ECONOMICALLY FEASIBLE CROP PRODUCTION ALTERNATIVES TO PEANUTS IN SOUTHWESTERN OKLAHOMA

By

SHANKAR DEVKOTA

Bachelor of Science in Agriculture

Tribhuvan University

Chitwan, Nepal

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Thesis Approved:

Rodney Holcomb
Thesis Adviser

Merritt Taylor

Francis Epplin

A. Gordon Emslie
Dean of the Graduate College

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TABLE OF CONTENTS

Chapter Page

INTRODUCTION 1

Background 1
Direct Fixed Payments and Counter Cyclical Payments 2
Marketing Assistance Loans 3
Problem Statement 3
Objectives 7
General Objective 7
Specific Objectives 7

REVIEW OF LITERATURE 8

Historical Overview of U.S. Peanut Policy 8
Policy Change and its Impact on Peanut Producers 14
Risk in Agricultural Production 17
Stochastic Dominance Analysis 19

METHODOLOGY 21

Gross Income (GI) 23
Price and Yield Data 23
Government Payments for Program Crops 26
Estimating Costs of Production 28
Variable Costs 28
Machinery Costs 29
Irrigation Costs 32
Net Returns 33
Stochastic Simulation 34
Risk Efficiency Analysis 35

RESULTS AND DISCUSSION 38

Profitability Analysis 38

Simulated Net Returns 41
Stochastic Dominance Analysis... 45

SUMMARY AND CONCLUSION 53

BIBLIOGRAPHY... 55

APPENDICES 59

APPENDIX -- A: ENTERPRISE BUDGETS.. 60
APPENDIX – B: FIELD OPERATION.. 68
APPENDIX – C: IRRIGATION ESTIMATES.. 72
APPENDIX – D: Caddo County Peanut Information... 73

LIST OF TABLES

Tables Page

Table 1: General Assumptions made while Preparing Enterprise Budget for Peanuts, Cotton, Soybeans and Watermelon produced in Caddo County 22

Table 2: Sources, Time Period and Summary Statistics of Producer received Prices for Peanuts, Cotton, Soybeans and Watermelons 24

Table 3: Sources, Time Period and Summary Statistics of Yield for Peanuts, Cotton, Soybeans and Watermelons 25

Table 4: Summary Statistics of Pre-harvest Machinery Custom Rates used in the Budgets for Caddo County.. 30

Table 5: Summary Statistics of Harvest Machinery Custom Rates used in the Budgets for Caddo County 31

Table 6: Ranking of Crop Production Choices based on Net Returns generated from the Enterprise Budgets using Baseline Mean Costs and Prices 39

Table 7: DCP Payments, Net Returns and Percent Contribution of Government Payment on Net Returns for Crop Alternatives in Caddo County using Baseline Costs and Prices 40

Table 8: Summary Statistics of Simulated Average Net Returns generated from Stochastic Budgets ($/Acre) 41

Table 9: Probabilities Associated with Net Returns for Different Crop Alternatives in Caddo County... 43

Table 10: Preference Rankings of Crop Production Alternatives in terms of Absolute Risk Aversion Coefficient 46

Table 11: Confidence Premium ($/Acre) for Risk Preferring Farmer with -0.01 ARAC 50

Table 12: Confidence Premium ($/Acre) for Risk Neutral Farmer with -0.0001 to 0.0001 ARAC 50

Tables Page

Table 13: Confidence Premium ($/Acre) for Risk Averse Farmer with 0.01 ARAC 51

Table 14: Break Even Risk Aversion Coefficient from Pair-wise Comparison of Crop Production Choices 52

Table 15: Variable Cost, Fixed Costs, Revenue and Net Returns for Custom Operated Irrigated Peanuts 60

Table 16: Variable Cost, Fixed Costs, Revenue and Net Returns for Custom Operated Dry land Peanuts 61

Table 17: Variable Costs, Fixed Costs, Revenue and Net Returns for Custom Operated Irrigated Cotton 62

Table 18: Variable Costs, Fixed Costs, Revenue and Net Returns for Custom Operated Dry land Cotton 63

Table 19: Variable Costs, Fixed Costs, Revenue and Net Returns for Custom Operated Irrigated Soybeans 64

Table 20: Variable Costs, Fixed Costs, Revenue and Net Returns for Custom Operated Dry land Soybeans 65

Table 21: Variable Costs, Fixed Costs, Revenue and Net Returns for Custom Operated Seedless Watermelon 66

Table 22: Variable Costs, Fixed Costs, Revenue and Net Returns for Custom Operated Seeded Watermelons 67

Table 23: Specified Monthly Field Operations for Irrigated Peanuts 68

Table 24: Specified Monthly Field Operations for Dry land Peanuts 68

Table 25: Specified Monthly Field Operations for Irrigated Soybeans 68

Table 26: Specified Monthly Field Operations for Dry land Soybeans 69

Table 27: Specified Monthly Field Operations for Irrigated Cotton 69

Table 28: Specified Monthly Field Operations for Dry land Cotton 70

Table 29: Specified Monthly Field Operations for Seedless Watermelons 70

Tables Page

Table 30: Specified Monthly Field Operations for Seeded Watermelons 71

Table 31: Annual Fixed Cost Estimates for Center Pivot Sprinkler Irrigation System in Caddo County 72

Table 32: Annual Variable Cost Estimates for Center Pivot Sprinkler Irrigation System in Caddo County 72

LIST OF FIGURES

Figures Pages

Figure 1: Percent Change in Peanut Planted Acres (2001 vs. 2003) 4

Figure 2: Peanut Planted Acres in Oklahoma, 1925 - 2004 (in 1000 acres)....................... 5

Figure 3: Average Price of Peanuts Received by Oklahoma Farmers and the Value of Production (1990 - 2003) 6

Figure 4: Spotlight Chart of Eight Crop Production Alternatives in Caddo County... 44

CHAPTER I

INTRODUCTION

Background

Peanuts are an important cash generating traditional crop in Oklahoma and grown primarily in the southwest and southeast portions of the State. However, the more concentrated growing is found in Southwestern Oklahoma covering 66.50 percent of Oklahoma's peanut producing area. Peanuts rank 7th in value among Oklahoma agricultural commodities and Oklahoma ranks 6th among peanut producing states with 4.63 percent of US peanut Production (Oklahoma Agricultural Statistics Service, 2003).

The Farm Security and Rural Investment Act of May 2002 (denoted as The 2002 Farm Bill hereafter) brought about historic changes in the US approach to regulating peanut markets. Before 2002, peanuts had been among a small group of US commodities regulated by marketing quotas. This marketing quota regulation system was established during the great depression to support and stabilize growers' incomes through supply limitation and price supports (Dohlman et al.).

Under the marketing quota system, supply controls assured peanut quota holders of receiving high support prices. Those quota peanuts could be sold for the domestic food use market. Peanuts produced beyond the quota limits could be sold at a lower price to the crush market or could be exported. Non-quota peanuts were called "additionals". Producers who were quota owners had the right to rent their quotas. Under the 1996 Farm Bill, these quota peanuts were priced up to $610 per ton. Producers who did not have quota rights were assured only $132 per ton in 2001/2002 (1996 Farm Bill).

The 2002 Farm Bill terminated this supply limiting marketing quota system for peanuts. The new peanut policy implied that all peanut producers, whether quota holders or non-quota holders are eligible for the same kinds of government payments that are available for the mainstream commodity crops such as grains, cotton and oilseed crops. The 2002 Farm Bill includes three provisions for peanuts growers: direct fixed payments, counter cyclical payments and marketing assistance loans.

Direct Fixed Payments and Counter Cyclical Payments

Those farmers who have enrolled for peanut base acres are eligible for Fixed Direct Payments. Direct Payments are derived by a formula from National payment rates, 85 percent of the farmer's base acres and farmer's payment yield. For peanuts, Direct Payments are fixed at $36 per ton. Farmers are eligible for Counter Cyclical Payments when the effective price falls below the target price. The target price for peanuts is set at $495 per ton. Unlike Direct Payments, Counter Cyclical Payments are variable.

Marketing Assistance Loans

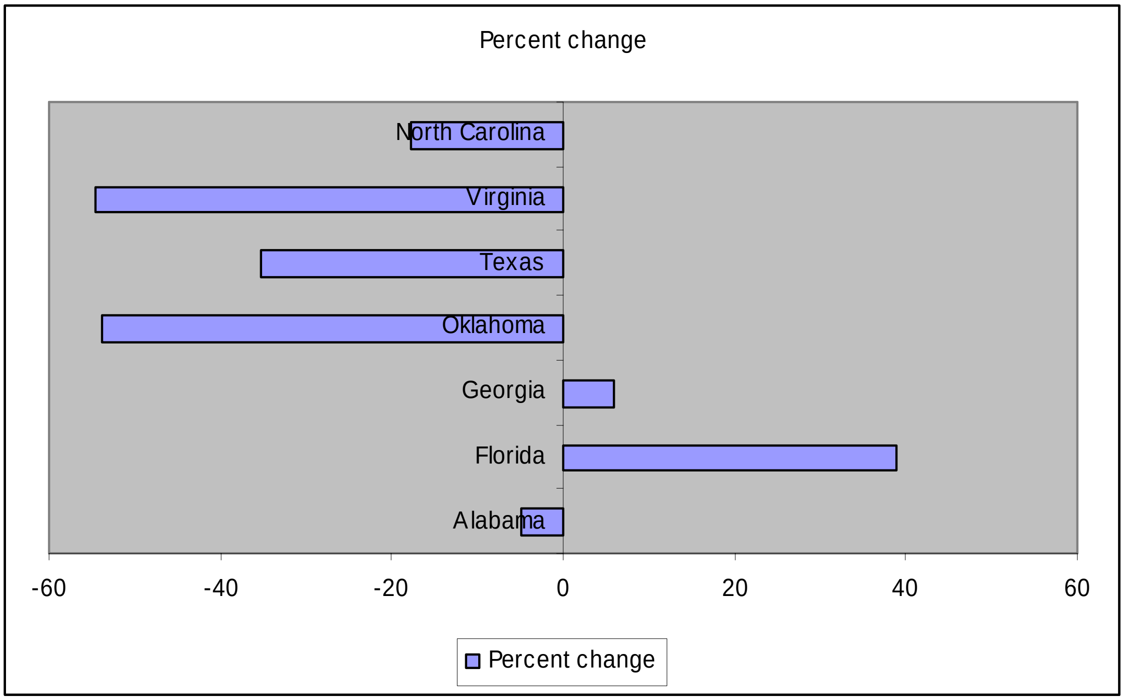
Peanut producers are eligible to receive marketing assistance loan benefits when the loan repayment rate that is established by United States Department of Agriculture (USDA) falls below the marketing loan rate, which is fixed at $355 per ton during the period of 2002-2007. Producers can either repay the marketing loan at the lower of the loan repayment rate, repay the loan rate plus interest anytime prior to the date the loan matures (9 months from the date of the loan) or forfeit the peanuts used as collateral to the Federal Government at the loan maturity. Alternatively, producers can forgo the loan and accept a loan deficiency payment if the marketing loan rate exceeds the repayment rate.

Problem Statement

US Peanut growers are a small but geographically concentrated group of farmers. Due to the crop's soil and climatic requirements, peanuts are produced only in 9 states. These states fall in one of three regions: The Southeast (Georgia, Alabama, Florida and South Carolina), the Southwest (Texas, Oklahoma and New Mexico) and Mid-Atlantic (Virginia and North Carolina).

The passage of the 2002 Farm Bill eliminated the support price policy. Consequently, farmers are obligated to sell their peanuts at prices as low as half the support price prior to the 2002 Farm Bill. Due to the fall in price, these peanut growing areas experienced large declines in the acreage in recent years. According to the USDA, National Agricultural Statistical Service data base, after the establishment of the 2002 Farm Bill, the US peanut planted acreage declined 12 percent from 2001 to 1.36 million acres and was the smallest since 1982. The decline in planted acres in the year 2003, compared with year 2001, was steep in Virginia (55 percent), Oklahoma (54 percent) and Texas (35 percent) (Fig.1)

Figure 1: Percent Change in Peanut Planted Acres (2001 vs. 2003)

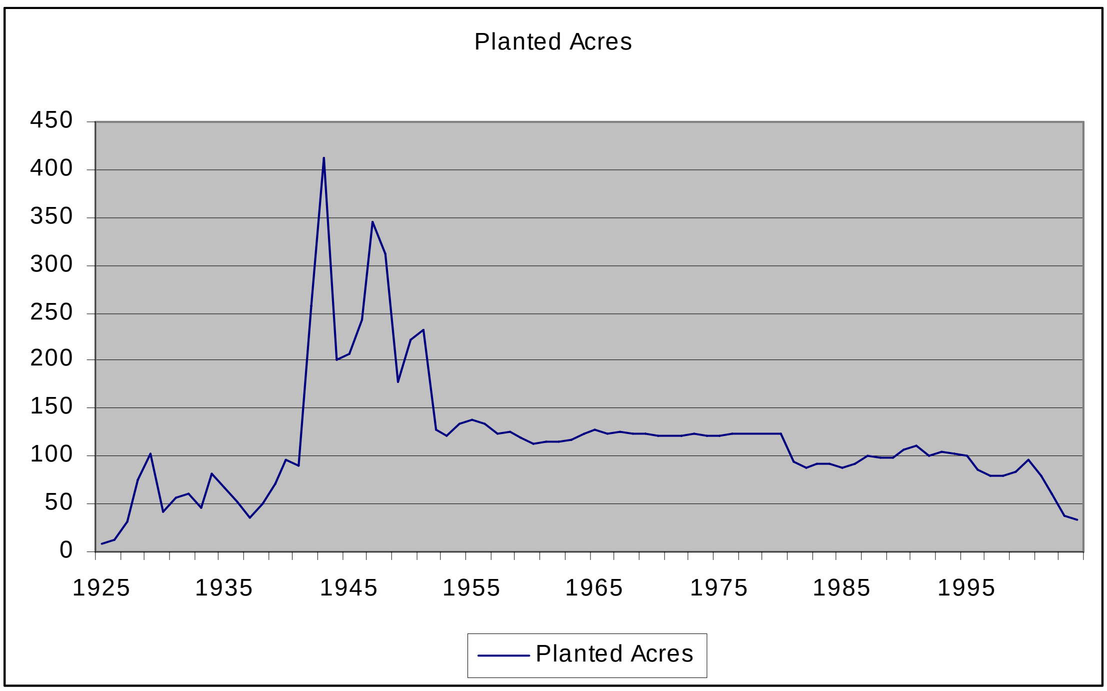


Source: USDA, National Agricultural Statistics Service.

