeans	Wheat
Crop Share Rent		Seed Variety	RR	Conv.
		Tillage	Conv.	Conv.
		Irrigation Type	Flood	Rainfed
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	None (25/75)
	Tenant Financial Performance	Revenue	$ 515.25	$ 247.50
		Operating Expenses	$ 280.09	$ 244.16
		Operating Interest	$ 7.59	$ 6.97
		Ownership Charges	$ 53.81	$ 39.30
		NRAT	$ 173.76	$ (41.93)
	Change	Tillage	No-Till	No-Till
	Tenant Modified Financial Performance	Modified Operating Expenses	$ 272.71	$ 246.44
		Modified Operating Interest	$ 7.07	$ 6.77
		Modified Ownership Charges	$ 45.41	$ 33.50
		Modified NRAT	$ 190.06	$ (39.21)
		Changes in Interest Costs	$ (0.52)	$ (0.20)
		Change in NRAT	$ 16.30	$ 2.72
		Change in Ownership Charges	$ (8.40)	$ (5.80)
		% Increase/Decrease in NRAT	9.38%	6.49%

Table 13 Continued

Notes:

[a] Same production method as baseline under ownership and cash rent but different returns to land charged via crop/cost share arrangement

[b] All costs born by the tenant except as outlined

b. Impact of Adoption of No-till - Five Year Weighted Moving Average Market Price

Changing market prices from 2011 to a five-year weighted moving average market price (FWMAP) can impact a YBP's bottom line when adopting a practice and participating in the loan program. Substituting in a FWMAP results in smaller YBP losses, especially when the land is rented under either a crop share or cash rent agreements. As Table 14 shows, we have been in a period of relatively high market prices compared to previous years. Using FWMAP instead of the projected prices used in the budgets, production costs held constant, we get a different sense of the impact of participation in the loan program. Fluctuating price based on a FWMAP, the adoption of no-till and participation in the loan program still provides positive improvements to a YBP's profits when the YBP owns the farmland (Table 15). Using rented farmland and a price varied based on a FWMAP, a YBP participating in the program and adopting no-till would experience smaller losses on some crops and improved profitability for other crops (Table 16 and Table 17).

The FWMAP for corn is below the projected price of corn used in the budget. In cases where the land is rented, a YBP may be operating on razor-thin margins. Lowering market price of corn results in losses for both furrow irrigation and center-pivot irrigation when the farmland is rented under a crop share lease (Table 17). Adoption of no-till and participation in the loan program works to reduce a YBP's loss by a projected $18.16 per acre with furrow irrigation (Table 17). A YBP would also realize a $0.78 per acre reduction in their interest costs (Table 17).

Table 14: Average Annual Crop Prices From 2001 to 2011 For Corn, Cotton, Rice, Soybeans, and Wheat. Source USDA-NASS

	2011	2010	2009	2008	2007	2006	2005
Corn $/bu	$ 6.200	$ 5.180	$ 3.550	$ 4.060	$ 4.200	$ 3.040	$ 2.000
Cotton $/lb	$ 0.965	$ 0.846	$ 0.648	$ 0.491	$ 0.613	$ 0.484	$ 0.497
Cottonseed $/ton	$ 260.000	$ 161.000	$ 158.000	$ 223.000	$ 162.000	$ 111.000	$ 96.000
Rice $/bu	$ 6.391	$ 5.716	$ 6.481	$ 7.561	$ 5.761	$ 4.482	$ 3.443
Soybeans $/bu	$ 11.700	$ 11.300	$ 9.590	$ 9.970	$ 10.100	$ 6.430	$ 5.660
Wheat $/bu	$ 6.850	$ 5.370	$ 4.710	$ 6.570	$ 6.130	$ 4.170	$ 3.320

Table 14 Continued

	2004	2003	2002	2001	2000
Corn $/bu	$ 2.060	$ 2.420	$ 2.320	$ 1.970	$ 1.850
Cotton $/lb	$ 0.447	$ 0.630	$ 0.457	$ 0.320	$ 0.516
Cottonseed $/ton	$ 107.000	$ 117.000	$ 101.000	$ 90.500	$ 105.000
Rice $/bu	$ -	$ -	$ -	$ -	$ -
Soybeans $/bu	$ 5.740	$ 7.340	$ 5.530	$ 4.380	$ 4.540
Wheat $/bu	$ 3.320	$ 3.270	$ 3.410	$ 2.720	$ 2.510

Table 15: Calculated Five-Year Weighted Moving Average Annual Market Price For Corn, Cotton, Rice, Soybeans, and Wheat For 2004 - 2011.

	2011	2010	2009	2008
Corn $/bu	$ 4.297	$ 3.764	$ 3.095	$ 2.659
Cotton $/lb	$ 0.642	$ 0.566	$ 0.526	$ 0.493
Cottonseed $/ton	$ 183.867	$ 156.600	$ 134.267	$ 119.933
Rice $/bu	$ 6.421	$ 5.788	$ 4.935	$ 4.186
Soybeans $/bu	$ 10.230	$ 8.863	$ 7.590	$ 6.720
Wheat $/bu	$ 5.910	$ 5.325	$ 4.635	$ 4.081

Table 15 Continued

	2007	2006	2005	2004
Corn $/bu	$ 2.441	$ 2.300	$ 2.167	$ 2.066
Cotton $/lb	$ 0.534	$ 0.508	$ 0.447	$ 0.463
Cottonseed $/ton	$ 112.333	$ 106.467	$ 101.167	$ 102.067
Rice $/bu	$ 3.762	$ 3.061	$ 2.573	$ 2.461
Soybeans $/bu	$ 6.640	$ 6.132	$ 5.545	$ 5.149
Wheat $/bu	$ 3.604	$ 3.393	$ 3.134	$ 2.901

Table 16: Comparison of Conventional Practices to Loan Program Participation and No-Till Adoption for Five Major Crops in Arkansas Using 2011 Enterprise Budgets Across Ownership and Cash Rent Assuming Constant Revenues. Numbers Represent $ per Acre and Using a Five-Year Weighted Moving Average for Market Price.

		Crop	Corn	Corn
Own or Cash Rent	Production Methods	Irrigation Type	Furrow	CP
		Seed Variety	RR	RR
		Tillage	Conv.	Conv.
	Financial Performance	Revenue	$ 751.98	$ 751.98
		Operating Expenses[a]	$ 520.40	$ 559.37
		Operating Interest	$ 12.66	$ 13.72
		Ownership Charges[b]	$ 69.87	$ 112.35
		NRAT[c]	$ 149.04	$ 66.53
		Cash Rent	$ 116.00	$ 116.00
	Change	Tillage	No-Till	No-Till
	Modified Financial Performance	Modified Operating Expenses	$ 511.82	$ 550.10
		Modified Operating Interest	$ 11.88	$ 12.87
		Modified Ownership Charges	$ 61.08	$ 103.14
		Modified Ownership Charges	$ 167.20	$ 85.86
		Changes in Interest Costs[d]	$ (0.78)	$ (0.85)
		Change in NRAT	$ 18.16	$ 19.33
		Change in Ownership Charges[e]	$ (8.79)	$ (9.21)
		% Increase/Decrease in NRAT	12.18%	29.06%

Table 16 Continued

		Crop	Cotton	Cotton
		Irrigation Type	Furrow	CP
	Production Methods	Seed Variety	RR-Flex	RR-Flex
		Tillage	Conv.	Conv.
Own or Cash Rent	Financial Performance	Revenue	$ 935.88	$ 935.88
		Operating Expenses[a]	$ 621.60	$ 652.98
		Operating Interest	$ 13.19	$ 14.05
		Ownership Charges[b]	$ 123.36	$ 156.93
		NRAT[c]	$ 177.73	$ 111.93
		Cash Rent	$ 116.00	$ 116.00
	Change	Tillage	No-Till	No-Till
	Modified Financial Performance	Modified Operating Expenses	$ 624.98	$ 644.31
		Modified Operating Interest	$ 12.37	$ 13.19
		Modified Ownership Charges	$ 112.55	$ 147.71
		Modified Ownership Charges	$ 198.35	$ 130.67
		Changes in Interest Costs[d]	$ (0.83)	$ (0.86)
		Change in NRAT	$ 20.62	$ 18.74
		Change in Ownership Charges[e]	$ (10.81)	$ (9.22)
		% Increase/Decrease in NRAT	11.60%	16.74%

Table 16 Continued

		Crop	Rice	Rice
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
	Financial Performance	Revenue	$ 1,091.57	$ 1,027.36
		Operating Expenses[a]	$ 574.77	$ 603.80
		Operating Interest	$ 12.69	$ 14.48
		Ownership Charges[b]	$ 104.03	$ 104.03
		NRAT[c]	$ 400.08	$ 305.04
		Cash Rent	$ 100.00	$ 100.00
	Change	Tillage	No-Till	No-Till
	Modified Financial Performance	Modified Operating Expenses	$ 547.34	$ 594.44
		Modified Operating Interest	$ 12.23	$ 13.60
		Modified Ownership Charges	$ 62.24	$ 89.27
		Modified Ownership Charges	$ 469.76	$ 330.05
		Changes in Interest Costs[d]	$ (0.46)	$ (0.88)
		Change in NRAT	$ 69.68	$ 25.00
		Change in Ownership Charges[e]	$ (41.79)	$ (14.76)
		% Increase/Decrease in NRAT	17.42%	8.20%

Table 16 Continued

		Crop	Rice	Rice
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Hybrid	Clearfield Hybrid
		Tillage	Conv.	Conv.
	Financial Performance	Revenue	$ 1,219.99	$ 1,219.99
		Operating Expenses[a]	$ 479.76	$ 639.10
		Operating Interest	$ 110.87	$ 14.97
		Ownership Charges[b]	$ 104.03	$ 104.03
		NRAT[c]	$ 511.68	$ 461.89
		Cash Rent	$ 100.00	$ 100.00
	Change	Tillage	No-Till	No-Till
	Modified Financial Performance	Modified Operating Expenses	$ 597.22	$ 636.89
		Modified Operating Interest	$ 13.22	$ 14.25
		Modified Ownership Charges	$ 82.02	$ 82.02
		Modified Ownership Charges	$ 527.53	$ 486.83
		Changes in Interest Costs[d]	$ (97.65)	$ (0.72)
		Change in NRAT	$ 15.85	$ 24.94
		Change in Ownership Charges[e]	$ (22.01)	$ (22.01)
		% Increase/Decrease in NRAT	3.10%	5.40%

Table 16 Continued

		Crop	Soybeans	Soybeans
		Irrigation Type	Furrow	CP
	Production Methods	Seed Variety	RR	RR
		Tillage	Conv.	Conv.
Own or Cash Rent	Financial Performance	Revenue	$ 613.80	$ 613.80
		Operating Expenses[a]	$ 280.13	$ 310.28
		Operating Interest	$ 7.59	$ 8.41
		Ownership Charges[b]	$ 57.80	$ 91.36
		NRAT[c]	$ 268.28	$ 203.75
		Cash Rent	$ 100.00	$ 100.00
	Change	Tillage	No-Till	No-Till
	Modified Financial Performance	Modified Operating Expenses	$ 267.39	$ 299.10
		Modified Operating Interest	$ 6.93	$ 7.75
		Modified Ownership Charges	$ 44.02	$ 79.22
		Modified Ownership Charges	$ 295.46	$ 227.73
		Changes in Interest Costs[d]	$ (0.66)	$ (0.66)
		Change in NRAT	$ 27.18	$ 23.98
		Change in Ownership Charges[e]	$ (13.78)	$ (12.14)
		% Increase/Decrease in NRAT	10.13%	11.77%

Table 16 Continued

		Crop	Soybeans	Wheat
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Rainfed
		Seed Variety	RR	Conv.
		Tillage	Conv.	Conv.
	Financial Performance	Revenue	$ 613.80	$ 325.05
		Operating Expenses[a]	$ 280.09	$ 243.16
		Operating Interest	$ 7.59	$ 6.97
		Ownership Charges[b]	$ 53.81	$ 39.30
		NRAT[c]	$ 272.31	$ 35.62
		Cash Rent	$ 100.00	$ 50.00
	Change	Tillage	No-Till	No-Till
	Modified Financial Performance	Modified Operating Expenses	$ 272.71	$ 246.44
		Modified Operating Interest	$ 7.07	$ 6.77
		Modified Ownership Charges	$ 45.41	$ 33.50
		Modified Ownership Charges	$ 288.61	$ 38.34
		Changes in Interest Costs[d]	$ (0.52)	$ (0.20)
		Change in NRAT	$ 16.30	$ 2.72
		Change in Ownership Charges[e]	$ (8.40)	$ (5.80)
		% Increase/Decrease in NRAT	5.99%	7.64%

Table 16 Continued

Notes:

[a] Inclues seed, fertilizer, chemicals, custom work, repair, maintenance, fuel, and irrigation supplies

[b] Annualized ownership charges includes tax, insurance, housing, as well as capital recovery on equipment

[c] Net returns above total specified expenses may be interpreted as returns to owner labor, land and capital employed. Subtracting cash rent would remove returns to land

[d] Operation's interest savings due to loan program participation

[e] Change in equipment ownership charges per acre may be multiplied by 5.5835 to arrive at change in loan volume per acre at 6% capital recovery rate assuming a 7 year average equipment loan and applies across ownership, cash rental or crop share arrangements

Table 17: Comparison of Conventional Practices to Loan Program Participation and No-Till Adoption for Five Major Crops in Arkansas Using 2011 Enterprise Budgets Across a 75/25 Crop-Share Arrangement Assuming Constant Revenues and Using a Five-Year Weighted Moving Average for Market Price. Numbers Represent $ per Acre.