Oklahoma peanut planted acres dramatically dropped in the 2003 planting season to the lowest level since 1928 (Fig 2). The drop in planted acres caused reduced production and hence the value of production. Oklahoma peanut production has already decreased to 98 million pounds in 2003 from 198 million pounds in 2001, more than a 50 percent decrease in production. Similarly, the value of production decreased to 18.7 million dollars in 2003 from 54.2 million dollars in 2001, more than a 65 percent decrease (Fig 3).

It is obvious that in Oklahoma peanut production is not as profitable as it was prior to the 2002 Farm Bill. The change forced many Oklahoma farmers to abandon peanut production and look for alternative crops. Farmers have complained that the present market price for peanuts is not sufficient to cover the cost of production (Beerwinkle).

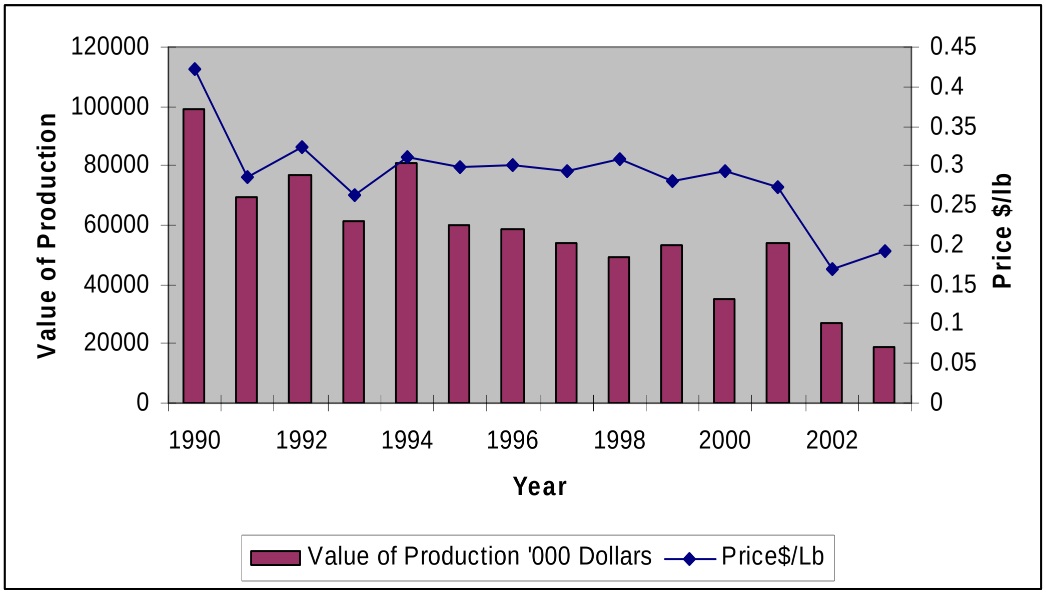
Figure 2: Peanut Planted Acres in Oklahoma, 1925 - 2004 (in 1000 acres)



Source: USDA, National Agricultural Statistical Service

Many farmers have expressed an interest in switching to alternative enterprises. However, due to inadequate knowledge about the future consequences of the new alternatives, farmers are having difficulty in crop choice decisions. At this time it is very important to carefully examine the profitability of peanuts relative to alternatives. If peanuts are not profitable, farmers should be provided with information about the risks and rewards of feasible crop alternatives on the historical peanut growing lands.

Figure 3: Average Price of Peanuts Received by Oklahoma Farmers and the Value of Production (1990 - 2003)



Source: USDA, National Agricultural Statistical Service

Objectives

General Objective

The overall objective of this research endeavor is to increase the ability of Southwestern Oklahoma peanut producers to make more informed decisions related to changes in the farm operations.

Specific Objectives

1. Determine the profitability of producing peanuts in Southwestern Oklahoma, given the program changes in the 2002 Farm Bill.
2. Determine the profitability of producing cotton, soybeans and watermelons on peanut acres in Southwestern Oklahoma.
3. Determine risk efficient crop alternatives to peanuts in Southwestern Oklahoma

CHAPTER II

REVIEW OF LITERATURE

Historical Overview of U.S. Peanut Policy

Most of the U.S. commodity programs originated with the Agricultural Adjustment Act of 1933 (Dohlman et al.). The peanut program was in effect when peanuts were designated as a basic commodity in 1934. Under this Act, peanut producers were mandated payments in return for taking land out of production. In 1937, the Regional Grower's Association was formed. It purchased specified quantities of peanuts from registered participants at support prices set by the government. However, this program was unsuccessful because it could not sustain high prices and non-participant growers expanded acreage planted to peanuts (Rucker and Thurman).

Failure of this voluntary acreage reduction led to the establishment of a mandatory program in 1941. Individual acreage allotments were set and penalties were applied to those who would produce on additional lands. However, during World War II, these penalties were not applied. As a result the U.S. peanut acreage increased to 3.4 million acres during the 1943-48 period, up from 1.9 million acres in 1941 (Chvosta et al.).

After World War II, the Agricultural Act of 1949 established support prices for peanuts between 75 to 90 percent of the then current levels. Payments of support prices were made only if acreage allotments and marketing quotas were approved by peanut growers. Periodical approval of such allotments and quotas were made and this program was in effect until 1978. During this period new peanut varieties were introduced and new production technologies were employed which led to the increase in per-acre yield. Rate of growth of production was higher than the rate of growth of consumption. Thus, government purchases and the treasury costs of the peanut program increased substantially (Chvosta et al.).

Due to the large program costs in the 1970s, the peanut program was amended by the Food and Agricultural Act of 1977. According to this new program (1978-81), producers received the support prices only on quota peanuts and this time the quota was set annually in poundage terms to meet the market demand (Borges). Growers who grew more than their poundage quota had two options for disposing of the additionals. First, they could contract with handlers for sale in the export market or in the domestic crush market. Second, the additionals were placed under loan with the area Grower's Association. Additionals placed under loan were guaranteed a minimum support price which was well below the quota support prices.

The Grower's Association incurred losses if it bought quota peanuts at the edible support price and resold them at lower prices for export or domestic crush. However, if the Grower's Association bought additionals at the additionals support price and sold them for edible support price through the buy-back provisions, it earned profits. Such profits were distributed among growers in proportion to their additionals placed into the association pools. Under this program, losses and profits were treated separately for each pool (Rucker and Thurman).

During the 1978-81 periods, farmers were required to own both the poundage quota as well as acreage allotment (Chvosta et al.; Rucker and Thurman). However, in 1982, the acreage allotment was abandoned. Under this new program anyone could grow peanuts but only those growers who had poundage quotas were eligible to receive the edible support price directly. Another potentially important change was the restriction under the legislation of quota owners' rights to lease their quota. Any quota owner could lease his or her quota without losing the quota but he or she was required to be involved in production of peanuts.

During 1986-90 program periods, one of the most noticeable changes was in the distribution of profits from association pools. Under the previous Act, the Growers' Association pools were one of two types: 'quota pools" and 'additionals pool'. The 1985 Act eliminated separate pools for different types of peanuts within the area. It also mandated that profits from the additionals pool be used to offset losses from the quota pools. If any profits were remaining then they were distributed among growers who contributed to the profitable additionals pool (Rucker and Thurman).

During this period, increases in quotas were distributed equally among all farms that had quotas in the previous year or had produced peanuts in at least two out of three previous years. After 1991 increases in quotas were distributed proportionally among all quota holders in the state according to their total production rather than equally among all the farmers. In any case if the farmers were not able to meet their quotas, they were allowed to carry the unproduced quantity, called carryovers, into the next growing season. However, the total national carryover could not exceed ten percent of the national quota. This rule did not apply in the case of unfavorable weather and the occurrence of natural disasters. In these cases, farmers did not need to produce their quota but only needed to show that they planted enough to meet the quota based on their historical yields. If for some reason a growers' quota was reduced then this quota was redistributed among all the producers in the state.

The 1990 Farm Act legislated a minimum national poundage quota and support price escalator that raised the peanut loan rate based on estimated increases in production cost. The loan rate for quota peanuts was set at $ 678 per ton and the national minimum quota was set at 1.35 million tons. The peanut program came under substantial pressure after the approval of NAFTA and GATT. The peanut program was blamed for creating barriers to trade and unfairly protecting peanut producers from international competition. This pressure led to the Federal Agricultural Improvement and Reform Act of 1996 (Chvosta et al.).

The 1996 FAIR Act had made some important adjustment in the previous Act. Before 1996, there was a price support system and a ban on imports. A basic feature of the 1996 FAIR Act is planting flexibility. At the same time support price was reduced by 10 percent to $610 per ton from $ 678 per ton. This was the first instance that the nominal price of peanuts was lowered in the history of the U.S. peanut program.

Fixed payments known as Production Flexibility Contract (PFC) payments that were based on past production replaced earlier deficiency payments tied to continued production of specific crops. The annual effective quota was reduced from 1.47 million tons for the 1995 crop year to 1.15 million tons for the 1996 crop year. Leases and sales of peanut quota across county lines were allowed but quotas still could not be transferred across states.

The Farm Security and Rural Investment Act of 2002 (the 2002 Farm Bill) brought historic changes in the U.S. approach to regulating peanut markets. The 2002 Farm Bill terminated the existing supply limiting marketing quota system for peanuts. The new policy implies that all peanut producers, whether quota holders or non-quota holders are eligible for the same kind of government payments that are available for commodity crops such as grains, cotton and oil seed crops.

The 2002 Farm Bill replaced the quota system with the marketing assistance loan program. All farmers are eligible for the loan rate for the current production regardless of whether or not they qualify as historic peanut producers under previous programs. The marketing assistance loan rate is set at $355 per ton throughout the effect of the policy (2002-2007). In other words, the 2002 Farm Bill introduced a price floor in the form of a marketing assistance loan rate. When the market prices are below the loan rate, the farmers are allowed to repay commodity loans at a loan repayment rate that is lower than the loan rate. Marketing loan repayment rates are based on weekly national average prices for peanuts.

Farmers can take the benefit of loan programs directly as loan deficiency payments (LDP). Farmers have a choice to receive marketing loan benefits through direct loan deficiency payment when market prices are lower than commodity loan rates. The loan deficiency payment rate is the amount by which the loan rate exceeds the loan repayment rate and thus is equivalent to the marketing loan gain that could alternatively be obtained for crop under loan (Westcott, Young and Price). When a loan deficiency payment is paid on a portion of the crop, that portion cannot be used as collateral for another marketing loan (Westcott and Price).

Direct payments under the 2002 Farm Bill are similar to production flexibility contract (PFC) payments of the 1996 Farm Bill. The payment rate for direct payments is fixed and is not affected by current production levels or by current market prices. Direct payments to farmers are based on historic acreage and historic yields. The direct payment differs from PFC payments in that the 2002 farm bill sets a fixed payment rate on a per unit basis for the entire life of the Bill, whereas, the 1996 Farm Bill fixed total expenditure levels for each fiscal year (Westcott, Young and Price). The direct payment rate for peanut is fixed at $36 per ton and is in effect through 2007.

Counter Cyclical Payments are paid when the effective price for peanuts is less than the target price. The effective price is equal to the sum of the higher of the national average market price during the marketing year for peanuts and the national average loan rate for peanut and the payment rate for fixed decoupled payment for peanuts (Chvosta et al.). The legislation established a target price for peanut to be $495 per ton. The 2002 Farm Bill allows peanut quota owners to receive quota buyout payments regardless of whether they farmed or rented out the quota. Quota owners can receive payments in five annual installments of $220 per ton during fiscal year 2002-06 or take the payment in a lump sum.

Policy Change and its Impact on Peanut Producers

The U.S. peanut support program started with the Agricultural Adjustment Act of 1933 (Rucker and Thurman, Chvosta et al.). The program was introduced during the great depression of 1930s to support prices and stabilize producer incomes through supply limitations (Dohlman et al.). Farm policy programs have changed substantially from their origins. The basic direction of change has been a shift from annual acreage supply controls, combined with price supports above market clearing levels, to less supply intervention and more direct income support (Pease et al.)

Head argued that the reform in the program may change the economic status of peanut producers because peanut production with a support price has been an economic backbone in many peanut producing areas for more than five decades. Chvosta et al. in their study have shown that in the aggregate U.S. farmers would lose $ 712 per farm per year under the 2002 Farm Bill if they continue to grow peanuts. More specifically they have estimated that quota holders will lose $ 332 million, however, the U.S. landowners would gain $246 million by selling additionals. Chvosta further estimated that Oklahoma quota peanut producers would lose $ 4,759 per farm per year which is the highest among other peanut producing states.