		Crop	Corn	Corn
Crop Share Rent		Seed Variety	Furrow	CP
		Tillage	RR	RR
		Irrigation Type	Conv.	Conv.
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance	Revenue	$ 563.98	$ 563.98
		Operating Expenses	$ 512.09	$ 551.06
		Operating Interest	$ 12.66	$ 13.72
		Ownership Charges	$ 69.87	$ 112.35
		NRAT	$ (30.64)	$ (113.15)
	Change	Tillage	No-Till	No-Till
	Tenant Modified Financial Performance	Modified Operating Expenses	$ 503.50	$ 541.79
		Modified Operating Interest	$ 11.88	$ 12.87
		Modified Ownership Charges	$ 61.08	$ 103.14
		Modified NRAT	$ (12.48)	$ (93.82)
		Changes in Interest Costs	$ (0.78)	$ (0.85)
		Change in NRAT	$ 18.16	$ 19.33
		Change in Ownership Charges	$ (8.79)	$ (9.21)
		% Increase/Decrease in NRAT	59.27%	17.09%

Table 17 Continued

		Crop	Cotton	Cotton
Crop Share Rent		Seed Variety	Furrow	CP
		Tillage	RR-Flex	RR-Flex
		Irrigation Type	Conv.	Conv.
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Chemical (25/75)	Chemical (25/75)
	Tenant Financial Performance	Revenue	$ 839.70	$ 839.70
		Operating Expenses	$ 577.09	$ 605.05
		Operating Interest	$ 10.98	$ 12.74
		Ownership Charges	$ 123.36	$ 156.93
		NRAT	$ 128.27	$ 64.98
	Change	Tillage	No-Till	No-Till
	Tenant Modified Financial Performance	Modified Operating Expenses	$ 596.73	$ 616.77
		Modified Operating Interest	$ 11.65	$ 12.48
		Modified Ownership Charges	$ 112.55	$ 147.71
		Modified NRAT	$ 130.42	$ 62.74
		Changes in Interest Costs	$ 0.67	$ (0.27)
		Change in NRAT	$ 2.15	$ (2.24)
		Change in Ownership Charges	$ (10.81)	$ (9.22)
		% Increase/Decrease in NRAT	1.68%	-3.45%

Table 17 Continued

		Crop	Rice	Rice
Crop Share Rent		Seed Variety	Flood	Flood
		Tillage	Conv.	Clearfield
		Irrigation Type	Conv.	Conv.
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance	Revenue	$ 717.83	$ 675.60
		Operating Expenses	$ 559.89	$ 589.80
		Operating Interest	$ 13.53	$ 14.48
		Ownership Charges	$ 104.03	$ 104.03
		NRAT	$ 141.22	$ (32.72)
	Change	Tillage	No-Till	No-Till
	Tenant Modified Financial Performance	Modified Operating Expenses	$ 532.47	$ 580.44
		Modified Operating Interest	$ 12.23	$ 13.60
		Modified Ownership Charges	$ 62.24	$ 89.27
		Modified NRAT	$ 211.75	$ (7.71)
		Changes in Interest Costs	$ (1.31)	$ (0.88)
		Change in NRAT	$ 70.52	$ 25.00
		Change in Ownership Charges	$ (41.79)	$ (14.76)
		% Increase/Decrease in NRAT	49.94%	76.42%

Table 17 Continued

		Crop	Rice	Rice
Crop Share Rent		Seed Variety	Flood	Flood Clearfield
		Tillage	Hybrid	Hybrid
		Irrigation Type	Conv.	Conv.
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance	Revenue	$ 802.28	$ 802.28
		Operating Expenses	$ 574.00	$ 622.47
		Operating Interest	$ 13.65	$ 14.97
		Ownership Charges	$ 104.03	$ 104.03
		NRAT	$ 110.59	$ 60.80
	Change	Tillage	No-Till	No-Till
	Tenant Modified Financial Performance	Modified Operating Expenses	$ 580.59	$ 620.26
		Modified Operating Interest	$ 13.22	$ 14.25
		Modified Ownership Charges	$ 82.02	$ 82.02
		Modified NRAT	$ 126.44	$ 85.74
		Changes in Interest Costs	$ (0.43)	$ (0.72)
		Change in NRAT	$ 15.85	$ 24.94
		Change in Ownership Charges	$ (22.01)	$ (22.01)
		% Increase/Decrease in NRAT	14.33%	41.02%

Table 17 Continued

		Crop	Soybeans	Soybeans
Crop Share Rent		Seed Variety	Furrow	CP
		Tillage	RR	RR
		Irrigation Type	Conv.	Conv.
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance	Revenue	$ 515.25	$ 515.25
		Operating Expenses	$ 280.13	$ 310.28
		Operating Interest	$ 7.59	$ 8.41
		Ownership Charges	$ 57.80	$ 91.36
		NRAT	$ 169.73	$ 105.20
	Change	Tillage	No-Till	No-Till
	Tenant Modified Financial Performance	Modified Operating Expenses	$ 267.39	$ 299.10
		Modified Operating Interest	$ 6.93	$ 7.75
		Modified Ownership Charges	$ 44.02	$ 79.22
		Modified NRAT	$ 196.91	$ 129.18
		Changes in Interest Costs	$ (0.66)	$ (0.66)
		Change in NRAT	$ 27.18	$ 23.98
		Change in Ownership Charges	$ (13.78)	$ (12.14)
		% Increase/Decrease in NRAT	16.01%	22.79%

Table 17 Continued

		Crop	Soybeans	Wheat
Crop Share Rent		Seed Variety	Flood	Rainfed
		Tillage	RR	Conv.
		Irrigation Type	Conv.	Conv.
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	None (25/75)
	Tenant Financial Performance	Revenue	$ 515.25	$ 247.50
		Operating Expenses	$ 280.09	$ 243.16
		Operating Interest	$ 7.59	$ 6.97
		Ownership Charges	$ 53.81	$ 39.30
		NRAT	$ 173.76	$ (41.93)
	Change	Tillage	No-Till	No-Till
	Tenant Modified Financial Performance	Modified Operating Expenses	$ 272.71	$ 246.44
		Modified Operating Interest	$ 7.07	$ 6.77
		Modified Ownership Charges	$ 45.41	$ 33.50
		Modified NRAT	$ 190.06	$ (39.21)
		Changes in Interest Costs	$ (0.52)	$ (0.20)
		Change in NRAT	$ 16.30	$ 2.72
		Change in Ownership Charges	$ (8.40)	$ (5.80)
		% Increase/Decrease in NRAT	9.38%	6.49%

Table 17 Continued

Notes:

[a] Same production method as baseline under ownership and cash rent but different returns to land charged via crop/cost share arrangement

[b] All costs born by the tenant except as outlined

Using a crop-share lease on farmland producing cotton, a YBP participating in the loan program and adopting no-till will help reduce the size of projected loss when the FWMAP for cotton and cotton seed is substituted for the projected price. With furrow-irrigated cotton, a YBP participating in the loan program would reduce the loss per acre by $25.63, from a $32.79 per acre loss to just a $7.16 per acre loss (Table 17). Interest costs per acre would be reduced by $1.13 per acre; $0.54 per acre of the interest costs per acre savings would be associated with participation in the loan program (Table 17).

With a cash rent leasing arrangement, a YBP producing center-pivot irrigated cotton, adopting no-till, and participating in the loan program could turn a loss of $4.07 per acre before entering the loan program to a net profit of $14.67 per acre (Table 16). There is a reduction in production costs of $18.74 per acre by entering the loan program and adopting a practice (Table 16). Interest costs would be reduced by $0.86 per acre from the reduction in production costs and a reduction in the interest rate (Table 16).

The changes from pre-loan program enrollment to adoption of no-till and participation in the loan program using a FWMAP for all crops mirrors the results found earlier when a YBP owns farmland and no-till is adopted (Table 16). The adoption of no-till along with participation in the loan program in periods of low market prices will help increase profit levels.

Agriculture has always had periods of high market prices and low market prices. Inclusion of a FWMAP helps to better represent the impact this loan program could have on YBP's profitability in periods of lower prices. Adoption of one of the practices such as no-till and a concessionary interest rate can work to lower a YBP's production costs and reduce loss during periods of low prices. By reducing the size of a potential loss or turning a potential loss

into a profit, the pilot loan program could help to ease financial pressures during tough times and work to keep YBPs in agriculture.

c. Impact of Adopting a Crop Rotation

Common crop rotations suggested for use and implementation in Arkansas were examined. Crop rotations are used to mitigate negative impacts of continuously single-cropping on a farm, such as disease and pest damage. Implementing crop rotation can reduce the usage of certain pesticides and fertilizers. Adoption of crop rotation can also lead to increased profits from yield increases. A YBP considering the loan program might already be employing crop rotation in their operations and have no trouble making adjustments necessary to participate in the loan program. Table 18 gives a review of the analysis we undertook with rotations.

Modification of baseline budgets to include impacts of adopting crop rotations was based on information found in the *Arkansas Crop Production Handbooks*. Table 18 shows each of the crop rotations, irrigation options, and rice seed varieties options investigated in our crop rotation and no-till crop rotation adoption with loan program participation analysis. For example, with RWSB we examined wheat, flood irrigated soybeans, and each of the rice seed varieties possible in the rotation. Adoption of a RWSB rotation using hybrid rice seeds and loan program participation had the best results when farmland is owned or cash-rented (Table 19).

A CC rotation will not be adopted by a YBP currently just producing cotton to participate in the loan program, regardless of farmland ownership or rental arrangement (Table 19 and Table 20). Cotton prices are at historically high levels and the estimated price per bushel of corn is not enough to make a CC rotation attractive enough for a YBP to consider adopting to participate in the loan program (Table 19 and Table 20). Although to a YBP currently just producing corn,

this rotation would provide an attractive practice to adopt to participate in the loan program, because the rotation would produce returns per acre per year above that of producing only corn.

The RWSB and SBR rotations would be attractive for a YBP who has historically only produced rice regardless of rental arrangement or land ownership (Table 19 and Table 20). Table 19 and Table 20 shows that for a YBP only producing rice would see the biggest per acre increase in profits from using a Clearfield rice variety in the rotation, regardless of land ownership or rental arrangement. The RWSB or SBR rotation would not be attractive for a YBP who has historically only grown flood irrigated soybeans to adopt if the farmland is crop-share rented (Table 20). These rotations would also only be attractive for a YBP who has historically grown flood irrigated soybeans when a hybrid rice variety or a Clearfield hybrid rice variety were used in the rotation (Table 19 and Table 20).

When farmland is owned or cash-rented, a YBP could expect net returns to increase by $65 per acre compared to just producing soybean, regardless of irrigation method used with the SBW rotation (Table 19). For YBPs crop-share renting farmland, this rotation would not be attractive to consider for adoption and participation in the loan program, with each irrigation method producing net returns per acre below that of just producing soybeans (Table 20).

Table 18: Overview of Crop Rotations, Irrigation Methods, and Rice Seed Varieties Analyzed To Evaluate Potential Impact of YBP Loan Program

	RWSB	SBR	SBW	CC
Irrigation System				
Furrow:				
Rotation	–	–	✔	✔
No-Till Rotation	–	–	☒	✔
Center-Pivot:				
Rotation	–	–	☒	✔
No-Till Rotation	–	–	✔	✔
Flood:				
Rotation	–	–	✔	–
No-Till Rotation	–	–	✔	–
Rice Seed Variety:				
Conventional				
Rotation	✔	✔	–	–
No-Till Rotation	✔	✔	–	–
Clearfield				
Rotation	☒	☒	–	–
No-Till Rotation	☒	☒	–	–
Hybrid				
Rotation	✔	✔	–	–
No-Till Rotation	✔	✔	–	–
Clearfield Hybrid				
Rotation	✔	✔	–	–
No-Till Rotation	✔	✔	–	–

✔ = Analysis complete
☒ = Best results for that rotation
– = No Analysis

Table 19: Comparison of Crop Rotations Adoptions to Loan Program Participation in Arkansas Using 2011 Enterprise Budgets Across Ownership and Cash Rent Assuming Constant Revenues. Numbers Represent $ per Acre

		Rotation	**RWSB**	**RWSB**
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Financial Performance (Avg/yr)	Revenue	$ 987.05	$ 958.90
		Operating Expenses[a]	$ 360.15	$ 369.83
		Operating Interest	$ 13.81	$ 14.28
		Ownership Charges[b]	$ 65.71	$ 65.71
		NRAT[c]	$ 334.45	$ 291.30
		Cash Rent ($/yr)	$ 100.00	$ 100.00
Change		Loan Program	Participation	Participation

Table 19 Continued

	Rotation	RWSB	RWSB
Production Methods	Irrigation Type	Flood	Flood
	Seed Variety	Conv.	Clearfield
	Tillage	Conv.	Conv.
	Lengh of Rotation (yrs)	3	3
Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 360.15	$ 369.83
	Modified Operating Interest	$ 13.21	$ 13.67
	Modified Ownership Charges	$ 69.75	$ 69.75
	Modified NRAT	$ 335.04	$ 291.92
	Changes in Interest Costs[d]	$ (0.60)	$ (0.62)
	Change in NRAT	$ 0.60	$ 0.62
	Change in Ownership Charges[e]	$ 4.03	$ 4.03
	% Increase/Decrease in NRAT	0.18%	0.21%
Changes From Only Producing:	Corn		
	Cotton		
	Rice	$ 70.27	$ 113.44
	Soybeans	$ (10.46)	$ (53.59)

Table 19 Continued

		Rotation	SBR	SBR
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Financial Performance (Avg/yr)	Revenue	$ 822.05	$ 793.90
		Operating Expenses[a]	$ 398.35	$ 381.19
		Operating Interest	$ 9.77	$ 10.24
		Ownership Charges[b]	$ 78.92	$ 78.92
		NRAT[c]	$ 335.01	$ 291.87
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	Participation	Participation
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 398.35	$ 412.87
		Modified Operating Interest	$ 9.34	$ 9.80
		Modified Ownership Charges	$ 78.92	$ 78.92
		Modified NRAT	$ 335.44	$ 292.32
		Changes in Interest Costs[d]	$ (0.43)	$ (0.45)
		Change in NRAT	$ 0.43	$ 0.45
		Change in Ownership Charges[e]	$ -	$ -
		% Increase/Decrease in NRAT	0.13%	0.15%
Changes From Only Producing:		Corn		
		Cotton		
		Rice	$ 70.67	$ 113.83
		Soybeans	$ (10.07)	$ (53.19)

Table 11 Continued

		Rotation	SBR	SBR
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Hybrid	Clearfield Hybrid
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Financial Performance (Avg/yr)	Revenue	$ 878.35	$ 878.35
		Operating Expenses[a]	$ 406.28	$ 431.04
		Operating Interest	$ 9.83	$ 10.50
		Ownership Charges[b]	$ 78.92	$ 78.92
		NRAT[c]	$ 383.32	$ 357.89
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	Participation	Participation
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 406.28	$ 431.04
		Modified Operating Interest	$ 9.40	$ 10.04
		Modified Ownership Charges	$ 78.92	$ 78.92
		Modified NRAT	$ 383.75	$ 358.35
		Changes in Interest Costs[d]	$ (0.43)	$ (0.46)
		Change in NRAT	$ 0.43	$ 0.46
		Change in Ownership Charges[e]	$ -	$ -
		% Increase/Decrease in NRAT	0.11%	0.13%
Changes From Only Producing:		Corn		
		Cotton		
		Rice	$ 22.36	$ 46.75
		Soybeans	$ 38.25	$ 12.85

Table 19 Continued

		Rotation	SBW	SBW
Own or Cash Rent	Production Methods	Irrigation Type	Furrow	CP
		Seed Variety	RR	RR
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	1	1
	Financial Performance (Avg/yr)	Revenue	$ 1,017.00	$ 1,017.00
		Operating Expenses[a]	$ 500.49	$ 530.64
		Operating Interest	$ 13.94	$ 14.77
		Ownership Charges[b]	$ 97.10	$ 130.66
		NRAT[c]	$ 405.47	$ 340.94
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	Participation	Participation
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 500.49	$ 530.64
		Modified Operating Interest	$ 13.35	$ 14.14
		Modified Ownership Charges	$ 97.10	$ 130.66
		Modified NRAT	$ 406.06	$ 341.57
		Changes in Interest Costs[d]	$ (0.59)	$ (0.63)
		Change in NRAT	$ 0.59	$ 0.63
		Change in Ownership Charges[e]	$ -	$ -
		% Increase/Decrease in NRAT	0.15%	0.18%
Changes From Only Producing:		Corn		
		Cotton		
		Rice		
		Soybeans	$ 64.58	$ 64.62

Table 19 Continued

		Rotation	SBW
Own or Cash Rent	Production Methods	Irrigation Type	Flood
		Seed Variety	RR
		Tillage	Conv.
		Lengh of Rotation (yrs)	1
	Financial Performance (Avg/yr)	Revenue	$ 1,017.00
		Operating Expenses[a]	$ 500.45
		Operating Interest	$ 13.94
		Ownership Charges[b]	$ 93.11
		NRAT[c]	$ 409.49
		Cash Rent ($/yr)	$ 100.00
	Change	Loan Program	Participation
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 500.45
		Modified Operating Interest	$ 13.35
		Modified Ownership Charges	$ 93.11
		Modified NRAT	$ 410.09
		Changes in Interest Costs[d]	$ (0.59)
		Change in NRAT	$ 0.59
		Change in Ownership Charges[e]	$ -
		% Increase/Decrease in NRAT	0.14%
Changes From Only Producing:		Corn	
		Cotton	
		Rice	
		Soybeans	$ 64.58

Table 19 Continued

		Rotation	CC	CC
Own or Cash Rent	Production Methods	Irrigation Type	Furrow	CP
		Seed Variety	RR/RR-Flex	RR/RR-Flex
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Financial Performance (Avg/yr)	Revenue	$ 1,014.80	$ 1,014.80
		Operating Expenses[a]	$ 571.00	$ 606.17
		Operating Interest	$ 12.93	$ 13.88
		Ownership Charges[b]	$ 96.62	$ 134.64
		NRAT[c]	$ 334.26	$ 260.10
		Cash Rent ($/yr)	$ 116.00	$ 116.00
	Change	Loan Program	Participation	Participation
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 571.00	$ 606.17
		Modified Operating Interest	$ 12.35	$ 13.27
		Modified Ownership Charges	$ 96.62	$ 134.64
		Modified NRAT	$ 334.83	$ 260.72
		Changes in Interest Costs[d]	$ (0.58)	$ (0.62)
		Change in NRAT	$ 0.58	$ 0.62
		Change in Ownership Charges[e]	$ -	$ -
		% Increase/Decrease in NRAT	0.17%	0.24%
	Changes From Only Producing:	Corn	$ 27.77	$ 36.16
		Cotton	$ (26.61)	$ (34.93)
		Rice		
		Soybeans		

Table 19 Continued

Notes:

[a] Inclues seed, fertilizer, chemicals, custom work, repair, maintenance, fuel, and irrigation supplies

[b] Annualized ownership charges includes tax, insurance, housing, as well as capital recovery on equipment

[c] Net returns above total specified expenses may be interpreted as returns to owner labor, land and capital employed. Subtracting cash rent would remove returns to land

[d] Operation's interest savings due to loan program participation

[e] Change in equipment ownership charges per acre may be multiplied by 5.5835 to arrive at change in loan volume per acre at 6% capital recovery rate assuming a 7 year average equipment loan and applies across ownership, cash rental or crop share arrangements

Table 20 Comparison of Crop Rotations Adoptions to Loan Program Participation in Arkansas Using 2011 Enterprise Budgets Across a 75/25 Crop-Share Arrangement Assuming Constant Revenues. Numbers Represent $ per Acre.

		Rotation	RWSB	RWSB
Crop Share Rent		Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 740.29	$ 719.18
		Operating Expenses	$ 355.19	$ 365.16
		Operating Interest	$ 13.81	$ 14.28
		Ownership Charges	$ 65.71	$ 65.71
		NRAT	$ 95.12	$ 58.58
	Change	Loan Program	Participation	Participation
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 355.19	$ 234.53
		Modified Operating Interest	$ 13.21	$ 13.67
		Modified Ownership Charges	$ 69.75	$ 69.75
		Modified NRAT	$ 95.72	$ 59.20
		Changes in Interest Costs	$ (0.60)	$ (0.62)
		Change in NRAT	$ 0.60	$ 0.62
		Change in Ownership Charges	$ 4.03	$ 4.03
		% Increase/Decrease in Profits	0.63%	1.06%

Table 20 Continued

		Rotation	RWSB	RWSB
Crop Share Rent		Irrigation Type	Flood	Flood
				Clearfield
		Seed Variety	Hybrid	Hybrid
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 782.51	$ 782.51
		Operating Expenses	$ 359.90	$ 376.05
		Operating Interest	$ 13.87	$ 14.53
		Ownership Charges	$ 65.71	$ 65.71
		NRAT	$ 130.23	$ 105.34
	Change	Loan Program	Participation	Participation
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 359.90	$ 248.64
		Modified Operating Interest	$ 13.27	$ 13.90
		Modified Ownership Charges	$ 69.75	$ 69.75
		Modified NRAT	$ 130.83	$ 105.97
		Changes in Interest Costs	$ (0.60)	$ (0.63)
		Change in NRAT	$ 0.60	$ 0.63
		Change in Ownership Charges	$ 4.03	$ 4.03
		% Increase/Decrease in Profits	0.46%	0.60%

Table 20 Continued

		Rotation	SBR	SBR
Crop Share Rent		Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 616.54	$ 595.43
		Operating Expenses	$ 390.91	$ 398.37
		Operating Interest	$ 9.77	$ 10.24
		Ownership Charges	$ 78.92	$ 78.92
		NRAT	$ 136.93	$ 100.39
	Change	Loan Program	Participation	Participation
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 390.91	$ 405.87
		Modified Operating Interest	$ 9.34	$ 9.80
		Modified Ownership Charges	$ 78.92	$ 78.92
		Modified NRAT	$ 137.36	$ 100.84
		Changes in Interest Costs	$ (0.43)	$ (0.45)
		Change in NRAT	$ 0.43	$ 0.45
		Change in Ownership Charges	$ -	$ -
		% Increase/Decrease in Profits	0.31%	-0.45%

Table 20 Continued

		Rotation	SBR	SBR
Crop Share Rent		Irrigation Type	Flood	Flood
				Clearfield
		Seed Variety	Hybrid	Hybrid
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 658.76	$ 658.76
		Operating Expenses	$ 390.47	$ 415.22
		Operating Interest	$ 9.83	$ 10.50
		Ownership Charges	$ 78.92	$ 78.92
		NRAT	$ 172.05	$ 146.62
	Change	Loan Program	Participation	Participation
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 397.97	$ 422.72
		Modified Operating Interest	$ 9.40	$ 10.04
		Modified Ownership Charges	$ 78.92	$ 78.92
		Modified NRAT	$ 172.48	$ 147.08
		Changes in Interest Costs	$ (0.43)	$ (0.46)
		Change in NRAT	$ 0.43	$ 0.46
		Change in Ownership Charges	$ -	$ -
		% Increase/Decrease in Profits	0.25%	0.31%

Table 20 Continued

		Rotation	SBW	SBW
Crop Share Rent		Irrigation Type	Furrow	CP
		Seed Variety	RR	RR
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	1	1
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 762.75	$ 762.75
		Operating Expenses	$ 500.49	$ 530.64
		Operating Interest	$ 13.94	$ 14.77
		Ownership Charges	$ 97.10	$ 130.66
		NRAT	$ 151.22	$ 86.69
	Change	Loan Program	Participation	Participation
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 500.49	$ 530.64
		Modified Operating Interest	$ 13.35	$ 14.14
		Modified Ownership Charges	$ 97.10	$ 130.66
		Modified NRAT	$ 151.81	$ 87.32
		Changes in Interest Costs	$ (0.59)	$ (0.63)
		Change in NRAT	$ 0.59	$ 0.63
		Change in Ownership Charges	$ -	$ -
		% Increase/Decrease in Profits	0.39%	0.73%

Table 20 Continued

		Rotation	SBW
Crop Share Rent		Irrigation Type	Flood
		Seed Variety	RR
		Tillage	Conv.
		Lengh of Rotation (yrs)	1
	Crop Share[a]	Revenue (L/T)	25/75
		Cost-Share[b]	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 762.75
		Operating Expenses	$ 500.45
		Operating Interest	$ 13.94
		Ownership Charges	$ 93.11
		NRAT	$ 155.24
	Change	Loan Program	Participation
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 500.45
		Modified Operating Interest	$ 13.35
		Modified Ownership Charges	$ 93.11
		Modified NRAT	$ 155.84
		Changes in Interest Costs	$ (0.59)
		Change in NRAT	$ 0.59
		Change in Ownership Charges	$ -
		% Increase/Decrease in Profits	0.38%

Table 20 Continued

		Rotation	CC	CC
Crop Share Rent		Irrigation Type	Furrow	CP
		Seed Variety	RR/RR-Flex	RR/RR-Flex
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Crop Share[a]	Revenue (L/T)	25/75	
		Cost-Share[b]	Drying & Chemical (25/75)	Drying & Chemical (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 761.10	$ 761.10
		Operating Expenses	$ 553.15	$ 588.32
		Operating Interest	$ 12.55	$ 13.51
		Ownership Charges	$ 96.62	$ 134.64
		NRAT	$ 98.78	$ 24.62
	Change	Loan Program	Participation	Participation
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 553.15	$ 588.32
		Modified Operating Interest	$ 11.99	$ 12.91
		Modified Ownership Charges	$ 96.62	$ 134.64
		Modified NRAT	$ 99.34	$ 25.23
		Changes in Interest Costs	$ (0.56)	$ (0.60)
		Change in NRAT	$ 0.56	$ 0.60
		Change in Ownership Charges	$ -	$ -
		% Increase/Decrease in Profits	0.57%	2.45%

Table 20 Continued

	Rotation	RWSB	RWSB	RWSB	RWSB
	Irrigation Type	Flood	Flood	Flood	Flood
	Seed Variety	Conv.	Clearfield	Hybrid	Clearfield Hybrid
	Tillage	Conv.	Conv.	Conv.	Conv.
Changes From Only Producing:	Corn				
	Cotton				
	Rice	$ 55.35	$ 91.91	$ 20.24	$ 45.16
	Soybeans	$ (78.04)	$ (114.56)	$ (42.92)	$ (67.79)

Table 20 Continued

	Rotation	SBR	SBR	SBR	SBR
	Irrigation Type	Flood	Flood	Flood	Flood
	Seed Variety	Conv.	Clearfield	Hybrid	Clearfield Hybrid
	Tillage	Conv.	Conv.	Conv.	Conv.
Changes From Only Producing:	Corn				
	Cotton				
	Rice	$ 96.99	$ 133.56	$ 61.88	$ 86.28
	Soybeans	$ (36.40)	$ (72.92)	$ (1.28)	$ (26.68)

Table 20 Continued

	Rotation	SBW	SBW	SBW
	Irrigation Type	Furrow	CP	Flood
	Seed Variety	RR	RR	RR
	Tillage	Conv.	Conv.	Conv.
Changes From Only Producing:	Corn			
	Cotton			
	Rice			
	Soybeans	$ (17.92)	$ (17.88)	$ (17.92)

Table 20 Continued

	Rotation	CC	CC
	Irrigation Type	Furrow	CP
	Seed Variety	RR/RR-Flex	RR/RR-Flex
	Tillage	Conv.	Conv.
Changes From Only Producing:	Corn	$ 11.46	$ 19.86
	Cotton	$ (28.93)	$ (39.75)
	Rice		
	Soybeans		

Notes:

[a] Same production method as baseline under ownership and cash rent but different returns to land charged via crop/cost share arrangement

[b] All costs born by the tenant except as outlined

We have not considered all possible rotations for adoption in Arkansas; many others are possible that would allow for the breakup of disease and pest patterns in the state. Similar to adoption of no-till, adoption of these rotations could cause a YBP to purchase additional equipment. For example, if a YBP had traditionally only grown corn and decided to adopt a CC rotation, the YBP would then need to purchase or lease a cotton stripper and other equipment to harvest the cotton crop, another lending opportunity for a FCB adopting this loan program.

d. Adoption of a Crop Rotation - Five-Year Weighted Moving Average for Market Price

When crop prices are changed to use a FWMAP, possible rotations that could be used by a YBP become more or less attractive based on the changes in market prices. Even with the change in price for cotton and corn, a CC rotation does not become more attractive for a YBP to adopt for participation in the loan program. Regardless of owning or renting the farmland and the irrigation method used, continuing to raise cotton only is more attractive than adopting a CC rotation (Table 21 and Table 22). The rotation would still be attractive for adoption by a YBP who has traditionally only planted corn, regardless of land ownership or rental arrangement.

The SBW rotation would still be attractive for a YBP owning or cash renting farmland, regardless of irrigation method used, to participate in the loan program (Table 21). In this situation, a YBP who had historically only grown soybeans could see a $60 per acre increase in profits per acre (Table 21). The SBW rotation would still not be considered for a YBP to adopt to participate in the loan program if the YBP has historically grown soybeans and is crop-share renting the farmland (Table 22).