Pease et al. have reported that the 2002 Farm Bill has substantially decreased the annual net returns of the Virginia peanut producers. Net returns over variable cost and variable cost plus fixed cost under the FAIR Act (1996-2001) was $87,405 and $ 39,177 per farm respectively. However, the peanut net returns over variable cost and variable cost plus fixed cost under the 2002 Farm Bill was estimated to be $3749 and $ -44,480 per farm respectively. This estimate shows that under the 2002 Farm Bill peanut enterprise would barely cover its variable cost of production. However, Pease et al. have further said that the Virginia producers can benefit if they take advantage of the planting flexibility provided by the 2002 Farm Bill and shift from peanut production business to the cotton production business.

Smith and Bullen constructed a representative farm model for cotton and peanut production for South Central Georgia and Northeast Coastal North Carolina to determine the net farm income and the portion of the income contributed through government payment. Profitability analysis using FINPACK, a farm financial budgeting and analysis software, showed that there is net increase in farm income under the 2002 Farm Bill compared with the FAIR Act of 1996. The Increase in the net return is due to government payments.

They found that for Georgia farms, government payments made up to 110.3 percent of the net income and for North Carolina farm government payment made up 114.6 percent of net farm income. This indicates that both the farms are not profitable without the government payments. Since this study assumes constant costs, price and yields, further study is suggested to incorporate price and yield risks which provide more reliable information about the producer gain.

Unlike the FAIR Act of 1996, the FSRI Act of 2002 does not have any requirements to maintain production of any crops including crops for which the payments are based. Direct payments and counter cyclical payments preserve farm acreage without artificially stimulating production in an attempt to increase revenue. Fletcher et al. have used optimization models to determine the profitability of peanuts, cotton, corn and wheat in irrigated and non-irrigated scenarios incorporating the program payments.

Point estimates were calculated for both the 2002 and 2003 crop years. Their study found that irrigated peanuts had the highest net returns in both years and non-irrigated cotton was least profitable. However, it is noted that, peanut farms typically cover operating cost from market receipts. Fixed costs may be met with supplementation of government payments.

Decrease in price and elimination of quantity control drives less efficient peanut producers out of the peanut business and benefits more efficient peanut producers (Dohlman et al.). Lassiter evaluated the impact of the new bill compared with the previous farm bill (FAIR Act). A whole farm budget was developed and analyzed using FINPACK. The model farm was made up of 1000 acres of cotton, 300 acres of peanuts, 150 acres of wheat and soybeans double cropped, and 50 acres of soybeans. They found that the government payment was higher under the new farm bill and the peanut farms were still profitable. However, each farm would lose $156.60 per acre if they continue to grow peanuts compared to the previous farm bill.

Despite the risky nature of peanuts and other crop production business, none of the studies have done the risk analysis for peanut farms after the 2002 Farm Bill. Risk analysis is equally as important as profitability analysis. Moreover, farmers have the tendency to minimize risk rather than maximizing profits (Anderson and Dillon). Davis et al. developed a stochastic simulation model to determine the optimal crop enterprise mix for both risk averse and risk neutral producers. They found that peanuts are in the optimal crop enterprise mix regardless of price and yield expectations under the contract production. However under the non-contract and pessimistic price scenario peanuts were not found efficient.

Risk in Agricultural Production

Agricultural production is a risky business. Farmers face uncertain yields (production risk) and prices (market risk). Uncertainty of yield results from the unpredictable nature of the weather and performance of crops, whereas uncertainty of prices comes from the market conditions, input prices and so on. Variability of yields and prices should be considered in making crop choice decisions (Anderson, Dillon and Hardaker). Accounting for risk is important in crop production decisions where the accumulated effect of repeated choices may have significant impact on overall business performance (Hardaker).

Decision makers are always confronted with the necessity of making choices among uncertain alternatives. There is a considerable amount of literature that explains how the informed decision can be made. One of the earliest and then very popular methods of ordering risky alternatives is Mean-Variance analysis, (E-V Method) (Markowitz). Prospects with the same level of expected return but smaller variance are preferred by this method.

Mean-variance analysis is appropriate when returns are normally distributed and/or the utility function is quadratic. However, most of the outcome variables such as yield and prices do not conform to the condition of normality due to the limited data availability within the same technological and policy framework. The utility function may also differ among decision makers. In addition, only two moments of the probability distributions are considered in making decisions by E-V method, however, in reality the expected utility is a function of all the moments of probability distributions that enter into the decision making process (Hadar and Russell)

It is important to note that the level of risk associated with an outcome differs among decision makers (DM). Different decision makers/farmers may have different attitudes towards risk. Therefore, risk cannot be assessed without accounting for the risk attitude of the decision maker. Choice of favorable and unfavorable outcomes can only be evaluated and compared knowing the decision maker's relative preferences for such outcomes (Hardaker et al.).

Risk averse is an attitude towards risk that will cause a decision maker to prefer an investment with a certain outcome to an investment with the same expected value but an uncertain outcome. Alternatively, risk preferring is an attitude towards risk that causes a decision maker to prefer an investment with the same expected value but an uncertain outcome to an investment with a certain outcome. The more risk averse a farmer, the more likely he or she is to make managerial decisions that emphasize the goal of reducing variation in income rather than the goal of maximizing income.

According to the subjective expected utility (SEU) hypothesis, the decision maker's utility function for outcomes is needed to assess risky alternatives (Anderson, Dillon and Hardakar). The SEU of a risky prospect, calculated as the probability weighted average of the utilities of the possible payoffs, is equal to the utility of that prospect. An important step in many applications of decision analysis under the expected utility hypothesis is the specification of a suitable utility function.

Zuhair, Taylor and Kramer estimated three different utility functions using minor export crop data from Sri Lankan farmers to determine if the ranking of the prospects is independent of the functional form. They found that the negative exponential utility functional form performed better than quadratic and cubic functional form. They also found that attitudes towards risk differ among functional forms. A similar study by Binici et al. indicated that negative exponential functional forms best described the risk attitudes of the Lower Seyhan Plain Farmers in the Adana Province of Turkey.

Mussar et al. have shown that the choice of functional form is critical because it can affect the classification of decision makers based on their risk attitudes. Mussar et al. used three different functional forms; quadratic, semi-log and non linear to predict the risk aversion nature of twelve graduate students. The semi-log functional form classified all subjects as risk averse. The quadratic functional form classified three subjects as risk preferring and the rest as risk indifferent and the non-linear function classified all subjects as risk indifferent.

There is a rich source of literature that shows negative exponential utility function and the power utility functional form best describes the farmers' attitudes towards risk (Zuhair, Taylor and Kramer, Mussar et al., Yassour, Zilberman and Rausser, Binici et al.). Some studies have just assumed negative exponential utility function and power utility function based on the previous studies.

Stochastic Dominance Analysis

Stochastic dominance criterion is a decision rule that provides a partial ordering of risky alternatives for decision makers whose preferences conform to specified conditions about their utility function (Kramer and Pope; McCarl 1988). This method is considered superior to the E-V method because alternative risky prospects are compared in terms of the full distribution of outcomes not just in terms of moments of the probability distributions.

Hadar and Russell presented the concept of first degree stochastic dominance (FSD) and second degree stochastic dominance (SSD). FSD is used to partition alternatives for decision makers who prefer more profit to less. SSD requires an additional assumption that decision makers are not risk preferring, that means, the absolute risk aversion coefficient is between zero and positive infinity.

Mayer came up with the stochastic dominance with respect to a function (SDRF) criterion, which is more powerful than FSD and SSD. In this method the absolute risk aversion bounds are reduced to some specified level and the criteria are defined for all decision makers where absolute risk aversion coefficient lies anywhere between lower and upper bound.

Hardaker and Lien introduced more straightforward and more discriminating SDRF, which they called stochastic efficiency with respect to a function (SERF). SERF partitions alternatives in terms of certainty equivalents (CEs). The CE values show the amount of money that the decision maker would have to be paid to be indifferent between the particular scenario and a non risky investment (Richardson SIMETAR). An advantage of using CE ranking strategy is that it is dynamic and updates itself each time the minimum and maximum risk aversion coefficient are changed (Hardakar and Lien).

CHAPTER III

METHODOLOGY

Typical enterprise budgets for peanuts, cotton, soybeans and watermelons that are specific to Caddo County, Oklahoma are constructed in the Excel spreadsheet to generate net returns. An enterprise budget is an organized listing of estimated gross income and costs used to determine the expected net returns for a particular enterprise. Budgeting is a fundamental tool for financial planning and crop production decision analysis.

Two budgets are prepared for peanuts, cotton and soybeans; one for dry land and one for irrigated conditions. Two budgets are also prepared for watermelons; one for seedless watermelons and one for seeded watermelons. Both seeded and seedless watermelons are grown under irrigated conditions. This provides eight enterprise budgets as alternatives to determine the most profitable enterprise and to rank the associated risk of each alternative. The purpose of preparing budgets in this study is to determine the profitability of existing peanut production practices in Caddo County to be compared to several other potential alternatives that may replace peanut production if peanuts are found to be less profitable.

This study aims to identify not only the level of profit that each enterprise is capable of providing but also the variability of profit that is associated with each enterprise. Several assumptions related to these budgets are described in detail in table 1.

Each estimated budget is on a per acre basis. Average farm acres in our model are fixed at 310 acres per farm because Caddo County has an average farm size of 310 acres according to the 2002 Census of Agriculture. The budgets assume no economies of size. The subsection that follows discusses the components of enterprise budgets such as gross income, net revenue, variable cost, and fixed costs.

Table 1: General Assumptions made while Preparing Enterprise Budget for Peanuts, Cotton, Soybeans and Watermelon produced in Caddo County

1	Average Farmed acres for each crops	310 Acres
2	Yield Coverage Level by Multi-Peril Crop Insurance (MPCI)	65 %
3	Type of Irrigation system	Center Pivot Sprinkler
4	Efficiency of Irrigation system	75 %
5	Energy used for irrigation	Natural Gas
6	Machinery	Custom Operated
7	Typical wage rate paid for labor	$ 7.75
8	Annual Operating Capital Interest Rate	6.00 %
9	Property Tax on Irrigation Structure	1.00 %
10	Insurance Rate on Irrigation Structure	1.00 %
11	Interest Rate on Irrigation Structure	5.50 %

Gross Income (GI)

Gross Income (GI) is defined as the value of total output produced per acre. GI is computed by multiplying average yields by average prices at the farm level for each crop. GI includes value of production and the payments received from the Government such as Direct Fixed payments (DP) and Counter Cyclical payments (CCP). The method used to estimate DP and CCP are described in a separate subtitle.

Price and Yield Data

State level average annual producer price of cotton and soybeans for a period of 10 years (1995-2004) were obtained from the National Agriculture Statistics Service of the United States Department of Agriculture (NASS/USDA). However, the peanut price from 1995-2004 cannot be used because of the changes in the price support program mandated by the 2002 Farm Bill. Therefore, weekly national market price for peanuts from 2002 (September) to 2004 (December) was obtained from the Farm Service Agency (FSA) of USDA. These weekly prices were converted into average annual prices using simple averages. FSA reports different prices for four different types of peanuts. This study utilizes the price of the runners since more than 70 percent of the total peanuts produced in Caddo County are runners (Beerwinkle).

Seedless and seeded watermelon prices were obtained from the Dallas Terminal Market reported by USDA's Agricultural Marketing Service (AMS/USDA). These prices are wholesale prices. Producer received prices are extrapolated from Dallas terminal wholesale price data assuming transportation and packaging cost margins of 30 percent. However, the actual margin will vary by an unknown amount depending upon supply and demand situation in the Dallas terminal market (Wathen et al.). Sources and summary statistics of the price data are shown in table 2.

Table 2: Sources, Time Period and Summary Statistics of Producer received Prices for Peanuts, Cotton, Soybeans and Watermelons

Commodity	Source of Data	Data Period	Unit	Mean	Standard Deviation	Minimum	Maximum
Peanuts[1]	FSA[2]	2002-04	$/LB	0.1807	0.0097	0.1700	0.1890
Cotton	NASS[3]	1995-04	$/LB	0.5049	0.1343	0.2950	0.7350
Soybeans	NASS	1995-04	$/BU	5.5500	1.1835	4.2500	7.4000
Watermelon (Seeded)	AMS[4]/Dallas Terminal Market	1995-04	$/LB	0.1076	0.0262	0.0700	0.1470
Watermelon (Seedless)	AMS/Dallas Terminal Market	1995-04	$/LB	0.1582	0.0743	0.0840	0.2800

[1] Prices for Peanuts before 2002 could not be used because of the change in the peanut policy. [2] Farm Service Agency, [3] National Agricultural Statistics Services, [4] Agricultural Marketing Services.

Yield data were obtained from various sources. Yield differs greatly between irrigated and non-irrigated conditions. Irrigated and non-irrigated yield of peanuts and cotton for Caddo County were obtained from NASS/USDA. Any missing value in the data set was filled by yield from neighboring Counties for that particular year. There is no separate yield of soybeans for irrigated and non-irrigated condition reported for Caddo County or even the state of Oklahoma. Therefore, the irrigated and non-irrigated yield of soybeans from Northern High Plain region of Texas is used assuming that this yield closely resembles Southwestern Oklahoma yields. The Northern High Plains region of Texas is geographically close to Southwestern Oklahoma.

Table 3: Sources, Time Period and Summary Statistics of Yield for Peanuts, Cotton, Soybeans and Watermelons

Commodity	Source of Data	Data Period	Unit	Mean	Standard Deviation	Minimum	Maximum
Peanuts Irrigated	NASS	1995-04	LB	2906.50	270.894	2470	3185
Peanuts Dry land	NASS	1995-04	LB	1732.22	682.189	685	2535
Cotton Irrigated	NASS	1995-04	LB	641.60	231.622	232	1013
Cotton Dry land	NASS	1995-04	LB	270.15	95.839	137.5	498
Soybeans[1] Irrigated	NASS	1995-04	BU	37.83	4.095	32	44.2
Soybeans[1] Dry land	NASS	1995-04	BU	23.51	5.655	12.9	30
Watermelon[2] (Seeded and Seedless)	Lane Ag. Center	-	LB	15656.0	-	1210	40799

[1] Average annual soybeans yield (irrigated and dry land) is obtained from Northern high plains region of Texas which we assume to closely represent Southwestern Oklahoma yield. [2] there is no statistical difference between the seedless and seeded watermelons under irrigated condition.