For a YBP who has traditionally grown rice, adoption of a RWSB or SBR rotation with owned or cash-rented farmland would only be considered when a Clearfield rice variety is used in the rotation (Table 21). Using a Clearfield rice seed variety would also produce the best

results in a RWSB and SBR rotation when farmland is crop-share rented by a YBP (Table 22). With a YBP traditionally producing soybeans, adoption of a RWSB or SBR rotation would be considered regardless or rice seed variety when farmland is owned or cash-rented (Table 21). For example, use of a hybrid rice variety could produce an increase in net returns per acre by at least $147 when farmland is cash-rented or owned (Table 21). With a YBP crop-share renting farmland and traditionally only producing soybeans, adoption of a RWSB rotation would not be an attractive practice to adopt for loan program participation (Table 22). Adoption of a SBR rotation for participation in the loan program would only be attractive to a YBP historically producing soybeans when a hybrid rice variety or a Clearfield hybrid rice variety are used in the rotation (Table 22).

Table 21: Comparison of Crop Rotations Adoptions to Loan Program Participation in Arkansas Using 2011 Enterprise Budgets Across Ownership and Cash Rent and Using a Five-Year Weighted Moving Average for Market Price. Assuming Constant Revenues. Numbers Represent $ per Acre.

		Rotation	RWSB	RWSB
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Financial Performance (Avg/yr)	Revenue	$ 1,015.21	$ 983.11
		Operating Expenses[a]	$ 360.15	$ 369.83
		Operating Interest	$ 13.81	$ 14.28
		Ownership Charges[b]	$ 65.71	$ 65.71
		NRAT[c]	$ 362.61	$ 315.51
		Cash Rent ($/yr)	$ 100.00	$ 100.00
Change		Loan Program	Participation	Participation

Table 21 Continued

		Rotation	RWSB	RWSB
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 360.15	$ 369.83
		Modified Operating Interest	$ 13.21	$ 13.67
		Modified Ownership Charges	$ 69.75	$ 69.75
		Modified NRAT	$ 363.20	$ 316.13
		Changes in Interest Costs[d]	$ (0.60)	$ (0.62)
		Change in NRAT	$ 0.60	$ 0.62
		Change in Ownership Charges[e]	$ 4.03	$ 4.03
		% Increase/Decrease in NRAT	0.16%	0.20%
Changes From Only Producing:		Corn		
		Cotton		
		Rice	$ (36.88)	$ 11.08
		Soybeans	$ 90.90	$ 43.82

Table 21 Continued

		Rotation	RWSB	RWSB
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Hybrid	Clearfield Hybrid
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Financial Performance (Avg/yr)	Revenue	$ 1,079.42	$ 1,079.42
		Operating Expenses[a]	$ 354.03	$ 381.59
		Operating Interest	$ 13.87	$ 14.53
		Ownership Charges[b]	$ 35.30	$ 65.71
		NRAT[c]	$ 418.83	$ 393.93
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	Participation	Participation
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 365.44	$ 381.59
		Modified Operating Interest	$ 13.27	$ 13.90
		Modified Ownership Charges	$ 69.75	$ 69.75
		Modified NRAT	$ 419.43	$ 394.56
		Changes in Interest Costs[d]	$ (0.60)	$ (0.63)
		Change in NRAT	$ 0.60	$ 0.63
		Change in Ownership Charges[e]	$ 34.44	$ 4.03
		% Increase/Decrease in NRAT	0.14%	0.16%
Changes From Only Producing:		Corn		
		Cotton		
		Rice	$ (92.26)	$ (67.33)
		Soybeans	$ 147.12	$ 122.26

Table 21 Continued

		Rotation	SBR	SBR
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Financial Performance (Avg/yr)	Revenue	$ 852.69	$ 820.58
		Operating Expenses[a]	$ 398.35	$ 381.19
		Operating Interest	$ 9.77	$ 10.24
		Ownership Charges[b]	$ 78.92	$ 78.92
		NRAT[c]	$ 365.64	$ 318.55
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	Participation	Participation
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 398.35	$ 412.87
		Modified Operating Interest	$ 9.34	$ 9.80
		Modified Ownership Charges	$ 78.92	$ 78.92
		Modified NRAT	$ 366.07	$ 319.00
		Changes in Interest Costs[d]	$ (0.43)	$ (0.45)
		Change in NRAT	$ 0.43	$ 0.45
		Change in Ownership Charges[e]	$ -	$ -
		% Increase/Decrease in NRAT	0.12%	0.14%
Changes From Only Producing:		Corn		
		Cotton		
		Rice	$ (34.01)	$ 13.95
		Soybeans	$ 93.76	$ 46.69

Table 21 Continued

		Rotation	SBR	SBR
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Hybrid	Clearfield Hybrid
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Financial Performance (Avg/yr)	Revenue	$ 916.90	$ 916.90
		Operating Expenses[a]	$ 406.28	$ 431.04
		Operating Interest	$ 9.83	$ 10.50
		Ownership Charges[b]	$ 78.92	$ 78.92
		NRAT[c]	$ 421.87	$ 396.44
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	Participation	Participation
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 406.28	$ -
		Modified Operating Interest	$ 9.40	$ 10.04
		Modified Ownership Charges	$ 78.92	$ -
		Modified NRAT	$ 422.30	$ 396.90
		Changes in Interest Costs[d]	$ (0.43)	$ (0.46)
		Change in NRAT	$ 0.43	$ 0.46
		Change in Ownership Charges[e]	$ -	$ (78.92)
		% Increase/Decrease in NRAT	0.10%	0.12%
Changes From Only Producing:		Corn		
		Cotton		
		Rice	$ (89.39)	$ (64.99)
		Soybeans	$ 149.99	$ 124.59

Table 21 Continued

		Rotation	SBW	SBW
Own or Cash Rent	Production Methods	Irrigation Type	Furrow	CP
		Seed Variety	RR	RR
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	1	1
	Financial Performance (Avg/yr)	Revenue	$ 938.85	$ 938.85
		Operating Expenses[a]	$ 500.49	$ 530.64
		Operating Interest	$ 13.94	$ 14.77
		Ownership Charges[b]	$ 97.10	$ 130.66
		NRAT[c]	$ 327.32	$ 262.79
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	Participation	Participation
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 500.49	$ 530.64
		Modified Operating Interest	$ 13.35	$ 14.14
		Modified Ownership Charges	$ 97.10	$ 130.66
		Modified NRAT	$ 327.91	$ 263.42
		Changes in Interest Costs[d]	$ (0.59)	$ (0.63)
		Change in NRAT	$ 0.59	$ 0.63
		Change in Ownership Charges[e]	$ -	$ -
		% Increase/Decrease in NRAT	0.18%	0.24%
Changes From Only Producing:		Corn		
		Cotton		
		Rice		
		Soybeans	$ 59.63	$ 59.67

Table 21 Content

		Rotation	SBW
Own or Cash Rent	Production Methods	Irrigation Type	Flood
		Seed Variety	RR
		Tillage	Conv.
		Lengh of Rotation (yrs)	1
	Financial Performance (Avg/yr)	Revenue	$ 938.85
		Operating Expenses[a]	$ 500.45
		Operating Interest	$ 13.94
		Ownership Charges[b]	$ 93.11
		NRAT[c]	$ 331.34
		Cash Rent ($/yr)	$ 100.00
	Change	Loan Program	Participation
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 500.45
		Modified Operating Interest	$ 13.35
		Modified Ownership Charges	$ 93.11
		Modified NRAT	$ 331.94
		Changes in Interest Costs[d]	$ (0.59)
		Change in NRAT	$ 0.59
		Change in Ownership Charges[e]	$ -
		% Increase/Decrease in NRAT	0.18%
Changes From Only Producing:		Corn	
		Cotton	
		Rice	
		Soybeans	$ 59.63

Table 21 Continued

		Rotation	CC	CC
Own or Cash Rent	Production Methods	Irrigation Type	Furrow	CP
		Seed Variety	RR/RR-Flex	RR/RR-Flex
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Financial Performance (Avg/yr)	Revenue	$ 843.93	$ 843.93
		Operating Expenses[a]	$ 573.60	$ 606.17
		Operating Interest	$ 12.93	$ 13.88
		Ownership Charges[b]	$ 96.62	$ 134.64
		NRAT[c]	$ 163.39	$ 89.23
		Cash Rent ($/yr)	$ 116.00	$ 116.00
	Change	Loan Program	Participation	Participation
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 573.30	$ 606.17
		Modified Operating Interest	$ 12.35	$ 13.27
		Modified Ownership Charges	$ 96.62	$ 134.64
		Modified NRAT	$ 163.96	$ 89.85
		Changes in Interest Costs[d]		
		Change in NRAT	$ 0.58	$ 0.62
		Change in Ownership Charges[e]	$ -	$ -
		% Increase/Decrease in NRAT	0.35%	0.69%
	Changes From Only Producing:	Corn	$ 14.92	$ 23.32
		Cotton	$ (13.77)	$ (22.08)
		Rice		
		Soybeans		

Table 21 Continued

Notes:

[a] Inclues seed, fertilizer, chemicals, custom work, repair, maintenance, fuel, and irrigation supplies

[b] Annualized ownership charges includes tax, insurance, housing, as well as capital recovery on equipment

[c] Net returns above total specified expenses may be interpreted as returns to owner labor, land and capital employed. Subtracting cash rent would remove returns to land

[d] Operation's interest savings due to loan program participation

[e] Change in equipment ownership charges per acre may be multiplied by 5.5835 to arrive at change in loan volume per acre at 6% capital recovery rate assuming a 7 year average equipment loan and applies across ownership, cash rental or crop share arrangements

Table 22: Comparison of Crop Rotations Adoptions to Loan Program Participation in Arkansas Using 2011 Enterprise Budgets Across a 75/25 Crop-Share Arrangement and Using a Five-Year Weighted Moving Average for Market Price. Assuming Constant Revenues. Numbers Represent $ per Acre.

		Rotation	RWSB	RWSB
Crop Share Rent		Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 761.41	$ 737.33
		Operating Expenses	$ 355.19	$ 365.16
		Operating Interest	$ 13.81	$ 14.28
		Ownership Charges	$ 65.71	$ 65.71
		NRAT	$ 116.24	$ 76.73
	Change	Loan Program	Participation	Participation
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 355.19	$ 234.53
		Modified Operating Interest	$ 13.21	$ 13.67
		Modified Ownership Charges	$ 69.75	$ 69.75
		Modified NRAT	$ 116.84	$ 77.35
		Changes in Interest Costs	$ (0.60)	$ (0.62)
		Change in NRAT	$ 0.60	$ 0.62
		Change in Ownership Charges	$ 4.03	$ 4.03
		% Increase/Decrease in Profits	0.51%	0.81%

Table 22 Continued

		Rotation	RWSB	RWSB
Crop Share Rent		Irrigation Type	Flood	Flood
				Clearfield
		Seed Variety	Hybrid	Hybrid
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 809.57	$ 809.57
		Operating Expenses	$ 359.90	$ 376.05
		Operating Interest	$ 13.87	$ 14.53
		Ownership Charges	$ 65.71	$ 65.71
		NRAT	$ 157.29	$ 132.39
	Change	Loan Program	Participation	Participation
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 359.90	$ 248.64
		Modified Operating Interest	$ 13.27	$ 13.90
		Modified Ownership Charges	$ 69.75	$ 69.75
		Modified NRAT	$ 157.89	$ 133.02
		Changes in Interest Costs	$ (0.60)	$ (0.63)
		Change in NRAT	$ 0.60	$ 0.63
		Change in Ownership Charges	$ 4.03	$ 4.03
		% Increase/Decrease in Profits	0.38%	0.48%

Table 22 Continued

		Rotation	SBR	SBR
Crop Share Rent		Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 639.51	$ 615.44
		Operating Expenses	$ 390.91	$ 398.37
		Operating Interest	$ 9.77	$ 10.24
		Ownership Charges	$ 78.92	$ 78.92
		NRAT	$ 159.91	$ 120.40
	Change	Loan Program	Participation	Participation
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 349.53	$ 405.87
		Modified Operating Interest	$ 9.34	$ 9.80
		Modified Ownership Charges	$ 114.68	$ 78.92
		Modified NRAT	$ 160.34	$ 120.85
		Changes in Interest Costs	$ (0.43)	$ (0.45)
		Change in NRAT	$ 0.43	$ 0.45
		Change in Ownership Charges	$ 35.76	$ -
		% Increase/Decrease in Profits	0.27%	0.37%

Table 22 Continued

		Rotation	SBR	SBR
Crop Share Rent		Irrigation Type	Flood	Flood
				Clearfield
		Seed Variety	Hybrid	Hybrid
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 687.67	$ 687.67
		Operating Expenses	$ 390.47	$ 415.22
		Operating Interest	$ 9.83	$ 10.50
		Ownership Charges	$ 78.92	$ 78.92
		NRAT	$ 200.96	$ 175.53
	Change	Loan Program	Participation	Participation
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 397.97	$ 422.72
		Modified Operating Interest	$ 9.40	$ 10.04
		Modified Ownership Charges	$ 78.92	$ 78.92
		Modified NRAT	$ 201.39	$ 175.99
		Changes in Interest Costs	$ (0.43)	$ (0.46)
		Change in NRAT	$ 0.43	$ 0.46
		Change in Ownership Charges	$ -	$ -
		% Increase/Decrease in Profits	0.21%	0.26%

Table 22 Continued

		Rotation	SBW	SBW
Crop Share Rent		Irrigation Type	Furrow	CP
		Seed Variety	RR	RR
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	1	1
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 704.14	$ 704.14
		Operating Expenses	$ 500.49	$ 530.64
		Operating Interest	$ 13.94	$ 14.77
		Ownership Charges	$ 97.10	$ 130.66
		NRAT	$ 92.61	$ 28.07
	Change	Loan Program	Participation	Participation
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 500.49	$ 530.64
		Modified Operating Interest	$ 13.35	$ 14.14
		Modified Ownership Charges	$ 97.10	$ 130.66
		Modified NRAT	$ 93.20	$ 28.70
		Changes in Interest Costs	$ (0.59)	$ (0.63)
		Change in NRAT	$ 0.59	$ 0.63
		Change in Ownership Charges	$ -	$ -
		% Increase/Decrease in Profits	0.64%	2.24%

Table 22 Continued

		Rotation	SBW
Crop Share Rent		Irrigation Type	Flood
		Seed Variety	RR
		Tillage	Conv.
		Lengh of Rotation (yrs)	1
	Crop Share[a]	Revenue (L/T)	25/75
		Cost-Share[b]	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 704.14
		Operating Expenses	$ 500.45
		Operating Interest	$ 13.94
		Ownership Charges	$ 93.11
		NRAT	$ 96.63
	Change	Loan Program	Participation
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 500.45
		Modified Operating Interest	$ 13.35
		Modified Ownership Charges	$ 93.11
		Modified NRAT	$ 97.22
		Changes in Interest Costs	$ (0.59)
		Change in NRAT	$ 0.59
		Change in Ownership Charges	$ -
		% Increase/Decrease in Profits	0.61%

Table 22 Continued

		Rotation	CC	CC
Crop Share Rent		Irrigation Type	Furrow	CP
		Seed Variety	RR/RR-Flex	RR/RR-Flex
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Crop Share[a]	Revenue (L/T)	25/75	
		Cost-Share[b]	Drying & Chemical (25/75)	Drying & Chemical
	Tenant Financial Performance (Avg/yr)	Revenue	$ 632.95	$ 632.95
		Operating Expenses	$ 553.15	$ 588.32
		Operating Interest	$ 12.55	$ 13.51
		Ownership Charges	$ 96.62	$ 134.64
		NRAT	$ (29.37)	$ (103.53)
	Change	Loan Program	Participation	Participation
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 553.15	$ 588.32
		Modified Operating Interest	$ 11.99	$ 12.91
		Modified Ownership Charges	$ 96.62	$ 134.64
		Modified NRAT	$ (28.81)	$ (102.93)
		Changes in Interest Costs	$ (0.56)	$ (0.60)
		Change in NRAT	$ 0.56	$ 0.60
		Change in Ownership Charges	$ -	$ -
		% Increase/Decrease in Profits	1.90%	0.58%

Table 22 Continued

	Rotation	RWSB	RWSB	RWSB	RWSB
	Irrigation Type	Flood	Flood	Flood	Flood
	Seed Variety	Conv.	Clearfield	Hybrid	Clearfield Hybrid
	Tillage	Conv.	Conv.	Conv.	Conv.
Changes From Only Producing:	Corn				
	Cotton				
	Rice	$ (24.38)	$ 110.07	$ 47.29	$ 72.22
	Soybeans	$ (56.92)	$ (96.41)	$ (15.87)	$ (40.74)

Table 22 Continued

	Rotation	SBR	SBR	SBR	SBR
	Irrigation Type	Flood	Flood	Flood	Flood
	Seed Variety	Conv.	Clearfield	Hybrid	Clearfield Hybrid
	Tillage	Conv.	Conv.	Conv.	Conv.
Changes From Only Producing:	Corn				
	Cotton				
	Rice	$ 19.12	$ 153.57	$ 90.79	$ 115.18
	Soybeans	$ (52.91)	$ 27.63	$ 2.23	$ (76.53)

Table 22 Continued

	Rotation	SBW	SBW	SBW
	Irrigation Type	Furrow	CP	Flood
	Seed Variety	RR	RR	RR
	Tillage	Conv.	Conv.	Conv.
Changes From Only Producing:	Corn			
	Cotton			
	Rice			
	Soybeans	$ (76.53)	$ (76.50)	$ (76.53)

Table 22 Continued

	Rotation	CC	CC
	Irrigation Type	Furrow	CP
	Seed Variety	RR/RR-Flex	RR/RR-Flex
	Tillage	Conv.	Conv.
Changes From Only Producing:	Corn	$ 1.82	$ 10.22
	Cotton	$ (157.08)	$ (167.91)
	Rice		
	Soybeans		

Notes:

[a] Same production method as baseline under ownership and cash rent but different returns to land charged via crop/cost share arrangement

[b] All costs born by the tenant except as outlined

e. Impact of Adopting a No-till Crop Rotation

Continuous cropping with no-till can lead to decreased yields over time from a number of factors. Adoption of a crop rotation is one way to ensure that no-till yields do not decrease over time and remain constant. Adopting a crop rotation would be one way for a participating YBP adopting no-till to get the best results as discussed previously in this article.

For a YBP who has traditionally only produced cotton, adoption of a no-till CC rotation to participate in the loan program would not be attractive from a profitability standpoint regardless of irrigation method, farmland ownership, or rental arrangement (Table 23 and Table 24). The cost savings from the adoption of no-till are not enough to make up for the lost revenue from a missed year of cotton production. On the other hand, this no-till rotation would be attractive for a YBP that has historically produced corn, regardless of irrigation method, rental arrangement or farmland ownership (Table 23 and Table 24). Using center-pivot irrigation and adoption of this rotation for participation in the loan program could produce increases net returns of $54.58 per acre when farmland is owned or cash-rented and increase in net returns by $38.35 per acre when farmland is crop-share rented (Table 23 and Table 24).

Adoption of a no-till SBW rotation for participation in the loan program would be considered by a YBP traditionally producing only soybeans, regardless of irrigation method, farmland ownership, or rental arrangement (Table 23 and Table 24). When farmland is owned or cash-rented, the adoption of a no-till SBW rotation and participation in the loan program increases a YBP's net returns per acre between $82.98 when flood irrigation is used to $93.86 when furrow irrigation is used (Table 23). With a crop-share leasing arrangement, a YBP's net returns per acre would increase in a range of $0.48 with flood irrigation to $11.36 per acre with furrow irrigation (Table 24).

Table 23: Comparison of No-till Crop Rotations Adoptions to Loan Program Participation for Five Major Crops in Arkansas Using 2011 Enterprise Budgets Across Ownership and Cash Rent. Assuming Constant Revenues. Numbers Represent $ per Acre.

		Rotation	RWSB	RWSB
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Financial Performance (Avg/yr)	Revenue	$ 987.05	$ 958.90
		Operating Expenses[a]	$ 360.15	$ 369.83
		Operating Interest	$ 13.81	$ 14.28
		Ownership Charges[b]	$ 65.71	$ 65.71
		NRAT[c]	$ 334.45	$ 291.30
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	No-Till	No-Till

Table 23 Continued

		Rotation	RWSB	RWSB
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 357.94	$ 363.60
		Modified Operating Interest	$ 13.13	$ 13.42
		Modified Ownership Charges	$ 57.81	$ 56.06
		Modified NRAT	$ 350.30	$ 315.99
		Changes in Interest Costs[d]	$ (0.68)	$ (0.86)
		Change in NRAT	$ 15.85	$ 24.69
		Change in Ownership Charges[e]	$ (7.90)	$ (9.65)
		% Increase/Decrease in NRAT	4.74%	8.47%
Changes From Only Producing:		Corn		
		Cotton		
		Rice	$ 85.53	$ 137.51
		Soybeans	$ 4.79	$ (29.52)

Table 23 Continued

		Rotation	RWSB	RWSB
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Hybrid	Clearfield Hybrid
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Financial Performance (Avg/yr)	Revenue	$ 1,043.35	$ 1,043.35
		Operating Expenses[a]	$ 354.03	$ 381.59
		Operating Interest	$ 13.87	$ 14.53
		Ownership Charges[b]	$ 35.30	$ 65.71
		NRAT[c]	$ 382.76	$ 357.86
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	No-Till	No-Till
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 364.52	$ 377.75
		Modified Operating Interest	$ 13.23	$ 13.67
		Modified Ownership Charges	$ 53.64	$ 53.64
		Modified NRAT	$ 402.87	$ 382.59
		Changes in Interest Costs[d]	$ (0.63)	$ (0.86)
		Change in NRAT	$ 20.11	$ 24.73
		Change in Ownership Charges[e]	$ 18.34	$ (12.07)
		% Increase/Decrease in NRAT	5.25%	6.91%
Changes From Only Producing:		Corn		
		Cotton		
		Rice	$ 41.47	$ 70.99
		Soybeans	$ 57.36	$ 37.09

Table 23 Continued

		Rotation	SBR	SBR
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Financial Performance (Avg/yr)	Revenue	$ 822.05	$ 793.90
		Operating Expenses[a]	$ 398.35	$ 381.19
		Operating Interest	$ 9.77	$ 10.24
		Ownership Charges[b]	$ 78.92	$ 78.92
		NRAT[c]	$ 335.01	$ 291.87
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	Participation	Participation
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 398.35	$ 412.87
		Modified Operating Interest	$ 9.34	$ 9.80
		Modified Ownership Charges	$ 78.92	$ 78.92
		Modified NRAT	$ 335.44	$ 292.32
		Changes in Interest Costs[d]	$ (0.43)	$ (0.45)
		Change in NRAT	$ 0.43	$ 0.45
		Change in Ownership Charges[e]	$ -	$ -
		% Increase/Decrease in NRAT	0.13%	0.15%
Changes From Only Producing:		Corn		
		Cotton		
		Rice	$ 70.67	$ 113.83
		Soybeans	$ (10.07)	$ (53.19)

Table 23 Continued

		Rotation	SBR	SBR
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Hybrid	Clearfield Hybrid
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Financial Performance (Avg/yr)	Revenue	$ 878.35	$ 878.35
		Operating Expenses[a]	$ 406.28	$ 431.04
		Operating Interest	$ 9.83	$ 10.50
		Ownership Charges[b]	$ 78.92	$ 78.92
		NRAT[c]	$ 383.32	$ 357.89
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	No-Till	No-Till
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 405.88	$ 426.24
		Modified Operating Interest	$ 9.39	$ 9.92
		Modified Ownership Charges	$ 63.72	$ 63.72
		Modified NRAT	$ 399.36	$ 378.48
		Changes in Interest Costs[d]	$ (0.44)	$ (0.58)
		Change in NRAT	$ 16.04	$ 20.59
		Change in Ownership Charges[e]	$ (15.21)	$ (15.21)
		% Increase/Decrease in NRAT	4.18%	5.75%
Changes From Only Producing:		Corn		
		Cotton		
		Rice	$ 37.97	$ 66.88
		Soybeans	$ 53.86	$ 32.97

Table 23 Continued

		Rotation	SBW	SBW
Own or Cash Rent	Production Methods	Irrigation Type	Furrow	CP
		Seed Variety	RR	RR
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	1	1
	Financial Performance (Avg/yr)	Revenue	$ 1,017.00	$ 1,017.00
		Operating Expenses[a]	$ 500.49	$ 530.64
		Operating Interest	$ 13.94	$ 14.77
		Ownership Charges[b]	$ 97.10	$ 130.66
		NRAT[c]	$ 405.47	$ 340.94
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	No-Till	No-Till
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 491.03	$ 522.74
		Modified Operating Interest	$ 13.11	$ 13.93
		Modified Ownership Charges	$ 77.52	$ 112.72
		Modified NRAT	$ 435.34	$ 367.60
		Changes in Interest Costs[d]	$ (0.84)	$ (0.83)
		Change in NRAT	$ 29.87	$ 26.67
		Change in Ownership Charges[e]	$ (19.58)	$ (17.94)
		% Increase/Decrease in NRAT	7.37%	7.82%
Changes From Only Producing:		Corn		
		Cotton		
		Rice		
		Soybeans	$ 93.86	$ 90.66

Table 23 Continued

		Rotation	SBW
Own or Cash Rent	Production Methods	Irrigation Type	Flood
		Seed Variety	RR
		Tillage	Conv.
		Lengh of Rotation (yrs)	1
	Financial Performance (Avg/yr)	Revenue	$ 1,017.00
		Operating Expenses[a]	$ 500.45
		Operating Interest	$ 13.94
		Ownership Charges[b]	$ 93.11
		NRAT[c]	$ 409.49
		Cash Rent ($/yr)	$ 100.00
	Change	Loan Program	No-Till
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 496.35
		Modified Operating Interest	$ 13.25
		Modified Ownership Charges	$ 78.91
		Modified NRAT	$ 428.49
		Changes in Interest Costs[d]	$ (0.70)
		Change in NRAT	$ 19.00
		Change in Ownership Charges[e]	$ (14.20)
		% Increase/Decrease in NRAT	4.64%
Changes From Only Producing:		Corn	
		Cotton	
		Rice	
		Soybeans	$ 82.98

Table 23 Continued

		Rotation	CC	CC
		Irrigation Type	Furrow	CP
	Production Methods	Seed Variety	RR/RR-Flex	RR/RR-Flex
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
Own or Cash Rent	Financial Performance (Avg/yr)	Revenue	$ 1,014.80	$ 1,014.80
		Operating Expenses[a]	$ 571.00	$ 606.17
		Operating Interest	$ 12.93	$ 13.88
		Ownership Charges[b]	$ 96.62	$ 134.64
		NRAT[c]	$ 334.26	$ 260.10
		Cash Rent ($/yr)	$ 116.00	$ 116.00
	Change	Loan Program	No-Till	No-Till
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 562.21	$ 597.21
		Modified Operating Interest	$ 12.12	$ 13.03
		Modified Ownership Charges	$ 86.82	$ 125.43
		Modified NRAT	$ 353.65	$ 279.14
		Changes in Interest Costs[d]	$ (0.80)	$ (0.85)
		Change in NRAT	$ 19.39	$ 19.04
		Change in Ownership Charges[e]	$ (9.80)	$ (9.22)
		% Increase/Decrease in NRAT	5.80%	7.32%
Changes From Only Producing:		Corn	$ 46.58	$ 54.58
		Cotton	$ (7.80)	$ (16.51)
		Rice		
		Soybeans		

Table 23 Continued

Notes:

[a] Inclues seed, fertilizer, chemicals, custom work, repair, maintenance, fuel, and irrigation supplies

[b] Annualized ownership charges includes tax, insurance, housing, as well as capital recovery on equipment

[c] Net returns above total specified expenses may be interpreted as returns to owner labor, land and capital employed. Subtracting cash rent would remove returns to land

[d] Operation's interest savings due to loan program participation

[e] Change in equipment ownership charges per acre may be multiplied by 5.5835 to arrive at change in loan volume per acre at 6% capital recovery rate assuming a 7 year average equipment loan and applies across ownership, cash rental or crop share arrangements

Table 24: Comparison of No-till Crop Rotations Adoptions to Loan Program Participation for Five Major Crops in Arkansas Using 2011 Enterprise Budgets For Crop-Share Rented. Assuming Constant Revenues. Numbers Represent $ per Acre.