Watermelon yield for both seeded and seedless variety is obtained from Wes Watkins Agricultural Research and Extension Center, Lane. The United States Department of Agriculture and Oklahoma State University jointly operate the Lane Agriculture Center. This study uses historical yield for a period of 10 years from 1995 to

2004 for peanuts, cotton and soybeans under both irrigated and non-irrigated condition. However, according to the information provided by the Lane Agriculture Center scientists, yield for both the seedless and seeded watermelon can be assumed to be the same when irrigated. But the producer received price for these two types of watermelons can be different.

Government Payments for Program Crops

Peanuts, cotton and soybeans are program crops and the farmers growing these crops will receive several payments from the government. Payments are made based on the base acres established on the farm during the crop year 2002. Base acres cannot exceed the farm's cropland acreage.

Once the farmers enroll in the payment program, they are eligible for the payment through the policy period (2002-2007) even though they did not grow that crop in a particular year. Farmers can still receive payments although they choose to grow different crop in the peanut base. However, the crop alternative should be a program crop or pasture.

Watermelons are non program crops. Any farmers who wish to grow watermelons in the peanut base without notification of cancellation of enrollment would not only lose peanut base but also lose the entire base he had on his farm. However, farmers can choose not to enroll in the program any one year and again they can enroll in the very next year. This flexibility enables farmers to grow watermelons in peanuts base without having to lose the payments for other base. Farmers will however lose peanut base if they grow watermelons in peanut base.

There are three types of payments implemented by the 2002 Farm Bill: the Direct Fixed Payments (DP), Counter Cyclical Payments (CCP) and Loan Deficiency Payment (LDP). There were no LDPs in 2003 and 2004 as the market price exceeded the loan rate. Trend in the market price shows it is highly likely that there will be no LDPs in the coming years. Therefore, we assume LDPs to be zero while preparing budgets. DP for peanut base is calculated as

(1) $$DP = DPR * PY * BA * 0.85$$

Where, *DPR* is the direct payment rate that is constant ($36/ton) and established by the 2002 Farm Bill. *PY* is payment yield and *BA* is base acres. *PY* is determined by FSA. PY for Caddo County was set to be 3210 pounds per acre through the policy period (2002-2007). Base acre may vary greatly among different farmers. However, our budget model assumes it to be 310 acres. CCP is calculated as

(2) $$CCP = \{TP - DPR - \max(\Pr, MLR)\} * PY * BA * 0.85$$

Where, *TP* is the target price established by the 2002 Farm Bill ($495/ton), *DPR* is the direct payment rate as in equation (1). Max (Pr, *MLR*) is either market prices (Pr) or the Marketing Assistance Loan Rate (MLR) whichever is higher. MLR is set to be $355 per ton by the 2002 Farm Bill. *PY* and *BA* are payment yield and base acres respectively as in equation (1). The number 0.85 in equation (1) and (2) indicate that only 85 percent of the base acres are eligible for the government payments.

Estimating Costs of Production

The estimated costs of peanuts, cotton and soybeans (irrigated and dry land condition), as well as watermelons (seeded and seedless variety) in this study are based on the data obtained from several sources. They include different series of extension fact sheets from Oklahoma State University, information obtained from Oklahoma State University enterprise budgets software, Dr. Mike Kizer (Extension Irrigation Specialist, Oklahoma State University), Roger Sahs (OSU enterprise budget specialist) and the Cucurbit Manual published by Lane Agriculture Center. These cost estimates are representative of average costs for farms in Caddo County. Larger and smaller farms may have lower or higher costs per acre.

Variable Costs

Variable costs are independent of fixed costs and generally increase as level of management intensity is increased. Items that are included under variable costs are seed cost, fertilizer cost, chemical cost, fuel cost, labor cost, repair cost, interest on operating capital, crop insurance, custom pre-harvest and harvest machinery. Estimates of variable cost for each item that are included in the budget are presented in Appendix A. Machinery cost and Irrigation costs can differ greatly depending upon the type, size, expected life of equipment and the type of fuel used.

Machinery Costs

Estimating machinery costs is a complicated and tedious job if done accurately. Machinery ownership might be profitable, yet it still may not be in the best interest of the business to purchase it. Most machines last more than 10 years but financing their purchase through borrowing generally requires payback period of 3 to 5 years (James and Eberle). If the loan payment period is shorter than the life of the machine it may cause cash flow problems and create financial stress. Even if the machine is not dept financed, there is an opportunity cost of ownership that should be recognized when justifying a purchase.

All of the machinery costs in the budgets prepared for this study are based on custom hired machines. Custom hire is a common method for gaining short-term use of machinery services. Custom machinery rates are assumed to be a reasonable approximation of the opportunity costs of ownership. Justification for using custom farming/application services instead of owned machines are described as follows;

1. Operator assumes the responsibility of operating the machine and its daily care.
2. Farmers have no long term commitment in the machines
3. Farmers know exactly what their costs will be for farm planning purposes.
4. Farmers have no ownership responsibility, including purchase, finance and disposal when no longer needed.
5. The hired machine will be nearly new and should perform efficiently with few breakdowns.

The Information regarding custom machinery rates is obtained from Okalahoma Farm and Ranch Custom Rates, 2003-2004, CR-205. Summery statistics of these custom rates are listed in table 5 and 6.

Table 4: Summary Statistics of Pre-harvest Machinery Custom Rates used in the Budgets for Caddo County

Number	Type of Operation	Custom Rates $/Acre		
		Minimum	Average	Maximum
1	Mold Board Plow	6.00	7.92	10
2	Offset Disc	4	6.36	12
3	Chisel Plow	4	6.31	9
4	Spring tooth Harrow	2	5.1	8.6
5	Field Cultivator	2.92	4.48	6
6	Row Cultivator	5	7.86	12
7	Stalk Shredder	5	6.5	8.5
8	Bedding (Listing)	5	6.67	8
9	Rotary Hoe	3	4.47	5
10	Planter (Peanuts and Soybeans)	5	9	13
11	Planter (Cotton)	3	6	10
12	Sprayer (Insect and Disease)	2.5	3.32	5

Table 4: Summary statistics of Pre-harvest Machinery Custom Rates used in the Budgets for Caddo County (continued)

Number	Type of Operation	Custom Rates $ per Acre		
		Minimum	Average	Maximum
13	Sprayer (Herbicide)	2	3.33	5
14	Sprayer (Growth Regulator)	2.5	3.32	5
15	Dry Fertilizer Spreader	2.5	3.04	4.5

Table 5: Summary Statistics of Harvest Machinery Custom Rates used in the Budgets for Caddo County

No.	Type of Operation	Units	Custom Rates		
			Minimum	Average	Maximum
1	Combining Peanuts	$/Acre	20	32.5	45
2	Digging and Shaking Peanuts	$/Acre	10	10	10
3	Stripping Cotton	$/Pound	0.05	0.08	0.1
4	Hauling Cotton	$/pound	0.03	0.03	0.03
5	Combining Soybeans	$/Acre	13	15	17
6	Extra Combine Charge*	$/Bushel	0.13	0.15	0.17
7	Hauling Soybeans	$/Bushel	0.1	0.13	0.15

Source: Oklahoma Farm and Ranch Custom Rates, 2003-2004, CR-205.

*Extra Combine charge for soybeans is applied if the yield exceeds 25 bushels/Acre.

Irrigation Costs

Having accurate estimates of cost of irrigation is important when making irrigation decisions. Cost of irrigation varies greatly depending upon the type of irrigation system used as well as the type of energy source used such as electricity, natural gas, diesel or propane. The type of irrigation system used to prepare our budgets is Center Pivot sprinkler. Energy cost is a major portion of the total cost of pumping irrigation water. Our budgets are based on natural gas as an energy source. Natural gas is considered a cheap source of energy compared to other types of energy (Beerwinkle, personal communication). Irrigation cost applies to those crops which actually are irrigated. Dry land crops do not have irrigation costs.

Irrigation cost is estimated using the information provided by OSU Extension Irrigation specialist (Dr. Mike Kizer). The cost information of the component of irrigation system such as cost of irrigation well, cost of pump, cost of center pivot, cost of column pipe and cost of motor is specific to Caddo County. Details on these estimates are provided in the appendix C. Irrigation labor, fuel, repair and maintenance are considered variable and can be different for different crops. These costs depend on amount of water applied per acre, and the efficiency of the system.

Fixed cost includes depreciation, property tax, insurance and annual interest cost. Depreciation is calculated as follows;

$$\text{Annual Average Depreciation Cost} = \frac{\text{Purchase Price - Salvage Value}}{\text{Useful Life (years)}}$$

Salvage value is assumed to be zero at the end of the useful life. Purchase price is the actual dollar amount paid and may vary significantly from list price.

Annual fixed cost estimates for property taxes, insurance and interest are calculated by multiplying the appropriate percentage by the average value of the asset over its useful life, assuming zero salvage value.

$$\text{Annual Property Tax Cost} = \text{Purchase Price} * \text{Irrigation Tax Rate}$$

$$\text{Annual Interest Cost} = \frac{\text{Purchase Price} + \text{Salvage Value}}{2} * \text{Irrigation Interest Rate}$$

$$\text{Annual Insurance Cost} = \frac{\text{Purchase Price} + \text{Salvage Value}}{2} * \text{Irrigation Insurance Cost}$$

Net Returns

Net returns are calculated for each crop alternatives as;

(3) $$NR_i = (P_i * Y_i) - (VC_i + FC_i) + DP_i + CCP_i$$

Where,

NR_i is the net returns for i^{th} alternative. i is the number of alternatives.

P_i is the price of i^{th} commodity

Y_i is the yield of i^{th} commodity

VC_i is the variable cost of i^{th} commodity

FC_i is the fixed cost of i^{th} commodity

DP_i is the direct fixed payment for i^{th} commodity

CCP_i is the counter cyclical payment for i^{th} commodity

Stochastic Simulation

Stochastic simulation is defined as a tool for addressing “what if…” questions about a real economic system in a non-destructive manner (Richardson, 2005). The purpose of simulation in agricultural production risk analysis is to estimate distributions of economic returns for alternative scenarios, so the decision maker can make better decisions. Simulation can be done both deterministically and stochastically. Deterministic simulation does not address the risk around estimated variables. Rather it uses a point estimate for each variable. Crop production decisions have degree of risk associated with them such as weather and market condition. Therefore, it is wise to consider a stochastically simulated model rather than to use a deterministic model while making crop production decision choices.

It is very important to identify a Key Output Variable (KOV) before doing actual simulations. In this study net return for each crop production alternative is considered as KOV. To be able to simulate net returns one or more of the input variables of the model (exogenous variables) should be considered stochastic. Our study considers average annual crop yield, price received by farmers and the custom machinery rates as stochastic. The type of distribution that is actually used to simulate stochastic variables depends on the nature of the data and the number of observations. Our data for yield, price and custom machinery rate does not conform to a normal distribution therefore, we used a GRKS distribution to simulate these variables.

Gray, Richardson, Klose and Schumann developed the GRKS distribution to simulate subjective probability distributions based on minimal input data. Parameters used for GRKS distributions are minimum, mean and maximum of the stochastic variables. GRKS distribution is a modified triangular distribution. According to Richardson, 2005, the properties of GRKS distributions are as follows;

1. 50 percent of the simulated observations are less than the midpoint.
2. About 95 percent of the simulated observations are between the minimum and the maximum.
3. 2.5 percent of the simulated observations are less than the minimum and 2.5 percent are greater than the maximum.

Enterprise budgets that include one or more stochastic variables are called stochastic budgets. Net returns estimated from these budgets are simulated for 200 iterations generating 200 possible net returns for each crop production alternative. Simulation was done using the SIMETAR© simulation package developed by Richardson, Schumann and Feldman in the Department of Agricultural Economics at Texas A&M University. SIMETAR is an Add-in to Microsoft EXCEL© that is developed in Visual Basic for applications. These iterated net returns are used in stochastic efficiency analysis to rank the preferred production alternatives.

Risk Efficiency Analysis

Risk efficient crop production alternatives were identified using Stochastic Efficiency with Respect to a Function (SERF) criteria for a range of risk attitudes. SERF does not require a decision maker to know the actual risk aversion coefficient for an individual farmer. Rather it uses a range of Risk Aversion Coefficients (RACs) within which all level of farmers are included. SERF involves comparison of cumulative probability distributions of simulated net returns for each crop alternatives.

SERF analysis is performed using SIMETAR software. SERF analysis is done assuming negative exponential utility function for which Absolute Risk Aversion Coefficient (ARAC) range is set to be -0.1 and +0.5. SERF uses Certainty Equivalents (CE) to rank risky alternatives. SIMETAR estimates CE as follows;

(4) $$CE = E - 0.5\, R_a\, V$$

Where,

E is the expected net returns, R_a is the ARAC and V is the variance of net returns.

Instead of evaluating CE at the two extreme ARACs (as with Stochastic Dominance with Respect to a Function, SDRF), SERF evaluates CEs for ARACs between the Lower Risk Aversion Coefficient (LRAC) and the Upper Risk Aversion Coefficient (URAC). An advantage of SERF over SDRF is that it can simultaneously compare several risky alternatives while SDRF is a pair wise comparison.