		Rotation	RWSB	RWSB
Crop Share Rent		Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 740.29	$ 719.18
		Operating Expenses	$ 355.19	$ 365.16
		Operating Interest	$ 13.81	$ 14.28
		Ownership Charges	$ 65.71	$ 65.71
		NRAT	$ 95.12	$ 58.58
	Change	Loan Program	No-Till	No-Till
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 352.98	$ 358.93
		Modified Operating Interest	$ 13.13	$ 13.42
		Modified Ownership Charges	$ 57.81	$ 56.06
		Modified NRAT	$ 110.97	$ 83.26
		Changes in Interest Costs	$ (0.68)	$ (0.86)
		Change in NRAT	$ 15.85	$ 24.69
		Change in Ownership Charges	$ (7.90)	$ (9.65)
		% Increase/Decrease in Profits	16.66%	42.14%

Table 24 Continued

		Rotation	RWSB	RWSB
Crop Share Rent		Irrigation Type	Flood	Flood
				Clearfield
		Seed Variety	Hybrid	Hybrid
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 782.51	$ 782.51
		Operating Expenses	$ 359.90	$ 376.05
		Operating Interest	$ 13.87	$ 14.53
		Ownership Charges	$ 65.71	$ 65.71
		NRAT	$ 130.23	$ 105.34
	Change	Loan Program	No-Till	No-Till
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 358.98	$ 372.21
		Modified Operating Interest	$ 13.23	$ 13.67
		Modified Ownership Charges	$ 53.64	$ 53.64
		Modified NRAT	$ 150.34	$ 130.07
		Changes in Interest Costs	$ (0.63)	$ (0.86)
		Change in NRAT	$ 20.11	$ 24.73
		Change in Ownership Charges	$ (12.07)	$ (12.07)
		% Increase/Decrease in Profits	15.44%	23.48%

Table 24 Continued

		Rotation	SBR	SBR
Crop Share Rent		Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 616.54	$ 595.43
		Operating Expenses	$ 390.91	$ 398.37
		Operating Interest	$ 9.77	$ 10.24
		Ownership Charges	$ 78.92	$ 78.92
		NRAT	$ 136.93	$ 100.39
	Change	Loan Program	No-Till	No-Till
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 385.97	$ 397.50
		Modified Operating Interest	$ 9.21	$ 9.58
		Modified Ownership Charges	$ 69.97	$ 67.34
		Modified NRAT	$ 151.38	$ 121.01
		Changes in Interest Costs	$ (0.56)	$ (0.67)
		Change in NRAT	$ 14.45	$ 20.62
		Change in Ownership Charges	$ (8.95)	$ (11.58)
		% Increase/Decrease in Profits	10.55%	-20.54%

Table 24 Continued

		Rotation	SBR	SBR
Crop Share Rent		Irrigation Type	Flood	Flood
				Clearfield
		Seed Variety	Hybrid	Hybrid
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 658.76	$ 658.76
		Operating Expenses	$ 390.47	$ 415.22
		Operating Interest	$ 9.83	$ 10.50
		Ownership Charges	$ 78.92	$ 78.92
		NRAT	$ 172.05	$ 146.62
	Change	Loan Program	No-Till	No-Till
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 397.57	$ 417.93
		Modified Operating Interest	$ 9.39	$ 9.92
		Modified Ownership Charges	$ 63.72	$ 63.72
		Modified NRAT	$ 188.09	$ 167.20
		Changes in Interest Costs	$ (0.44)	$ (0.58)
		Change in NRAT	$ 16.04	$ 20.59
		Change in Ownership Charges	$ (15.21)	$ (15.21)
		% Increase/Decrease in Profits	9.32%	14.04%

Table 24 Continued

		Rotation	SBW	SBW
Crop Share Rent		Irrigation Type	Furrow	CP
		Seed Variety	RR	RR
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	1	1
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 762.75	$ 762.75
		Operating Expenses	$ 500.49	$ 530.64
		Operating Interest	$ 13.94	$ 14.77
		Ownership Charges	$ 97.10	$ 130.66
		NRAT	$ 151.22	$ 86.69
	Change	Loan Program	No-Till	No-Till
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 491.03	$ 522.74
		Modified Operating Interest	$ 13.11	$ 13.93
		Modified Ownership Charges	$ 77.52	$ 112.72
		Modified NRAT	$ 181.09	$ 113.35
		Changes in Interest Costs	$ (0.84)	$ (0.83)
		Change in NRAT	$ 29.87	$ 26.67
		Change in Ownership Charges	$ (19.58)	$ (17.94)
		% Increase/Decrease in Profits	19.75%	30.76%

Table 24 Continued

		Rotation	SBW
Crop Share Rent		Irrigation Type	Flood
		Seed Variety	RR
		Tillage	Conv.
		Lengh of Rotation (yrs)	1
	Crop Share[a]	Revenue (L/T)	25/75
		Cost-Share[b]	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 762.75
		Operating Expenses	$ 500.45
		Operating Interest	$ 13.94
		Ownership Charges	$ 93.11
		NRAT	$ 155.24
	Change	Loan Program	No-Till
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 496.35
		Modified Operating Interest	$ 13.25
		Modified Ownership Charges	$ 78.91
		Modified NRAT	$ 174.24
		Changes in Interest Costs	$ (0.70)
		Change in NRAT	$ 19.00
		Change in Ownership Charges	$ (14.20)
		% Increase/Decrease in Profits	12.24%

Table 24 Continued

	Rotation	CC	CC
	Irrigation Type	Furrow	CP
	Seed Variety	RR/RR-Flex	RR/RR-Flex
	Tillage	Conv.	Conv.
	Lengh of Rotation (yrs)	2	2
Crop Share[a]	Revenue (L/T)	25/75	
	Cost-Share[b]	Drying & Chemical (25/75)	Drying & Chemical
Tenant Financial Performance (Avg/yr)	Revenue	$ 761.10	$ 761.10
	Operating Expenses	$ 553.15	$ 588.32
	Operating Interest	$ 12.55	$ 13.51
	Ownership Charges	$ 96.62	$ 134.64
	NRAT	$ 98.78	$ 24.62
Change	Loan Program	No-Till	No-Till
Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 544.29	$ 579.28
	Modified Operating Interest	$ 11.76	$ 12.67
	Modified Ownership Charges	$ 86.82	$ 125.43
	Modified NRAT	$ 118.23	$ 43.72
	Changes in Interest Costs	$ (0.79)	$ (0.84)
	Change in NRAT	$ 19.45	$ 19.10
	Change in Ownership Charges	$ (9.80)	$ (9.22)
	% Increase/Decrease in Profits	19.69%	77.55%

Table 24 Continued

	Rotation	RWSB	RWSB	RWSB	RWSB
	Irrigation Type	Flood	Flood	Flood	Flood
	Seed Variety	Conv.	Clearfield	Hybrid	Clearfield Hybrid
	Tillage	Conv.	Conv.	Conv.	Conv.
Changes From Only Producing:	Corn				
	Cotton				
	Rice	$ 70.60	$ 115.98	$ 39.75	$ 69.26
	Soybeans	$ (62.78)	$ (90.49)	$ (23.41)	$ (43.69)

Table 24 Continued

	Rotation	SBR	SBR	SBR	SBR
	Irrigation Type	Flood	Flood	Flood	Flood
	Seed Variety	Conv.	Clearfield	Hybrid	Clearfield Hybrid
	Tillage	Conv.	Conv.	Conv.	Conv.
Changes From Only Producing:	Corn				
	Cotton				
	Rice	$ 111.02	$ 153.73	$ 77.49	$ 106.40
	Soybeans	$ (22.37)	$ (52.75)	$ 14.33	$ (6.55)

Table 24 Continued

	Rotation	SBW	SBW	SBW
	Irrigation Type	Furrow	CP	Flood
	Seed Variety	RR	RR	RR
	Tillage	Conv.	Conv.	Conv.
Changes From Only Producing:	Corn			
	Cotton			
	Rice			
	Soybeans	$ 11.36	$ 8.16	$ 0.48

Table 24 Continued

	Rotation	CC	CC
	Irrigation Type	Furrow	CP
	Seed Variety	RR/RR-Flex	RR/RR-Flex
	Tillage	Conv.	Conv.
Changes From Only Producing:	Corn	$ 30.35	$ 38.35
	Cotton	$ (12.19)	$ (19.02)
	Rice		
	Soybeans		

Notes:

[a] Same production method as baseline under ownership and cash rent but different returns to land charged via crop/cost share arrangement

[b] All costs born by the tenant except as outlined

Adoption of a no-till RWSB rotation and no-till SBR rotation and loan program participation would be attractive for a YBP historically producing soybeans to consider with all rice seed varieties except a Clearfield variety when farmland is owned or cash-rented (Table 23). When farmland is crop-share rented, a YBP would only consider adopting a SBR rotation with a hybrid rice seed variety (Table 24).

Adoption of a no-till RWSB rotation and no-till SBR rotation to participate in the loan program would be attractive to a YBP historically producing only rice regardless of farmland ownership, rental arrangement, or rice variety used in the rotation (Table 23 and Table 24). With a no-till RWSB rotation, net returns per acre would increase in a range of $41.47 with a hybrid rice variety used in the rotation to $137.51 when a Clearfield variety is used in the rotation for farmland owned or cash-rented, or in a range of $39.75 per acre with a hybrid rice variety to $115.98 per acre with a Clearfield rice variety for crop-share rented farmland (Table 23 and Table 24). With a no-till SBR rotation, net returns would increase in a range of $37.97 per acre with a hybrid rice variety to $134.00 per acre with a Clearfield rice variety when farmland is owned or cash-rented and from $77.49 per acre with a hybrid rice variety to $153.73 per acre with a Clearfield rice variety (Table 23 and Table 24).

f. Impact of Adopting No-till and a Crop Rotation - Five-Year Weighted Moving Average for Market Price

Adopting a no-till CC rotation and participating in the loan with the use of a FWMAP produces different results compared to the other CC rotations previously discussed. A YBP considering participating in the loan program by adopting a no-till CC rotation actually experiences per acre net returns increases compared to producing only furrow-irrigated cotton when farmland is owned or cash-rented (Table 25). Adoption of this no-till rotation while using center-pivot irrigation would still not produce net return levels above that of producing only

center-pivot irrigated cotton, regardless of landownership or rental method (Table 17 and Table 26).

When a FWMAP is used, a YBP historically producing soybeans would find adoption of either a no-till SBW, SBR, or RWSB rotation to be attractive for participation in the loan program when farmland is owned or cash-rented, regardless of rice seed variety used in the rotation or irrigation method used (Table 25). With a no-till SBW rotation, per acre net return increases would range from $78.03 for flood irrigation to $88.91 for furrow irrigation (Table 25). Per acre net return increases would range from $66.86 for a Clearfield rice variety to $165.60 for a hybrid rice variety in a no-till SBR rotation and range from $67.97 per acre for a Clearfield rice variety to $166.63 per acre for a hybrid rice variety for a no-till RWSB rotation (Table 25). Net return increases per acre could range from $0.64 with a conventional rice variety and $43.24 with a hybrid rice variety when a YBP is crop-share renting the farmland (Table 25). With a crop-share leasing arrangement, a YBP historically producing soybeans would not consider adopting the SBW rotation and only consider adopting a no-till RWSB rotation when a hybrid rice variety is used in the rotation (Table 26).

Table 25: Comparison of No-till Crop Rotations Adoptions to Loan Program Participation for Five Major Crops in Arkansas Using 2011 Enterprise Budgets Across Ownership and Cash Rent and Using a Five-Year Weighted Moving Average for Market Price. Assuming Constant Revenues. Numbers Represent $ per Acre.

		Rotation	RWSB	RWSB
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Financial Performance (Avg/yr)	Revenue	$ 1,015.21	$ 983.11
		Operating Expenses[a]	$ 360.15	$ 369.83
		Operating Interest	$ 13.81	$ 14.28
		Ownership Charges[b]	$ 65.71	$ 65.71
		NRAT[c]	$ 362.61	$ 315.51
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	No-Till	No-Till

Table 25 Continued

		Rotation	RWSB	RWSB
Own or Cash Rent		Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 357.94	$ 363.60
		Modified Operating Interest	$ 13.13	$ 13.34
		Modified Ownership Charges	$ 57.81	$ 56.06
		Modified NRAT	$ 378.46	$ 340.28
		Changes in Interest Costs[d]	$ (0.68)	$ (0.95)
		Change in NRAT	$ 15.85	$ 24.77
		Change in Ownership Charges[e]	$ (7.90)	$ (9.65)
		% Increase/Decrease in NRAT	4.37%	7.85%
	Changes From Only Producing:	Corn		
		Cotton		
		Rice	$ (21.62)	$ 35.24
		Soybeans	$ 106.15	$ 67.97

Table 25 Continued

		Rotation	RWSB	RWSB
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Hybrid	Clearfield Hybrid
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Financial Performance (Avg/yr)	Revenue	$ 1,079.42	$ 1,079.42
		Operating Expenses[a]	$ 354.03	$ 381.59
		Operating Interest	$ 13.87	$ 14.53
		Ownership Charges[b]	$ 35.30	$ 65.71
		NRAT[c]	$ 418.83	$ 393.93
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	No-Till	No-Till
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 364.52	$ 377.75
		Modified Operating Interest	$ 13.23	$ 13.67
		Modified Ownership Charges	$ 53.64	$ 53.64
		Modified NRAT	$ 438.94	$ 418.66
		Changes in Interest Costs[d]	$ (0.63)	$ (0.86)
		Change in NRAT	$ 20.11	$ 24.73
		Change in Ownership Charges[e]	$ 18.34	$ (12.07)
		% Increase/Decrease in NRAT	4.80%	6.28%
Changes From Only Producing:		Corn		
		Cotton		
		Rice	$ (72.75)	$ (43.23)
		Soybeans	$ 166.63	$ 146.36

Table 25 Continued

		Rotation	SBR	SBR
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Financial Performance (Avg/yr)	Revenue	$ 852.69	$ 820.58
		Operating Expenses[a]	$ 398.35	$ 381.19
		Operating Interest	$ 9.77	$ 10.24
		Ownership Charges[b]	$ 78.92	$ 78.92
		NRAT[c]	$ 365.64	$ 318.55
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	No-Till	No-Till
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 393.41	$ 404.50
		Modified Operating Interest	$ 9.21	$ 9.58
		Modified Ownership Charges	$ 69.97	$ 67.34
		Modified NRAT	$ 380.09	$ 339.16
		Changes in Interest Costs[d]	$ (0.56)	$ (0.67)
		Change in NRAT	$ 14.45	$ 20.62
		Change in Ownership Charges[e]	$ (8.95)	$ (11.58)
		% Increase/Decrease in NRAT	3.95%	6.47%
Changes From Only Producing:		Corn		
		Cotton		
		Rice	$ (19.99)	$ 34.12
		Soybeans	$ 107.79	$ 66.86