Using the SERF option in SIMETAR, the Risk Premium (RP) for each alternative was also estimated. Net returns for irrigated peanuts are considered as the base while calculating RP.   The formula used by SIMETAR to calculate RP is as follows;

(5) $$RP_j = CE_{alternative\ j} - CE_{Base\ j} \text{ for } ARAC_j$$

Positive RP for an alternative j indicates that it is preferred over the base j by the given amount in dollars, whereas negative RP indicate that the base j is preferred over the selected alternative.

RAC where the preference changes is called Break Even Risk Aversion Coefficient (McCarl 1988). This study does not involve elicitation of risk preferences from individual farmers. Therefore, Break even risk aversion coefficient (BRAC) method is used to identify risk preference interval reflecting unique preference ranking.

BRAC for each pair of risky alternative is identified. Richardson, Schumann and Feldmann (SIMETAR) suggest that BRACs are the same as the RACs where the CE line crosses in the SERF chart. Using McCarls BRAC procedure we can calculate the actual range of RACs where one alternative is preferred and the range over which another alternative is preferred.

Finally the probabilities for getting target level of net returns for each crop production alternative are estimated using Stoplight Analysis in SIMETAR. Lower level target income and the upper level target income is set to $0.00 per acre and $200 per acre respectively. Probabilities for less than the lower level of target income, in-between lower and upper level target income and more than the upper level target income is generated using SIMETAR and interpretation is done accordingly.

CHAPTER IV

RESULTS AND DISCUSSION

Profitability Analysis

Our analysis starts with the interpretation of the average net returns generated from the deterministic enterprise budget model. Average net returns, gross revenue, total cost of production and preference rankings based on average net returns for each alternative is shown in table 7. The mean analysis indicates that growing seedless watermelon is the most profitable alternative with the net returns of $ 893.87 per acre followed by seeded watermelon ($ 674.39 per acre) and irrigated peanuts ($ 288.98 per acre) respectively.

Growing dry land cotton is the least profitable option with average net returns of $99.52 per acre. The second and the third least profitable alternatives include irrigated cotton and dry land peanuts with average net returns of $ 122.61 per acre and $ 148.51 per acre respectively.

Despite the change in the commodity program policy by the 2002 Farm Bill, irrigated peanuts are still more profitable compared to other program crops like cotton and soybeans. Direct fixed payments and counter cyclical payments for peanut base was estimated to be $49.11 per acre and $133.24 per acre respectively. Due to the planting flexibility provided by the 2002 Farm Bill, farmers growing any program crops on their peanut base can claim these payments. Therefore, not only peanuts but also cotton and soybeans average net returns is the sum of the actual income and the government payments for peanut base.

Table 6: Ranking of Crop Production Choices based on Net Returns generated from the Enterprise Budgets using Baseline Mean Costs and Prices

Crop Alternative	Rankings	Total Cost ($/Acre)	Gross Revenue ($/Acre)	Returns ($/Acre)
Irrigated Peanuts	3	493.36	782.34	288.98
Dry land Peanuts	6	421.87	570.376	148.51
Irrigated Cotton	7	434.81	557.42	122.61
Dry land Cotton	8	238.75	338.27	99.52
Irrigated Soybeans	5	225.47	392.31	166.84
Dry land Soybeans	4	107.03	312.834	205.80
Seedless Watermelon	1	1582.91	2476.78	893.87
Seeded Watermelon	2	1010.20	1684.59	674.39

Note: Both seedless and seeded watermelons are grown under irrigated conditions.

Government payments have significant contribution to net farm income. For farmers growing irrigated peanuts, the government payment constitutes 63 percent of the net return. Highest percentage net return from government payment is for dry land cotton, 183 percent. DCP payments, mean net returns and percent contribution of government payment to net return is shown in table 8. Note that watermelons are not included in the government program crops and farmers will gain no government payments for growing watermelons.

Table 7: DCP Payments, Net Returns and Percent Contribution of Government Payment on Net Returns for Crop Alternatives in Caddo County using Baseline Costs and Prices

Commodity	DCP Payment[1]	Mean Net Return ($/Acre)	Percent Net Return from Government Payment
Irrigated Peanuts	182.35	288.98	63.10
Dry land Peanuts	182.35	148.51	122.77
Irrigated Cotton	182.35	122.61	148.72
Dry land Cotton	182.35	99.52	183.23
Irrigated Soybeans	182.35	166.84	109.29
Dry land Soybeans	182.35	205.80	88.60
Seedless Watermelon	0.00	893.87	0.00
Seeded Watermelon	0.00	674.39	0.00

Note: watermelons are not program crops and are not eligible for government payment

[1]DCP Payments ($/Acre) = Sum of Direct fixed payment and counter cyclical payments.

Simulated Net Returns

Deterministic analysis provides us only the point estimate of the net returns. It does not take into account the variability of the net returns. Therefore to get a better informed decision, stochastically simulated net returns are utilized in this study. Simulated net returns provide us the opportunity to conduct the stoplight analysis and the risk efficiency analysis. The mean, standard deviation, minimum and maximum of the simulated net return distributions for the eight crop production choices are given in table 9. There is a considerable variation in the mean net returns among different crop alternatives.

Table 8: Summary Statistics of Simulated Average Net Returns generated from Stochastic Budgets ($/Acre)

Commodity	Mean	Std. Dev.	Minimum	Maximum	Ratio of Std. Dev. to Mean
Irrigated Peanuts	276.34	35.006	174.53	358.20	0.13
Dry Land Peanuts	133.24	84.920	-107.75	325.92	0.64
Irrigated Cotton	120.90	106.586	-130.77	404.47	0.88
Dry land Cotton	105.45	53.346	2.08	291.69	0.51
Irrigated Soybeans	168.99	37.319	85.83	279.10	0.22
Dry land Soybeans	200.93	31.723	120.74	296.26	0.16
Seedless Watermelon	1353.66	1835.954	-2602.86	9117.04	1.36
Seeded Watermelon	853.47	899.96	-868.47	3678.78	1.05

Simulated average net returns are consistent with the deterministic net returns except for seeded watermelons. Mean simulated net returns were found to be the highest for seedless watermelon ($ 1353.66 per acre) followed by seeded watermelons ($853.47 per acre) and irrigated peanuts ($ 276.34 per acre) respectively. However, the standard deviation for seedless watermelon was found to be the highest (1835.95) followed by seeded watermelon (899.96) and irrigated cotton (106.586).

Higher standard deviation indicates that the alternative has more variability of returns. However, the knowledge of standard deviation alone does not provide outright decision to adopt certain crop production alternatives. It may be possible and most likely that higher average net return along with the higher standard deviation is preferred to the lower average net return along with lower standard deviation. Question still remains, how much lower average net return and lower standard deviation is low enough not to be preferred. Therefore it makes sense to associate the level of probability for the given level of target net return.

As explained in the methodology section, lower level target income and upper level target income was set to $ 0.00 per acre and $ 200 per acre respectively. Using stoplight analysis with the aid of SIMETAR software, probabilities for obtaining less than $ 0.00 per acre, in-between $ 25 and $200 per acre, and more than $200 per acre average net returns from different crop production alternative is estimated and shown in table 10.

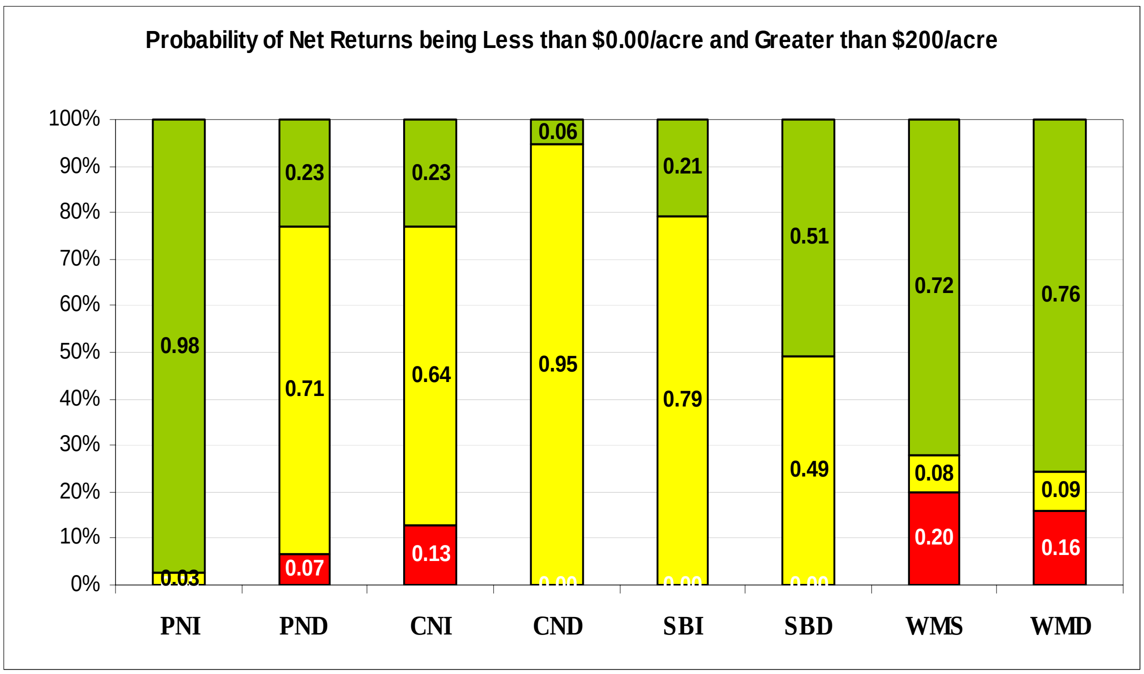
Results from the stoplight analysis indicate that there is 98 percent chance for irrigated peanuts to generate net income greater than $200 per acre and for the remaining 2 percent of the times the net return is in-between $ 0 and $ 200. There is no chance that the farmers growing irrigated peanuts will get negative returns. Similarly, for seeded watermelon, chance that the net returns are greater than $ 200 is 76 percent. There is 9 percent chance that net returns fall between $ 0 and $ 200 and 16 percent chance of getting negative returns. For seedless watermelon, chance that the net returns are greater than $200 is 72 percent. There is 8 percent chance that net return fall between $0 and $200 and 20 percent chance of getting negative returns. This implies that growing irrigated peanuts will generate 100 percent positive net returns, growing seeded watermelons will generate 85 percent positive net returns and growing seedless watermelons will generate 80 percent positive net returns.

Table 9: Probabilities Associated with Net Returns for Different Crop Alternatives in Caddo County

Crop Alternative	**Probabilities Associated with Net Returns**		
	Less than $0	**Between $ 0 and $ 200**	**Greater than $ 200**
Irrigated Peanuts	0.00	0.02	0.98
Dry land Peanuts	0.07	0.71	0.23
Irrigated Cotton	0.13	0.64	0.23
Dry land Cotton	0.00	0.95	0.05
Irrigated Soybeans	0.00	0.79	0.21
Dry land Soybeans	0.00	0.49	0.51
Seedless Watermelon	0.20	0.08	0.72
Seeded Watermelon	0.16	0.09	0.76

To make the stoplight analysis visually more clear, the results are also shown in figure 4. The red color in the chart represents the probability that net returns can fall below $ 0 per acre. Yellow color represents the probability that net returns can fall between $ 0 and $ 200 per acre and green color represents the probability that the net returns is greater than $ 200 per acre.

Figure 4: Stoplight Chart of Eight Crop Production Alternatives in Caddo County



Where, PNI = Irrigated Peanuts, PND = Dry land Peanuts, CNI = Irrigated Cotton, CND= Dry land Cotton, SBI = Irrigated Soybeans, SBD = Dry Land Soybeans, WMS = Seedless Watermelon, WMD = Seeded Watermelon.

Stochastic Dominance Analysis

Stochastic dominance analysis utilizes simulated net returns distribution to rank crop production alternatives in terms of Absolute Risk Aversion Coefficient (ARAC). Preferences ranking of different crop alternatives under different ARAC are shown in table 11. Each column in the table shows the range of upper and lower risk aversion coefficient within which the preference prevails. Seedless watermelon production is ranked first in the risk aversion coefficient as high as 0.000613. The ARAC can be interpreted as the percentage change in marginal utility per unit change in the net revenue. ARAC of 0.000613 implies that, $100 per acre increase in the net returns will increase the marginal utility of the farmer by 0.0613 percent. The change in the marginal utility can be positive, zero or negative based on the risk averse, risk neutral or risk preferring nature of the farmers respectively.

The seedless watermelon production dropped rapidly in the rankings as the ARAC increased, suggesting that a rough knowledge of risk preferences may be of significant importance in identifying preferred production alternatives. Seedless watermelon production can be worse case for the farmers having ARAC higher than 0.002280. Preference ranking based on generalized stochastic dominance indicate that irrigated peanuts can be stable alternative and is ranked high throughout the range of the ARAC.