Table 25 Continued

		Rotation	SBR	SBR
Own or Cash Rent	Production Methods	Irrigation Type	Flood	Flood
		Seed Variety	Hybrid	Clearfield Hybrid
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Financial Performance (Avg/yr)	Revenue	$ 916.90	$ 916.90
		Operating Expenses[a]	$ 406.28	$ 431.04
		Operating Interest	$ 9.83	$ 10.50
		Ownership Charges[b]	$ 78.92	$ 78.92
		NRAT[c]	$ 421.87	$ 396.44
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	No-Till	No-Till
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 405.88	$ 426.24
		Modified Operating Interest	$ 9.39	$ 9.92
		Modified Ownership Charges	$ 63.72	$ 63.72
		Modified NRAT	$ 437.91	$ 417.02
		Changes in Interest Costs[d]	$ (0.44)	$ (0.58)
		Change in NRAT	$ 16.04	$ 20.59
		Change in Ownership Charges[e]	$ (15.21)	$ (15.21)
		% Increase/Decrease in NRAT	3.80%	5.19%
Changes From Only Producing:		Corn		
		Cotton		
		Rice	$ (73.78)	$ (44.87)
		Soybeans	$ 165.60	$ 144.72

Table 25 Continued

		Rotation	SBW	SBW
		Irrigation Type	Furrow	CP
	Production Methods	Seed Variety	RR	RR
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	1	1
Own or Cash Rent	Financial Performance (Avg/yr)	Revenue	$ 938.85	$ 938.85
		Operating Expenses[a]	$ 500.49	$ 530.64
		Operating Interest	$ 13.94	$ 14.77
		Ownership Charges[b]	$ 97.10	$ 130.66
		NRAT[c]	$ 327.32	$ 262.79
		Cash Rent ($/yr)	$ 100.00	$ 100.00
	Change	Loan Program	No-Till	No-Till
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 491.03	$ 522.74
		Modified Operating Interest	$ 13.11	$ 13.93
		Modified Ownership Charges	$ 77.52	$ 112.72
		Modified NRAT	$ 357.19	$ 289.45
		Changes in Interest Costs[d]	$ (0.84)	$ (0.83)
		Change in NRAT	$ 29.87	$ 26.67
		Change in Ownership Charges[e]	$ (19.58)	$ (17.94)
		% Increase/Decrease in NRAT	9.12%	10.15%
Changes From Only Producing:		Corn		
		Cotton		
		Rice		
		Soybeans	$ 88.91	$ 85.71

Table 25 Continued

		Rotation	SBW
Own or Cash Rent	Production Methods	Irrigation Type	Flood
		Seed Variety	RR
		Tillage	Conv.
		Lengh of Rotation (yrs)	1
	Financial Performance (Avg/yr)	Revenue	$ 938.85
		Operating Expenses[a]	$ 500.45
		Operating Interest	$ 13.94
		Ownership Charges[b]	$ 93.11
		NRAT[c]	$ 331.34
		Cash Rent ($/yr)	$ 100.00
	Change	Loan Program	No-Till
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 496.35
		Modified Operating Interest	$ 13.25
		Modified Ownership Charges	$ 78.91
		Modified NRAT	$ 350.34
		Changes in Interest Costs[d]	$ (0.70)
		Change in NRAT	$ 19.00
		Change in Ownership Charges[e]	$ (14.20)
		% Increase/Decrease in NRAT	5.73%
Changes From Only Producing:		Corn	
		Cotton	
		Rice	
		Soybeans	$ 78.03

Table 25 Continued

		Rotation	CC	CC
Own or Cash Rent	Production Methods	Irrigation Type	Furrow	CP
		Seed Variety	RR/RR-Flex	RR/RR-Flex
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Financial Performance (Avg/yr)	Revenue	$ 843.93	$ 843.93
		Operating Expenses[a]	$ 573.60	$ 606.17
		Operating Interest	$ 12.93	$ 13.88
		Ownership Charges[b]	$ 96.62	$ 134.64
		NRAT[c]	$ 163.39	$ 89.23
		Cash Rent ($/yr)	$ 116.00	$ 116.00
	Change	Loan Program	No-Till	No-Till
	Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 564.40	$ 599.80
		Modified Operating Interest	$ 12.12	$ 13.03
		Modified Ownership Charges	$ 86.82	$ 125.43
		Modified NRAT	$ 182.78	$ 108.27
		Changes in Interest Costs[d]	$ (0.80)	$ (0.85)
		Change in NRAT	$ 19.39	$ 19.04
		Change in Ownership Charges[e]	$ (9.80)	$ (9.22)
		% Increase/Decrease in NRAT	11.87%	21.34%
Changes From Only Producing:		Corn	$ 33.73	$ 41.73
		Cotton	$ (178.67)	$ (187.38)
		Rice		
		Soybeans		

Table 25 Continued

Notes:

[a] Inclues seed, fertilizer, chemicals, custom work, repair, maintenance, fuel, and irrigation supplies

[b] Annualized ownership charges includes tax, insurance, housing, as well as capital recovery on equipment

[c] Net returns above total specified expenses may be interpreted as returns to owner labor, land and capital employed. Subtracting cash rent would remove returns to land

[d] Operation's interest savings due to loan program participation

[e] Change in equipment ownership charges per acre may be multiplied by 5.5835 to arrive at change in loan volume per acre at 6% capital recovery rate assuming a 7 year average equipment loan and applies across ownership, cash rental or crop share arrangements

Table 26: Comparison of No-till Crop Rotations Adoptions to Loan Program Participation for Five Major Crops in Arkansas Using 2011 Enterprise Budgets For Crop-Share Rent and Using a Five-Year Weighted Moving Average for Market Price. Assuming Constant Revenues. Numbers Represent $ per Acre.

		Rotation	RWSB	RWSB
Crop Share Rent		Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 761.41	$ 737.33
		Operating Expenses	$ 355.19	$ 365.16
		Operating Interest	$ 13.81	$ 14.28
		Ownership Charges	$ 65.71	$ 65.71
		NRAT	$ 116.24	$ 76.73
	Change	Loan Program	No-Till	No-Till
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 352.98	$ 358.93
		Modified Operating Interest	$ 13.13	$ 13.42
		Modified Ownership Charges	$ 57.81	$ 56.06
		Modified NRAT	$ 132.09	$ 101.42
		Changes in Interest Costs	$ (0.68)	$ (0.86)
		Change in NRAT	$ 15.85	$ 24.69
		Change in Ownership Charges	$ (7.90)	$ (9.65)
		% Increase/Decrease in Profits	13.64%	32.17%

Table 26 Continued

		Rotation	RWSB	RWSB
Crop Share Rent		Irrigation Type	Flood	Flood
				Clearfield
		Seed Variety	Hybrid	Hybrid
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	3	3
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 809.57	$ 809.57
		Operating Expenses	$ 359.90	$ 376.05
		Operating Interest	$ 13.87	$ 14.53
		Ownership Charges	$ 65.71	$ 65.71
		NRAT	$ 157.29	$ 132.39
	Change	Loan Program	No-Till	No-Till
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 358.98	$ 372.21
		Modified Operating Interest	$ 13.23	$ 13.67
		Modified Ownership Charges	$ 53.64	$ 53.64
		Modified NRAT	$ 177.40	$ 157.12
		Changes in Interest Costs	$ (0.63)	$ (0.86)
		Change in NRAT	$ 20.11	$ 24.73
		Change in Ownership Charges	$ (12.07)	$ (12.07)
		% Increase/Decrease in Profits	12.78%	18.68%

Table 26 Continued

		Rotation	SBR	SBR
Crop Share Rent		Irrigation Type	Flood	Flood
		Seed Variety	Conv.	Clearfield
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 639.51	$ 615.44
		Operating Expenses	$ 390.91	$ 398.37
		Operating Interest	$ 9.77	$ 10.24
		Ownership Charges	$ 78.92	$ 78.92
		NRAT	$ 159.91	$ 120.40
	Change	Loan Program	No-Till	No-Till
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 385.97	$ 397.50
		Modified Operating Interest	$ 9.21	$ 9.58
		Modified Ownership Charges	$ 69.97	$ 67.34
		Modified NRAT	$ 174.36	$ 141.02
		Changes in Interest Costs	$ (0.56)	$ (0.67)
		Change in NRAT	$ 14.45	$ 20.62
		Change in Ownership Charges	$ (8.95)	$ (11.58)
		% Increase/Decrease in Profits	9.04%	17.12%

Table 26 Continued

		Rotation	SBR	SBR
Crop Share Rent		Irrigation Type	Flood	Flood
				Clearfield
		Seed Variety	Hybrid	Hybrid
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 687.67	$ 687.67
		Operating Expenses	$ 390.47	$ 415.22
		Operating Interest	$ 9.83	$ 10.50
		Ownership Charges	$ 78.92	$ 78.92
		NRAT	$ 200.96	$ 175.53
	Change	Loan Program	No-Till	No-Till
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 397.57	$ 417.93
		Modified Operating Interest	$ 9.39	$ 9.92
		Modified Ownership Charges	$ 63.72	$ 63.72
		Modified NRAT	$ 217.00	$ 196.11
		Changes in Interest Costs	$ (0.44)	$ (0.58)
		Change in NRAT	$ 16.04	$ 20.59
		Change in Ownership Charges	$ (15.21)	$ (15.21)
		% Increase/Decrease in Profits	7.98%	11.73%

Table 26 Continued

		Rotation	SBW	SBW
Crop Share Rent		Irrigation Type	Furrow	CP
		Seed Variety	RR	RR
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	1	1
	Crop Share[a]	Revenue (L/T)	25/75	25/75
		Cost-Share[b]	Drying (25/75)	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 704.14	$ 704.14
		Operating Expenses	$ 500.49	$ 530.64
		Operating Interest	$ 13.94	$ 14.77
		Ownership Charges	$ 97.10	$ 130.66
		NRAT	$ 92.61	$ 28.07
	Change	Loan Program	No-Till	No-Till
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 491.03	$ 522.74
		Modified Operating Interest	$ 13.11	$ 13.93
		Modified Ownership Charges	$ 77.52	$ 112.72
		Modified NRAT	$ 122.48	$ 54.74
		Changes in Interest Costs	$ (0.84)	$ (0.83)
		Change in NRAT	$ 29.87	$ 26.67
		Change in Ownership Charges	$ (19.58)	$ (17.94)
		% Increase/Decrease in Profits	32.25%	94.99%

Table 26 Continued

		Rotation	SBW
Crop Share Rent		Irrigation Type	Flood
		Seed Variety	RR
		Tillage	Conv.
		Lengh of Rotation (yrs)	1
	Crop Share[a]	Revenue (L/T)	25/75
		Cost-Share[b]	Drying (25/75)
	Tenant Financial Performance (Avg/yr)	Revenue	$ 704.14
		Operating Expenses	$ 500.45
		Operating Interest	$ 13.94
		Ownership Charges	$ 93.11
		NRAT	$ 96.63
	Change	Loan Program	No-Till
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 496.35
		Modified Operating Interest	$ 13.25
		Modified Ownership Charges	$ 78.91
		Modified NRAT	$ 115.63
		Changes in Interest Costs	$ (0.70)
		Change in NRAT	$ 19.00
		Change in Ownership Charges	$ (14.20)
		% Increase/Decrease in Profits	19.66%

Table 26 Continued

		Rotation	CC	CC
Crop Share Rent		Irrigation Type	Furrow	CP
		Seed Variety	RR/RR-Flex	RR/RR-Flex
		Tillage	Conv.	Conv.
		Lengh of Rotation (yrs)	2	2
	Crop Share[a]	Revenue (L/T)	25/75	
		Cost-Share[b]	Drying & Chemical (25/75)	Drying & Chemical
	Tenant Financial Performance (Avg/yr)	Revenue	$ 632.95	$ 632.95
		Operating Expenses	$ 553.15	$ 588.32
		Operating Interest	$ 12.55	$ 13.51
		Ownership Charges	$ 96.62	$ 134.64
		NRAT	$ (29.37)	$ (103.53)
	Change	Loan Program	No-Till	No-Till
	Tenant Modified Financial Performance (Avg/yr)	Modified Operating Expenses	$ 544.29	$ 579.28
		Modified Operating Interest	$ 11.76	$ 12.67
		Modified Ownership Charges	$ 86.82	$ 125.43
		Modified NRAT	$ 49.34	$ (25.17)
		Changes in Interest Costs	$ (0.79)	$ (0.84)
		Change in NRAT	$ 78.71	$ 78.36
		Change in Ownership Charges	$ (9.80)	$ (9.22)
		% Increase/Decrease in Profits	267.97%	75.68%

Table 26 Continued

	Rotation	RWSB	RWSB	RWSB	RWSB
	Irrigation Type	Flood	Flood	Flood	Flood
	Seed Variety	Conv.	Clearfield	Hybrid	Clearfield Hybrid
	Tillage	Conv.	Conv.	Conv.	Conv.
Changes From Only Producing:	Corn				
	Cotton				
	Rice	$ (9.13)	$ 134.14	$ 66.80	$ 96.32
	Soybeans	$ (41.66)	$ (72.34)	$ 3.64	$ (16.64)

Table 26 Continued

	Rotation	SBR	SBR	SBR	SBR
	Irrigation Type	Flood	Flood	Flood	Flood
	Seed Variety	Conv.	Clearfield	Hybrid	Clearfield Hybrid
	Tillage	Conv.	Conv.	Conv.	Conv.
Changes From Only Producing:	Corn				
	Cotton				
	Rice	$ 33.14	$ 173.74	$ 106.40	$ 135.31
	Soybeans	$ 0.60	$ (32.74)	$ 43.24	$ 22.36

Table 26 Continued

Rotation		SBW	SBW	SBW
Irrigation Type		Furrow	CP	Flood
Seed Variety		RR	RR	RR
Tillage		Conv.	Conv.	Conv.
Changes From Only Producing:	Corn			
	Cotton			
	Rice			
	Soybeans	$ (47.26)	$ (50.46)	$ (58.13)

Table 26 Continued

Rotation		CC	CC
Irrigation Type		Furrow	CP
Seed Variety		RR/RR-Flex	RR/RR-Flex
Tillage		Conv.	Conv.
Changes From Only Producing:	Corn	$ 79.97	$ 87.98
	Cotton	$ (81.09)	$ (87.91)
	Rice		
	Soybeans		

Notes:

[a] Same production method as baseline under ownership and cash rent but different returns to land charged via crop/cost share arrangement

[b] All costs born by the tenant except as outlined

A YBP historically producing only rice would only consider adopting either a no-till RWSB rotation or a no-till SBR rotation when a Clearfield rice variety is used and the farmland is owned or cash-rented (Table 25). When farmland is crop-share rented, a YBP historically producing only rice would consider adopting a no-till SBR rotation regardless of variety used with net returns per acre ranging from $33.14 with a conventional rice variety to $173.74 per acre for Clearfield variety (Table 26). A YBP crop-share renting farmland and considering adopting a RWSB rotation for participation in the loan program would consider all rice seed varieties but a conventional variety (Table 26).