Table 10: Preference Rankings of Crop Production Alternatives in terms of Absolute Risk Aversion Coefficient

	Absolute Risk Aversion Coefficient			
Lower	-0.1000	-0.0704	-0.0428	-0.0320
Upper	-0.0705	-0.0429	-0.0320	-0.0154
Ranking				
Irrigated Peanuts	4	4	3	3
Dry land Peanuts	5	5	5	6
Irrigated Cotton	3	3	4	4
Dry land Cotton	7	8	8	8
Irrigated Soybeans	8	7	7	7
Dry land Soybeans	6	6	6	5
Seedless Watermelon	1	1	1	1
Seeded Watermelon	2	2	2	2

	Absolute Risk Aversion Coefficient			
Lower	-0.0154	-0.0152	-0.0094	-0.0051
Upper	-0.0153	-0.0094	-0.0052	0.000613
Ranking				
Irrigated Peanuts	3	3	3	3
Dry land Peanuts	6	7	7	6
Irrigated Cotton	5	5	6	7
Dry land Cotton	8	8	8	8
Irrigated Soybeans	7	6	5	5
Dry land Soybeans	4	4	4	4
Seedless Watermelon	1	1	1	1
Seeded Watermelon	2	2	2	2

Table 10: Preference Rankings of Crop Production Alternatives in terms of Absolute Risk Aversion Coefficient (Continued)

	Absolute Risk Aversion Coefficient			
Lower	0.000614	0.001105	0.001216	0.001265
Upper	0.001104	0.001215	0.001264	0.001324
	Ranking			
Irrigated Peanuts	3	2	2	2
Dry land Peanuts	6	6	6	6
Irrigated Cotton	7	7	7	7
Dry land Cotton	8	8	8	8
Irrigated Soybeans	5	5	5	4
Dry land Soybeans	4	4	3	3
Seedless Watermelon	2	3	4	5
Seeded Watermelon	1	1	1	1

	Absolute Risk Aversion Coefficient			
Lower	0.001324	0.001347	0.001361	0.002281
Upper	0.001346	0.001360	0.002280	0.002769
	Ranking			
Irrigated Peanuts	2	2	2	1
Dry land Peanuts	5	5	5	5
Irrigated Cotton	7	6	6	6
Dry land Cotton	8	8	7	7
Irrigated Soybeans	4	4	4	4
Dry land Soybeans	3	3	3	3
Seedless Watermelon	6	7	8	8
Seeded Watermelon	1	1	1	2

Table 10: Preference Rankings of Crop Production Alternatives in terms of Absolute Risk Aversion Coefficient (Continued)

	Absolute Risk Aversion Coefficient			
Lower	0.002770	0.002998	0.003343	0.003494
Upper	0.002997	0.003342	0.003493	0.003501
Ranking				
Irrigated Peanuts	1	1	1	1
Dry land Peanuts	5	5	4	4
Irrigated Cotton	6	6	6	5
Dry land Cotton	7	7	7	7
Irrigated Soybeans	4	3	3	3
Dry land Soybeans	2	2	2	2
Seedless Watermelon	8	8	8	8
Seeded Watermelon	3	4	5	6

	Absolute Risk Aversion Coefficient		
Lower	0.003502	0.003734	0.01042
Upper	0.003733	0.010410	0.50000
Ranking			
Irrigated Peanuts	1	1	1
Dry land Peanuts	4	4	5
Irrigated Cotton	5	6	6
Dry land Cotton	6	5	4
Irrigated Soybeans	3	3	3
Dry land Soybeans	2	2	2
Seedless Watermelon	8	8	8
Seeded Watermelon	7	7	7

Confidence Premium (CP) results are shown in table 12-14 assuming ARAC of -0.01 for risk preferring farmer (table 12), -0.0001 to 0.0001 for risk neutral farmer (table 13) and 0.01 for risk averse farmer (table 14). CP indicates the relative conviction that a farmer has to a particular alternative ranking.

The result shows that the risk preferring farmer will have to be paid $ 5390.13 per acre to accept seeded watermelon production (second best) over seedless watermelon (best alternative). Similarly, risk preferring farmer will have to be paid $8305.07 per acre to accept irrigated peanut production (third best) over seedless watermelon (best alternative). Risk neutral farmer has to be paid $ 640.92 per acre to accept seeded watermelon production and he has to be paid $1259.27 per acre to accept irrigated peanuts production over seedless watermelon.

However, irrigated peanuts production is the best alternative and seedless watermelon production is the worst for a risk averse farmer with ARAC of 0.01. He has to be paid $ 73.99 per acre to accept dry land soybean production (second best) over irrigated peanuts. However, the risk averse farmer has to be paid as high as $ 2349.27 per acre to accept seedless watermelon (worse) over irrigated peanut production. This result clearly shows the importance of risk aversion coefficient while making crop production choices.

Table 11: Confidence Premium ($/Acre) for Risk Preferring Farmer with -0.01 ARAC

	WMS	WMD	PNI	SBD	CNI	SBI	PND
WMS	-						
WMD	5390.13	-					
PNI	8305.07	2914.94	-				
SBD	8381.23	2991.10	76.16	-			
CNI	8407.94	3017.80	102.86	26.71	-		
SBI	8410.91	3020.78	105.84	29.68	2.97	-	
PND	8421.36	3031.23	116.29	40.13	13.43	10.45	-
CND	8465.15	3075.02	160.08	83.92	57.21	54.24	43.79

Note: Crops in the column are dominant over crops in the row.

Table 12: Confidence Premium ($/Acre) for Risk Neutral Farmer with -0.0001 to 0.0001 ARAC

	WMS	WMD	PNI	SBD	SBI	PND	CNI
WMS	-						
WMD	640.92	-					
PNI	1259.27	618.35	-				
SBD	1334.69	693.77	75.42	-			
SBI	1336.61	725.69	107.34	31.92	-		
PND	1402.08	761.16	142.81	67.39	35.47	-	
CNI	1412.21	773.29	154.94	79.52	47.60	12.13	-
CND	1430.09	789.17	170.82	95.39	63.47	28.01	15.87

Note: Crops in the column are dominant over crops in the row.

Table 13: Confidence Premium ($/Acre) for Risk Averse Farmer with 0.01 ARAC

	PNI	SBD	SBI	PND	CND	CNI	WMD
PNI	-						
SBD	73.99	-					
SBI	107.54	33.55	-				
PND	175.35	101.36	67.81	-			
CND	176.80	102.81	69.26	1.45	-		
CNI	200.35	126.36	92.81	25.00	23.55	-	
WMD	647.11	573.12	539.56	471.75	470.31	446.76	-
WMS	2349.03	2275.04	2241.49	2173.68	2172.23	2148.68	1701.93

Note: Crops in the column are dominant over crops in the row.

Pair wise comparison of simulated cumulative distribution functions (CDFs) of eight crop production alternatives are also provided in table 15. There are two possible outcomes: either one alternative dominates the other or dominance can not be determined. If one crop alternative dominate the other through the entire range of given ARACs, then either alternative in the column dominates alternative in the row (CDR) or alternative in the row dominates alternative in the column (RDC). However, if the CDFs have an intersection then either column dominates row (BRAC with asterisk) or the row dominates column (BRAC without asterisk) above that intersection. BRAC is the ARAC at which risk preference changes between a pair of production choices. In other word, each BRAC is a reference point that separates the farmers by their risk attitudes.

Table 14: Break Even Risk Aversion Coefficient from Pair-wise Comparison of Crop Production Choices

	PNI	PND	CNI	CND	SBI	SBD	WMS
PNI							
PND	CDR						
CNI	-0.0428	-0.0051					
CND	CDR	0.01042*	0.003734*				
SBI	CDR	-0.0152*	-0.0094*	-0.0704*			
SBD	CDR	-0.0320*	-0.0154*	RDC	RDC		
WMS	0.001105	0.001324	0.001347	0.00136	0.00127	0.001216	
WMD	0.002281	0.003343	0.003494	0.00350	0.00299	0.002770	0.00061*

Where, PNI = Irrigated Peanuts, PND = Dry land Peanuts, CNI = Irrigated Cotton, CND= Dry land Cotton,
SBI = Irrigated Soybeans, SBD = Dry Land Soybeans, WMS = Seedless Watermelon, WMD = Seeded Watermelon.
CDR = alternative in the column dominates alternative in the row
RDC = alternative in the row dominates alternative in the column
* indicates that row alternative dominates column alternative above this BRAC
BRAC without * indicate that column alternative dominate row alternative above this BRAC

CHAPTER V

SUMMARY AND CONCLUSION

Peanuts are an important cash generating traditional crop in Oklahoma grown primarily in the Southwest and Southeast portions of the state. The 2002 Farm Bill brought about historic changes in regulating U.S. peanut markets. Changes in the U.S. peanut program, coupled with increased costs and complexities related to irrigation and production inputs, have resulted in drastically decreased planted acres and forced many peanut producers in Southwestern Oklahoma to consider alternative crops.

This study attempted to examine the economic risks associated with producing peanuts and common alternatives for peanuts in Southwestern Oklahoma. A total of eight different enterprises were generated for analysis. Enterprise budgets were made stochastic to come up with more informed decision. Analyses were performed under the deterministic as well as stochastic conditions. Both deterministic and stochastic analysis revealed similar results for mean analysis.

Results indicate that seedless watermelon production is a highly probable alternative to irrigated peanuts if producers are willing to accept the risk associated with the perishable nature of horticultural crops. The seedless watermelon production dropped rapidly in the rankings as the ARAC increased, suggesting that the rough knowledge of the risk attitude has significant importance in identifying preference ranking. Preference rankings indicated that the irrigated peanut production is a highly viable choice for risk averse farmers.

Government payments play a significant roll in the sustainability of the farms in Southwestern Okalahoma. Only irrigated peanuts and dry land soybeans were found to be profitable without including government payments. All other program crops generated negative returns excluding government payments.

As this study only considers eight different alternatives, this is not all that can be grown in Southwestern Oklahoma. Further research can utilize several other alternatives to determine the profitability and risk associated with them. Another research focus could be to determine different management strategies such as use of different levels of inputs, time of planting, use of own machinery so that precise information can be generated and disseminated to the farmers. The results from this research are general and apply to the overall farmers of Southwestern Oklahoma. Specific farmers may have differing results depending upon their farming conditions and the size of the farms.

Another potential research area could be to evaluate the profitability under Conservation Reserve Program (CRP) participation. Under this program farmers could retire their land under peanuts to the CRP through the USDA Farm Service Agency. CRP is a voluntary program where eligible farmers can retire their land for 10 to 15 years. In return the FSA will provide an incentive that is comparable to or higher than the rental rates. This is a risk free alternative. However not all farmers are necessarily able to enroll to this program. CRP farmers can however grow perennial crops where periodic harvesting, haying and grazing are possible.

BIBLIOGRAPHY

Agricultural Marketing Service, United States Department of Agriculture www.ams.usda.gov

Anderson, J.R., and J.L. Dillon. "*Risk Analysis in Dryland Farming Systems*." Food and Agriculture Organization of the United Nations, Rome, 1992.

Anderson, J.R., J.L. Dillon, and J.B. Hardaker. "*Agricultural Decision Analysis*." Ames: The Iowa State University Press, 1977.

Beerwinkle, D. "Personal Communication." Caddo County Extension Agent.

Binici, T., A.A. Koc, C.R. Zulauf, and A. Bayaner. "Risk Attitudes of Farmers in Terms of Risk Aversion: A Case Study of Lower Seyhan Plain Farmers in Adana Province, Turkey." *Truk J Agric For* 27 (2003): 305-312.

Bolin, Patricia, and Lynn Brandenberger ed. "Cucurbit Integrated Crop Management." Oklahoma Cooperative Extension Service E-853, Oklahoma State University.

Borges R.B. "Trade and the Political Economy of Agricultural Policy: The Case of the United States Peanut Program." Journal of Agricultural and Applied Economics 27 (1995): 595-612.

Chvosta J., R.R. Rucker, and W.N. Thurman. "Peanut Quota Markets and Peanut Production After FAIR." Selected Paper presented at the American Agricultural Economics Association Annual meetings, Chicago, IL, August 2001.

Chvosta, J., W.N. Thurman, B.A. Brown, and R.R. Rucker. "The End of Supply Controls: The Economic Effects of Recent change in Federal Peanut Policy." Selected Paper Prepared for Presentation at the Southern Agricultural Economics Association Annual Meeting, Mobile, Alabama, 2003.

Davis, T.D., C.E. Curtis, Jr., G.A. Shumaker, and N.B. Smith. "The Effect of the 2002 Farm Bill on Crop Enterprise Selection in the Southeast Region." Selected Paper Presented at the Southern Agricultural Economics Association Annual Meetings, Mobile, Alabama, February, 2003.

Dohlman, E., L. Hoffman, E. Young, and W. McBride. "Peanut Policy change and Adjustment under the 2002 Farm Act." Economic Research Service, Electronic Outlook Report, United States Department of Agriculture, July 2004.

Doye, D., R. Sahs, and D. Kletke. "Oklahoma Farm and Ranch Custom Rates, 2003-2004, Oklahoma Cooperative Extension Service, CR-205.

Doye, D., R. Sahs, D. Kletke, and M. Hardin. "OSU Enterprise Budget Software Advanced User's Guide." Oklahoma Cooperative Extension Service, Oklahoma State University, 2004.

Farm Service Agency. "Weekly National Market Price for Peanuts." United States Department of Agriculture, www.fas.usda.gov

Fletcher, S.M., A. Flanders, N.B.Smith, and A. McCorvey. "Government Payments: Economic Impact of Southeastern Peanut Farms." Department of Agricultural and Applied Economics, University of Georgia, 2005.

Fletcher, S.M., A.S. Luke, A.E. McCorvey, and J.W. Richardson. "Farm Commodity Payment Limits: What Impact will they have on the Economic Viability of Southeastern Agriculture?" Selected Paper prepared for Presentation at the Southern Agricultural Economics Association Annual Meetings, Mobile, Alabama, February, 2003.

Fletcher, S.M., D.A. Nadolnyak, and V. Hartarska. "Producer Characteristics and Peanut cost Efficiency in the Southeast: Implications of the Farm-Level Impacts of the 2002 Farm Act." Selected Paper Prepared for Presentation at the Annual meetings of the Southern Agricultural Economics Association, Little Rock, Arkansas, February 2005.

Hadar, J., and W.R. Russell. "Rules for Ordering Unvertain Prospects." *American Economic Review* 59 (1969): 25-34

Hardaker J. B., and G. Lien. "Stochastic Efficiency Analysis With Risk Aversion Bounds: A Simplified Approach." University of New England, Graduate School of Agricultural and Resource Economics, Working Paper Series No. 2003-1, (2003).

Hardaker, J.B. "Some Issues in Dealing with Risk in Agriculture." Working Paper Series No. 2000-3 in Agricultural and Resource Economics, University of New England, 2000.

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

Hardaker, J.B., R.B.M. Huirne, and J.R. Anderson. *Coping with Risk in Agriculture.* Wallingford: CAB International, 2004.

Head, M. "Auburn University Study shows Cuts in Peanut Program could Cost the southeast 4,510 Jobs." *Southern Peanut Grower*. Vol. 33, 1995.

James, S.C., and P.R. Eberle. *"Economics and Business Principles in Farm Planning and Production"* Iowa State University Press/Ames.2000.

Kizer, M. "Personal Communication." Extension Irrigation Specialist, Department of Biosystems and Agricultural Engineering, Oklahoma State University.

Kramer, R.A., and R.D. Pope. "Participation in Farm Commodity Programs: A Stochastic Dominance Analysis." *American Journal of Agricultural Economics* 63 (1981): 119-128.

Lassiter, D.L. "Economic Comparison of North Carolina Peanut Producers now and with the Proposed End of Peanut Quota Program." Department of Agricultural and Resource Economics, North Carolina State University, 2002.

Markowitz, H.M. *Portfolio Selection; Efficient Diversification of Investments*, New York, Wiley, 1959.

Mayer, J. "Choice Among distributions." *Journal of Economic Theory* 14 (1977): 326-336.

McCarl, B.A. "Generalized Stochastic Dominance: An Empirical Examination." *Southern Journal of Agricultural Economics* 22 (1990): 49-55.

McCarl, B.A. "Preference among Risky Prospects under Constant Risk Aversion." *Southern Journal of Agricultural Economics* 20 (1988): 25-33.

Musser, W.N., Wetzstein, M.E., Reece, S.Y., Musser, L.M., Varca, P.E., and Chou, C.C.J. "Classification of Risk Preferences with Elicited Utility Data: Does the Functional Form Matter?" *Western Journal of Agricultural Economics* 9 (1984): 322-328.

National Agricultural Statistics Service, United States Department of Agriculture www.usda.gov/nass

Pease J., J. Lehman, and D. Orden. "Proposed End of Peanut Quota Program: Economic Effects on Virginia Producers." Department of Agricultural and Applied Economics, Virginia Tech, November 2001.

Richardson, J.W., K. chumann, and P. Feldman. "SIMETAR, Risk Analysis Management Modeling." College Station, Texas, January 2005.

Richardson, J.W., K. Schumann, and P. Feldman. “Simetar, Simulation for Excel to Analyze Risk.” Department of Agricultural Economics, Texas A&M University, January 2005.

Rucker, R.R., and W.N. Thurman. “The Economic Effects of Supply Controls: The Simple Analytics of the U.S. Peanut Program.” *Journal of Law and Economics* 33 (1990): 483-515.

Smith, N., and G. Bullen. “Farm Level Impacts of the 2002 Farm Bill on a Georgia and North Carolina Farm.” Selected Paper Presented at the Southern Agricultural Economics Association Annual Meeting, Mobile, Alabama, February, 2003.

U.S. Department of Agriculture, Economic Research Service. “Provisions of the Federal Agriculture Improvement and Reform Act of 1996, ERS Agricultural Information Bulletin No. 779. Washington, D.C., September 1996.

Wathen, B.L., M.J. Taylor, J.V. Edelson, B.W. Roberts, R.B. Holcomb. “Melon Marketing and Price Volatility: Applied Study of the Southern Oklahoma Region.” Manuscript for Publication in the *Journal of Agricultural and Applied Economics*, February 2005.

Westcott, P.C., and J.M. Price. “Analysis of the U.S. Commodity Loan Program with Marketing Loan Provisions.” Market and Trade Economics Division, Economic Research Service, United States Department of Agriculture, Agricultural Economic Report No. 801, (2001)

Westcott, P.C., C.E. Young, and J.M. Price. “The 2002 Farm Act: Provisions and Implications for Commodity Markets.” Economic Research Service, United States Department of Agriculture, November, 2002.

Yassour, J., D. Zilberman, and G.C. Rausser. “Optimal Choices among Alternative Technologies with Stochastic Yield.” *American Journal of Agricultural Economics*, 63 (1981): 718-723.

Zuhair, S.M.M., D.B. Taylor, and R.A. Kramer. “Choice of Utility Function Form: Its Effect on Classification of Risk Preferences and the Prediction of Farmer decisions.” *Agricultural Economics* 6(1992): 333-344.

APPENDICES

APPENDIX –A: ENTERPRISE BUDGETS

Table 15: Variable Cost, Fixed Costs, Revenue and Net Returns for Custom Operated Irrigated Peanuts

Production	**Units**	**Price**	**Quantity**	**Total ($/Acre)**
Peanuts	Pound	0.18	2906.5	523.17
Direct Payment (DP)	Acre		1	49.11
Counter Cyclical Payment (CCP)	Acre		1	135.06
Hay	Ton	100.00	0.75	75.00
Total Revenue	**Dollars**			**782.34**
Operating Inputs				
Seeds (Tamrun 96)	Pound	0.57	75	42.75
Fertilizer	Acre	10.16	1	10.16
Custom harvest				
Digging and Shaking	Acre	10.00	1	10.00
Combining Peanuts	Acre	32.50	1	32.50
Agro-Chemicals				
Disease Control				
Foliar Pesticide	Acre	100.08	1	100.08
Sclerotinia Blight Pesticide	Acre	80.40	1	80.40
Insect Control				
Asana XL	Acre	6.16	1	6.16
Weed Control (Herbicide)	Acre	24.34	1	24.34
Crop Insurance	Acre	11.12	1	11.12
Annual Operating Capital	Dollars	0.06	104.05	6.243
Custom Hire	Acre	93.08	1	93.08
Irrigation				
Fuel, Lube and Repair	Acre	33.95	1	33.95
Irrigation Labor	Hours	7.75	1.54	11.935
Total Operating Cost	**Dollars**			**462.72**
Fixed Cost				
Irrigation				
Depreciation	Dollars			18.89
Taxes	Dollars	1%		2.33
Insurance	Dollars	0.60%		0.70
Interest	Dollars	5.50%		8.72
Total Fixed Cost	Dollars			30.64
Total Cost (Operating and Fixed)	Dollars			493.36
Returns over Variable Cost	Dollars			319.63
Returns over Total Cost	**Dollars**			**288.98**

Table 16: Variable Cost, Fixed Costs, Revenue and Net Returns for Custom Operated Dry land Peanuts

Production	Units	Price	Quantity	Total ($/Acre)
Peanuts	Pound	0.18	1732.22	312.84
Direct Payment (DP)	Acre		1	49.11
Counter Cyclical Payment (CCP)	Acre		1	133.24
Hay	Ton	100.00	0.75	75.00
Total Revenue	**Dollars**			**570.38**
Operating Inputs				
Seeds (Tamrun 96)	Pound	0.57	75	42.75
Fertilizer	Acre	7.36	1	7.36
Custom harvest				
Digging and Shaking	Acre	10.00	1	10.00
Combining Peanuts	Acre	32.50	1	32.50
Agro-Chemicals				
Disease Control				
Foliar Pesticide	Acre	100.08	1	100.08
Sclerotinia Blight Pesticide	Acre	80.40	1	80.40
Insect Control				
Asana XL	Acre	6.16	1	6.16
Weed Control (Herbicide)	Acre	24.34	1	24.34
Crop Insurance	Acre	19.34	1	19.34
Annual Operating Capital	Dollars	0.06	97.67	5.86
Custom Hire	Acre	93.08	1	93.08
Total Operating Cost	**Dollars**			**421.87**
Fixed Cost				
Irrigation				
Depreciation	Dollars			0.00
Taxes	Dollars	1%		0.00
Insurance	Dollars	0.60%		0.00
Interest	Dollars	5.50%		0.00
Total Fixed Cost	Dollars			0.00
Total Cost (Operating and Fixed)	Dollars			421.87
Returns over Variable Cost	Dollars			148.51
Returns over Total Cost	**Dollars**			**148.51**

Table 17: Variable Costs, Fixed Costs, Revenue and Net Returns for Custom Operated Irrigated Cotton

Production	Units	Price	Quantity	Total ($/Acre)
Cotton	Pound	0.50	641.6	323.94
Direct Payment (DP)	Acre		1	49.11
Counter Cyclical Payment (CCP)	Acre		1	135.06
Cotton Seed	Cwt	4.76	10.74	51.12
Total Revenue	**Dollars**			**557.42**
Operating Inputs				
Seed	Pound	1.08	18.3	19.76
Fertilizer	Acre	33.49	1	33.49
Custom harvest				
Stripping Cotton	Pound	0.08	641.6	51.33
Hauling Cotton	Pound	0.03	641.6	19.25
Agro-Chemicals (Pesticide)	Acre	25.96	1	25.96
Growth Regulators	Fl. Oz.	0.94	8	7.52
Crop Insurance	Acre	9.91	1	9.91
Annual Operating Capital	Acre	0.06	122.14	7.33
Custom Hire	Acre	73.82	1	73.82
Ginning and Processing	Acre	72.66	1	72.66
Irrigation				
Fuel, Lube and Repair	Acre	48.55	1	48.55
Irrigation Labor	Hours	7.75	2.68	20.77
Other Expenses	Acre	13.82	1	13.82
Total Operating Cost	**Dollars**			**404.17**
Fixed Cost				
Irrigation				
Depreciation	Dollars			18.89
Taxes	Dollars	1%		2.33
Insurance	Dollars	0.60%		0.70
Interest	Dollars	5.50%		8.72
Total Fixed Cost	Dollars			30.64
Total Cost (Operating and Fixed)	Dollars			434.81
Returns over Variable Cost	Dollars			153.25
Returns over Total Cost	**Dollars**			**122.61**

Table 18: Variable Costs, Fixed Costs, Revenue and Net Returns for Custom Operated Dry land Cotton

Production	**Units**	**Price**	**Quantity**	**Total ($/Acre)**
Cotton	Pound	0.50	270.15	136.40
Direct Payment (DP)	Acre		1	49.11
Counter Cyclical Payment (CCP)	Acre		1	133.24
Cotton Seed	Cwt	4.76	4.1	19.52
Total Revenue	**Dollars**			**338.27**
Operating Inputs				
Seed	Pound	1.00	11	11
Fertilizer	Acre	11.77	1	11.77
Custom harvest				
Stripping Cotton	Pound	0.08	270.15	21.61
Hauling Cotton	Pound	0.03	270.15	8.10
Agro-Chemicals (Pesticide)	Acre	25.96	1	25.96
Growth Regulators	Fl. Oz.	0.94	8	7.52
Crop Insurance	Acre	9.91	1	9.91
Annual Operating Capital	Acre	0.06	80.52	4.83
Custom Hire	Acre	73.82	1	73.82
Ginning and Processing	Acre	27.76	1	27.76
Other Expenses	Acre	9.91	1	9.91
Total Operating Cost	**Dollars**			**238.75**
Fixed Cost				
Irrigation				
Depreciation	Dollars			0.00
Taxes	Dollars	1%		0.00
Insurance	Dollars	0.60%		0.00
Interest	Dollars	5.50%		0.00
Total Fixed Cost	Dollars			0.00
Total Cost (Operating and Fixed)	Dollars			238.75
Returns over Variable Cost	Dollars			99.52
Returns over Total Cost	**Dollars**			**99.52**

Table 19: Variable Costs, Fixed Costs, Revenue and Net Returns for Custom Operated Irrigated Soybeans

Production	Units	Price	Quantity	Total ($/Acre)
Soybeans	Bushel	5.5	37.83	209.96
Direct Payment (DP)	Acre		1	49.11
Counter Cyclical Payment (CCP)	Acre		1	133.24
Total Revenue	**Dollars**			**392.31**
Operating Inputs				
Seeds	Pound	0.35	50	17.5
Fertilizer	Acre			0.00
Custom harvest				
Combining Soybeans	Acre	15	1	15
Extra Combine charge	Bushel	0.15	12.83	1.92
Hauling soybeans	Acre	0.13	37.83	4.92
Agro-Chemicals (Pesticide)	Acre	19.7	1	19.7
Crop Insurance	Acre	4.41	1	4.41
Annual Operating Capital	Dollars	0.06	48.24	2.89
Custom Hire	Acre	45.81	1	45.81
Irrigation				
Fuel, Lube and Repair	Acre	58.22	1	58.22
Irrigation Labor	Hours	7.75	0.23	1.78
Total Operating Cost	**Dollars**			**172.16**
Fixed Cost				
Irrigation				
Depreciation	Dollars			18.89
Taxes	Dollars	1%		2.33
Insurance	Dollars	0.60%		0.70
Interest	Dollars	5.50%		8.72
Total Fixed Cost	Dollars			30.64
Total Cost (Operating and Fixed)	Dollars			202.80
Returns over Variable Cost	Dollars			220.15
Returns over Total Cost	**Dollars**			**189.51**

Table 20: Variable Costs, Fixed Costs, Revenue and Net Returns for Custom Operated Dry land Soybeans