5. Government Programs to Reduce Adoption Costs

One thing not considered in our budgets is participation in a state or federal conservation program. Many of the chosen menu practices are eligible for financial assistance from USDA's Natural Resource Conservation Service (NRCS), FSA, or the Arkansas Natural Resource Commission. These government programs may also have special provisions that allow for increased cost-share rates and special monies set aside for YBPs and could help reduce costs of implementing many of the practices.

The Environmental Quality Incentives Program (EQIP) is a voluntary conservation program administered by NRCS that provides technical and financial assistance in implementing various approved conservation practices. Financial assistance of the approved conservation practices is provided through cost-share payments. The 2008 Farm Bill provided specifically that 5 percent of EQIP funds be used to help YBPs. This 5 percent of EQIP funds allocated to YBPs is available on a first-come-first-served-basis. With EQIP, YBPs are eligible for higher cost-share rates than traditional producers, up to 90 percent of the conservation practice cost-shared instead of the normal 75 percent cost share rate.

For YBPs already implementing practices considered the loan program's menu, the 2008 Farm Bill established the Conservation Stewardship Program (CSP) administered by NRCS. CSP "is a voluntary program that encourages agricultural and forestry producers to address resource concerns by (1) undertaking additional conservation activities and (2) improving and maintaining existing conservation systems." (CSP Factsheet 2010). Similar to EQIP, CSP has set aside 5 percent of the total number of acres enrolled as available for YBPs to enroll on a first-come-first-served-basis. CSP pays based on conservation performance, meaning the more conservation practices being utilized the higher the payment the farmer will receive. YBPs could collect two CSP payments: 1) an annual payment for installing new conservation practices and for maintaining existing conservation practices and 2) payment if the YBP also adopts a resource-conserving cover crop (CSP Factsheet 2010). CSP would provide YBPs with already established conservation practices an annual payment to maintain existing conservation practices and to install new conservation practices to improve their land.

The Wildlife Habitat Incentive Program (WHIP) is a voluntary conservation program designed to help landowners develop and improve wildlife habitat on agricultural land. One approved conservation practice for WHIP YBPs may find beneficial to their operations is establishment of field borders. These field borders could be used to attract beneficial species that are natural predators of various pests in conjunction with an IPM plan. Both an IPM plan and buffer strips, such as field borders, are practices a YBP can adopt to participate in the loan program.

A YBP could should consider signing up for these federal or state conservation programs. The programs provide either a cost share payment to implement new approved conservation practices on the YBP's farm or a payment to maintain existing conservation practices. For a

YBP struggling to make a profit with their operation, these conservation programs can help to greatly reduce the costs of implementing practices in the pilot program's menu of practices.

6. Implications of Results

Adoption of no-till and the adoption of a crop rotation were selected to analyze because these two practices were thought to potentially have the largest impact on improving a participating YBP's profitability. A participating YBP would be able to see quicker improvements to their bottom line from cost savings compared to adopting other practices, such as precision land leveling or buffer strips that could require large initial investments. Review of two selected conservation practices with loan program participation demonstrates that a YBP, in most cases, could earn higher profits per acre when adopting either no-till, a crop rotation, or a no-till crop rotation and participating in the loan program compared to the baseline situation, regardless of owning or renting the farmland. In periods of low crop prices and high production costs, adopting one practice or a combination of the two practices reviewed in this manuscript along with loan program participation can reduce the size of a loss experienced by a YBP. These results show that consideration for adopting the loan program have merit.

Looking at our results, from the previous article we discussed initially studying implementation of the loan program by using twenty selected YBPs currently making their payments but falling short of breaking even as the initial subsample group (Goeringer 2012). We could assume that participation in the loan program and adoption of one practice or a combination of the two practices could have pushed members of our proposed sample group towards breaking even and making a profit in their operations. Research conducted by the University of Arkansas also shows that 47.5 percent beginning producers who receive FSA operating voluntarily left agriculture for reasons other than death or retirement upon leaving the

loan program, compared to 34.6 percent of regular recipients of operating loans from FSA (Dixon, et al. 2007). Beginning farmers also have a higher percentage of FSA operating loans terminated due to foreclosure, bankruptcy, or debt write-off, 9.6 percent for one-year operating loans and 16.1 percent for seven-year loans (Nwoha, et al., 2005). This pilot loan program may give our proposed sample group that push towards profitability in their operations, keeping them in agriculture and not leave agriculture for some other less risky venture, like taking a position in town.

Although the loan program's production and interest cost savings may not create large increases in a YBP's per acre profitability in all scenarios analyzed, when considered for an entire operation they could be substantial. For example, a YBP producing 500 crop-share rented acres of corn using center-pivot irrigation, adopting no-till, and participating in the loan program could experience a $9,665 total increase compared to the baseline situation. A YBP producing 400 cash-rented acres of conventional rice could experience potential increases by $28,208 with adoption of no-till and loan program participation compared to the baseline. For a YBP starting a new operation or just starting a new family, profit increases experienced from participating in the loan program could be what a YBP needs to stay in agriculture and not exit.

Finally, crop prices will not always stay at record high levels. Agriculture could once more experience lower prices and shrinking profit margins. Results show that in these periods, participation in the loan program would work to reduce the size of the loss experienced by a YBP. Experiencing a smaller loss could be one thing that helps keeps a YBP in agriculture during periods of tighter profit margins. By working to help keep YBPs profitable in the early years of their operation, they would potentially remaining agriculture for years to come and become more successful producers in the long-term.

7. Limitations of Research

To truly determine the impact of the loan program on a YBP's per acre profitability, we would need to evaluate the other eight practices not considered in this manuscript. Such an analysis may demonstrate that a practice included in the loan program may not actually increase a participating YBP's profitability. We cannot expect a YBP considering participating in the loan program to adopt one of the other eight practices without truly understanding the practice's impact on their operation. Once this analysis is complete, we would be able to fully present to a potential participant each practice and its potential impact on their profitability to allow the potential participant to make a truly informed decision about which practices to adopt.

For the two practices examined in this manuscript, more analysis is needed to a better predict the long-term impacts of the loan program. With our current analysis, we have only focused on the production cost data for the 2011 extension budgets using the 2011 assumed crop prices and, alternatively, a FWMAP. Future analysis would need to assess the impact from adoption of these two practices or a combination of the two when production costs change. Like crop prices, production costs change over time. To gain a better understanding of the long-term impacts on YBP's profitability, we would want to determine the impact of the loan program under various production cost situations.

Further investigation needs to be done on the extent of additional equipment purchases will have on a struggling YBP's bottom-line. Adoption of practices such as no-till and precision land leveling, for example, can require additional capital to purchase no-till drills or for the cost of precision land leveling. Additional research needs to be done to determine payback periods to truly give a YBP an idea of the additional equipment purchase is possible given the current size of their operations. This research would also benefit a FCB considering adopting this loan

program to gain a better understanding of lending opportunities that could arise because of a YBP adopting a practice from the program.

One other area of future research would be to focus on the impact on FCB's profitability. By granting concessionary interest rates or waiving fees, FCBs would experience reduced returns on those loans. However, potential increases in loan payback rates and additional loan activity could more than offset these reduced returns. Future research would need to focus on the exact impacts on participating FCBs. This analysis would need to focus on long-term impacts the FCB could experience from adopting the loan program, such as gaining long-term borrowers.

This manuscript has only brushed the surface of this important topic and provided an initial analysis to determine if the loan program would impact a participating YBP's profitability. As discussed above, future research is needed to truly determine the short-term and long-term impacts on a YBP's profitability. Research is also needed to determine if costs incurred by a FCB from granting a concessionary rate to a YBP can result in developing a long-term lending relationship which could be beneficial to a FCB.

C. Conclusion

Research has shown that by 2014, 50 percent of current farm operators will retire and that an increased number of YBPs will be need to replace these retiring producers. (Mishra, Wilson, and Williams 2009). This same research points out that one reason for the decline in YBPs is due to barriers to entry due to large initial investments and large yearly capital requirements. The foregoing analysis indicates the loan program has the potential to help reduce some of the production costs and capital costs that agricultural producers face each year through the adoption of cost-saving management practices and concessionary interest rates. Although this article has limited itself to two of the ten proposed practices, future work would allow us to include the

necessary analysis and development of budgets for all ten practices included in the initial loan program.

Table 19 shows the most profitable results for the adoption of no-till, a crop rotation, or a no-till crop rotation and participation in the loan program by a YBP owning the farmland. A YBP owning farmland and considering participating in the loan program would have many options available when looking at no-till adoption or adopting a crop rotation. A YBP cash renting farmland would also have many options available when considering adopting no-till, a crop rotation, or a no-till crop rotation to participate in the loan program. Table 27 shows the best results for the three practices analyzed for a YBP that cash rents farmland. A YBP crop-share renting farmland would have the fewest options available in considering adopting these three practices to participate in the loan program, but would still be able to find options that help increase farm profitability. This is because the landlord is taking a percentage of the crop and

Table 27: Most Profitable Results for No-Till, Crop Rotation, and No-till Rotation for Own, Cash-Rented, and Crop-Share Rented Farmland

		Own Land -- Profit/Acre ($)	Cash Rent -- Profit/Acre ($)	Crop-Share -- Profit/Acre ($)
No-Till:				
	Center-Pivot Corn	$ 314.39	$ 198.39	$ 24.70
	Furrow Cotton	$ 335.29	$ 266.07	$ 130.42
	Conventional Rice	$ 335.29	$ 235.29	$ 110.89
	Furrow Soybeans	$ 368.66	$ 268.66	$ 196.91
	Wheat	$ 43.29	$ (11.71)	$ (39.21)
Rotations:				
	RWSB - Hybrid Rice	$ 383.36	$ 283.36	$ 130.83
	SBR - Hybrid Rice	$ 371.11	$ 271.11	$ 173.01
	SBW - Center-Pivot	$ 341.57	$ 241.57	--
No-Till Rotations:				
	RWSB - Hybrid Rice	$ 383.49	$ 283.49	$ 130.83
	SBR - Hybrid Rice	$ 383.75	$ 283.75	$ 172.48
	SBW - Furrow	$ 435.34	$ 335.34	$ 181.09

reduces a YBP's expected crop revenue. Table 27 shows the best results for a YBP crop-share renting farmland.

Our research on the loan program will not end with this manuscript. Further research is needed to demonstrate the impact of the remaining eight practices on a participating YBP's profitability and to gain a better understanding of the long-term impact of the loan program's impact through modeling changes in production costs and market prices. As this future research progresses, we will truly get a better understanding of the loan program's true impact on YBP profitability.

Our analysis shows that the loan program can result in increased profitability for participating YBPs. This loan program could improve profitability of the YBPs selected for the pilot program and transform them into more profitable producers. Although no single program will be the cure all to our dwindling numbers of YBPs in the U.S. and Arkansas, the pilot loan program could help to keep some in agriculture and operating profitable, successful operations into the future.

IV. Concluding Thoughts

Agricultural producers, both nationwide and in Arkansas, are getting older. The average age of U.S. producers increased in each Census since 1982 and the average age of Arkansas producers increased in each Census since 1978, due in part to the growing number of producers over the age of 65 from 1974 to 2007. At the same time the number of older producers increased, the number of U.S. and Arkansas producers under the age of 25 and between the ages of 25 to 34 both experienced large declines from 1974 to 2007.

Research has shown that by 2014, 50 percent of current farm operators will retire and that an increased number of YBPs would be needed to replace these retiring producers. (Mishra, et al. 2009). This same research points out one reason for the decline in YBPs is barriers to entry due to large initial investments and higher costs of large yearly operating loans, compared to older more established producers. The proposed loan program has potential to be successful in helping reduce lending costs and improving profitability for YBPs.

Producers in the loan program would be rewarded through concessionary interest rates and/or fees for adopting selected best management practices that focused on improving one of four areas of societal concern: (1) water quality; (2) water quantity; (3) air quality; and (4) soil quality. Best management practices selected for inclusion in the program must demonstrate the practice maintains or increases farm profitability. Based up on a review of literature and interviews with subject matter experts, ten practices were selected that met the above criteria: (1) conservation tillage; (2) integrated pest management; (3) buffer strips; (4) use of cover crops; (5) precision land leveling; (6) underground irrigation pipe; (7) use of crop rotations; (8) tailwater recovery systems; (9) planting appropriate seed varieties; and (10) planting and irrigating

according to the standards found in the Arkansas crop production handbooks for rice, wheat, corn, soybeans, and grain sorghum.

YBPs implementing one or more of these 10 practices would receive concessionary interest rates and loan fees from their FCB. The concessionary interest rate and loan fees would be similar in nature to those being offered to YBPs through current lender programs. The main difference from current YBP programs offered by the FCBs would be the requirement to adopt best management practices to help increase YBPs' profitability. The reduction in interest rates and loan fees along with practices to increase profitability would work to increase YBP participants' profitability and work as an incentive to retain them in production agriculture.

The loan program would be run initially as a three-year study with the three Arkansas FCBs. These FCBs would select twenty potential participants who are making their loan payments but currently not making a profit in their operation. The goal is to turn this initial sample group into profitable producers. Monitoring of practice implementation would be done by NRCS, as many of the practices are approved for EQIP or other conservation programs. At the end of the three-year study, the loan program would be reviewed and adjusted for potential adoption by other states' FCBs to implement with their YBPs lending program.

The initial analysis of the proposed loan program impact has demonstrated the loan program can have a positively influence a participating YBP's profitability. Further research is needed to demonstrate the impact of the remaining eight practices on a participating YBP's profitability and to gain a better understanding of the long-term impact of the loan program by modeling changes in production costs and market prices. As this future research progresses, we will truly get a better understanding of the loan program's true impact on YBP profitability.

This loan program could improve profitability of the YBPs selected for the pilot program and transform them into more profitable producers. Although no single program will be the cure all to dwindling numbers of YBPs in the U.S. and Arkansas, the pilot loan program could help to keep some in agriculture and operating profitable, successful operations into the future.

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