Production	Units	Price	Quantity	Total ($/Acre)
Soybeans	Bushel	5.5	23.51	130.48
Direct Payment (DP)	Acre		1	49.11
Counter Cyclical Payment (CCP)	Acre		1	133.24
Total Revenue	**Dollars**			**312.83**
Operating Inputs				
Seeds	Pound	17.4	1	17.4
Fertilizer	Acre			0.00
Custom harvest				
Combining Soybeans	Acre	15	1	15
Extra Combine charge	Bushel	0.15	0	0.00
Hauling soybeans	Acre	0.13	23.51	3.06
Agro-Chemicals (Pesticide)	Acre	19.7	1	19.7
Crop Insurance	Acre	4.1	1	4.1
Annual Operating Capital	Dollars	0.06	32.71	1.96
Custom Hire	Acre	45.81	1	45.81
Total Operating Cost	**Dollars**			**107.03**
Fixed Cost				
Irrigation				
Depreciation	Dollars			0.00
Taxes	Dollars	1%		0.00
Insurance	Dollars	0.60%		0.00
Interest	Dollars	5.50%		0.00
Total Fixed Cost	Dollars			0.00
Total Cost (Operating and Fixed)	Dollars			107.03
Returns over Variable Cost	Dollars			205.8
Returns over Total Cost	**Dollars**			**205.8**

Table 21: Variable Costs, Fixed Costs, Revenue and Net Returns for Custom Operated Seedless Watermelon

Production	Units	Price	Quantity	Total ($/Acre)
Watermelon	Pound	0.16	15656	2476.78
Total Revenue	**Dollars**			**2476.78**
Operating Inputs				
Watermelon Transplants	Plants	0.28	1452	406.56
Transplant Labor	Plants	0.08	1452	116.16
Fertilizer	Acre	30.3	1	30.3
Agro-Chemicals				
Fungicide	Acre	147.61	1	147.61
Insecticide	Acre	44.44	1	44.44
Herbicide	Acre	26.94	1	26.94
Hoeing Labor	Hours	7.5	16	120
Pruning Labor	Hours	7.5	4	30
Harvest Cost	Pound	0.01	15656	156.56
Marketing Cost	Pound	0.015	15656	234.84
Annual Operating Capital	Dollars	0.06	234.5	14.07
Custom Hire	Acre	171.59	1	171.59
Irrigation				
Fuel, Lube and Repair	Acre	21.55	1	21.55
Irrigation Labor	Hours	7.75	0.22	1.65
Windbreak Plantation	Acre	20	1	20
Bee Hive Rent	Hive	25	0.4	10
Total Operating Cost	**Dollars**			**1552.27**
Fixed Cost				
Irrigation				
Depreciation	Dollars			18.89
Taxes	Dollars	1%		2.33
Insurance	Dollars	0.60%		0.70
Interest	Dollars	5.50%		8.72
Total Fixed Cost	Dollars			30.64
Total Cost (Operating and Fixed)	Dollars			1582.91
Returns over Variable Cost	Dollars			924.51
Returns over Total Cost	**Dollars**			**893.87**

Table 22: Variable Costs, Fixed Costs, Revenue and Net Returns for Custom Operated Seeded Watermelons

Production	Units	Price	Quantity	Total ($/Acre)
Watermelon	Pound	0.11	15656	1684.59
Total Revenue	**Dollars**			**1684.59**
Operating Inputs				
Watermelon Seed	Pound	18	5	90
Fertilizer	Acre	30.3	1	30.3
Agro-Chemicals				
Fungicide	Acre	147.61	1	147.61
Insecticide	Acre	44.44	1	44.44
Herbicide	Acre	26.94	1	26.94
Hoeing Labor	Hours	7.5	16	120
Pruning Labor	Hours	7.5	4	30
Harvest Cost	Pound	0.01	15656	156.56
Marketing Cost	Pound	0.015	15656	234.84
Annual Operating Capital	Dollars	0.06	123.47	7.41
Custom Hire	Acre	68.26	1	68.26
Irrigation				
Fuel, Lube and Repair	Acre	21.55	1	21.55
Irrigation Labor	Hours	7.75	0.22	1.65
Total Operating Cost	**Dollars**			**979.56**
Fixed Cost				
Irrigation				
Depreciation	Dollars			18.89
Taxes	Dollars	1%		2.33
Insurance	Dollars	0.60%		0.70
Interest	Dollars	5.50%		8.72
Total Fixed Cost	Dollars			30.64
Total Cost (Operating and Fixed)	Dollars			1010.20
Returns over Variable Cost	Dollars			705.03
Returns over Total Cost	**Dollars**			**674.38**

APPENDIX – B: FIELD OPERATION

Table 23: Specified Monthly Field Operations for Irrigated Peanuts

Months →	1	2	3	4	5	6	7	8	9	10	11	12
Machinery												
Offset Disc				1	1							
M.B. Plow			1									
Spring tooth					1							
Planter					1							
Cultivator						1	1					
Sprayer (insect & disease)						3	2	3	1			
Sprayer (herbicide)					1	1						
Dry Fert. Spreader					1					1		

Table 24: Specified Monthly Field Operations for Dry land Peanuts

Months →	1	2	3	4	5	6	7	8	9	10	11	12
Machinery												
Offset Disc				1	1							
M.B. Plow			1									
Spring tooth					1							
Planter					1							
Cultivator						1	1					
Sprayer (insect & disease)						3	2	3	1			
Sprayer (herbicide)					1	1						
Dry Fert. Spreader					1					1		

Table 25: Specified Monthly Field Operations for Irrigated Soybeans

Months →	1	2	3	4	5	6	7	8	9	10	11	12
Machinery												
Offset Disc				1								
Chisel			1									
Spring tooth						1						
Planter						1						
Cultivator						1	1					
Sprayer						1						

Table 26: Specified Monthly Field Operations for Dry land Soybeans

Months →	1	2	3	4	5	6	7	8	9	10	11	12
Machinery												
Offset Disc				1								
Chisel			1									
Springtooth						1						
Planter						1						
Cultivator						1	1					
Sprayer						1						

Table 27: Specified Monthly Field Operations for Irrigated Cotton

Months →	1	2	3	4	5	6	7	8	9	10	11	12
Machinery												
Offset Disc	1											
Chisel		0.8										
M.B. Plow		0.2										
Field Cultivator			1									
Springtooth				1								
Planter					1.2							
Cultivator						1	1					
Rotary Hoe					1							
Sprayer (pesticide)			1		1	1						
Sprayer (Growth regulator)								1				
S. Shreader												1
Dry Fert. Spreader				1								

Note: Number of M.B. Plow and Chisel operation are in fraction because these operations are done once in several years. For example, M.B. Plow is used once in every 5 years, therefore only 0.2 times will be accounted for in an annual budget.

Table 28: Specified Monthly Field Operations for Dry land Cotton

Months →	1	2	3	4	5	6	7	8	9	10	11	12
Machinery												
Offset Disc	1											
Chisel		0.8										
M.B. Plow		0.2										
Field Cultivator			1									
Springtooth				1								
Planter					1.2							
Cultivator						1	1					
Rotary Hoe					1							
Sprayer (pesticide)			1		1	1						
Sprayer (Growth regulator)								1				
S. Shreader												1
Dry Fert. Spreader				1								

Note: Number of M.B. Plow and Chisel operation are in fraction because these operations are done once in several years. For example, M.B. Plow is used once in every 5 years, therefore only 0.2 times will be accounted for in an annual budget.

Table 29: Specified Monthly Field Operations for Seedless Watermelons

Months →	1	2	3	4	5	6	7	8	9	10	11	12
Machinery												
M.B. Plow				1								
Cultipacker					1							
Tandem Disc				1	1							
S. Harrow					1							
Plastic mulch					1							
Planter					1							
Cultivator						1						
Sprayer (disease)						1	2	1				
Sprayer (Insect control)					1	1	1					
Sprayer (weed control)					1	1						
Bed Shaper					1							
Dry Fert. Spreader				1								

Table 30: Specified Monthly Field Operations for Seeded Watermelons

Months →	1	2	3	4	5	6	7	8	9	10	11	12
Machinery												
M.B. Plow				1								
Cultipacker					1							
Tandem Disc				1	1							
S. Harrow					1							
Planter					1							
Cultivator						1						
Sprayer					2	3	1	1				
Dry Fert. Spreader				2								

APPENDIX – C: IRRIGATION ESTIMATES

Table 31: Annual Fixed Cost Estimates for Center Pivot Sprinkler Irrigation System in Caddo County

Items	Purchase Price ($)	Useful life	Depreciation	Property tax (1%)	Insurance (0.6%)	Interest (5.5%)	Total ($)	Total per Acre ($)
Sprinkler System (Center Pivot)	50000.00	15	3333.33	500.00	150.00	1375.00	5358.33	**17.28**
Well	26100.00	25	1044.00			717.75	1761.75	**5.68**
Pump	3100.00	15	206.67	31.00	9.30	85.25	332.22	**1.07**
Column Pipe	12500.00	15	833.33	125.00	37.50	343.75	1339.58	**4.32**
Gear Head and Heat Exchanger	3200.00	15	213.33	32.00	9.60	88.00	342.93	**1.11**
Natural Gas Motor	3400.00	15	226.67	34.00	10.20	93.50	364.37	**1.18**
Total Cost	**98300.00**		**5857.33**	**722.00**	**216.60**	**2703.25**	**9499.18**	**30.64**

Table 32: Annual Variable Cost Estimates for Center Pivot Sprinkler Irrigation System in Caddo County

Crops	Water requireme-nt (inches)	Water from Rainfall (inches)	Water required from Irrigation (inches)	Water required with efficiency (inches)	Cost of Water (Acre-inch)	Total Cost per Acre ($)	Repair and Maintenance ($/Acre)	Total ($/Acre)
Peanuts	20	11	9	12	2.60	31.20	2.75	33.95
Cotton	28	13	15	20	2.29	45.80	2.75	48.55
Soybeans	31	15	16	21.33	2.60	55.47	2.75	58.22
Watermelon	15	5	10	13.33	1.41	18.80	2.75	21.55

APPENDIX – D: Caddo County Peanut Information

Acreage Information			
Year	**# of Farms**	**Acres Planted**	**Avg. Per Farm**
2001	390	29,855	76.5
2002	344	27,089	78.7
2003	205	14,675	71.6
2004	165	12,831	77.7

Farms with Peanut Base Acres Established According to 2002 Farm Bill		
# of Farms	**Base Acres**	**Avg. Base Per Farm**
480	31,062	64.7

Average DCP Payment Yield for Caddo County – 3210 lbs. per acre
1.605 tons per acre

Payment Data
Target Price $495/ton
Loan Rate $355/ton
Direct Payment Rate $36/ton
Maximum allowed Counter Cyclical Payment $104/ton [$495 – ($355+36)]
2002 CC Payment Rate $95/ton
2003 CC Payment Rate 73/ton
2004 CC Payment Rate 59/ton (projected)
2005 CC Payment Rate Unknown

Payment Calculation for the Average Caddo County Peanut Farm								
Year	**Factor**	**Pay Yield**	**Direct Rate**	**Payment**	**CC Rate**	**Payment**	**Total**	**Avg. Per Base Acre**
2002	85%	1.605	$36	$3,178	$95	$8,386	$11,564	$179
2003				$3,178	$73	$6,444	$ 9,622	$149
2004				$3,178	$59	$5,208	$ 8,386	$129

Loan Deficiency and Marketing Loan Gains *			
Year	**LDP's**	**MLG's**	**Total**
2002	$493,391	$571,215	$1,064,606

* LDP’s and marketing loan gains are hard to allocate on an acreage basis. They are based on actual production, a single producer can claim multiple LDP’s or MLG’s by submitting only part of their production for each request, and the rate changes on a daily basis as the market price goes up and down.

There were no LDP’s or MLG’s in 2003 or 2004 as the market price exceeded the loan rate.

All data is actual data from FSA files as submitted to Caddo County by producers.

VITA

SHANKAR DEVKOTA

Candidate for the Degree of

Master of Science

Thesis: ECONOMICALLY FEASIBLE CROP PRODUCTION ALTERNATIVES TO PEANUTS IN SOUTHWESTERN OKLAHOMA

Major Field: Agricultural Economics

Biographical:

Personal Data: Born and raised in a small village near Pokhara, Kaski, Nepal in September 2, 1977, the son of Tulsi Prasad and Tulsi Devi Devkota.

Education: Graduated from Institute of Agriculture and Animal Science, Lamjung Campus in 1996; received a Bachelor of Science degree in Agriculture from Institute of Agriculture and Animal Science, Rampur Campus, Tribhuvan University in 2001; completed the requirements for the Master of Science degree at Oklahoma State University in May, 2006.

Professional Experience: Graduate Research Assistant, Department of Agricultural Economics, Oklahoma State University, October 2003 to December 2005.

Professional Memberships: Southern Agricultural Economics Association (SAEA).

Name: Shankar Devkota Date of Degree: May, 2006

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: ECONOMICALLY FEASIBLE CROP PRODUCTION ALTERNATIVES TO PEANUTS IN SOUTHWESTERN OKLAHOMA

Pages in study: 74 Candidate for the Degree of Master of Science

Major Field: Agricultural Economics

Scope and Method of Study: Changes in the U.S. peanut program, coupled with increased costs and complexities related to irrigation and production inputs, have resulted in drastically decreased planted acres and forced many peanut producers in the Southwest to consider alternatives crops. This study has attempted to examine the economic risk associated with producing peanuts and common alternatives for peanuts in Southwestern Oklahoma: irrigated and/or non-irrigated cotton and soybeans. Irrigated watermelons, seeded and seedless, were also considered as a high-valued horticultural crop alternative. Risk efficient crop production alternatives were identified using stochastic efficiency with respect to a function (SERF) criteria for a range of risk attitudes.

Findings and Conclusions: Results indicate that seedless watermelon production is a highly probable alternative to irrigated peanuts if producers are willing to accept the risks associated with a perishable nature of the horticultural crops. The seedless watermelon production dropped rapidly in the rankings as the Absolute Risk Aversion Coefficient (ARAC) increased, suggesting that a rough knowledge of the risk attitude has significant importance in identifying preference ranking. Preference ranking indicate that irrigated peanuts production is a highly viable choice for risk averse farmers.

ADVISER’S APPROVAL: Dr. Rodney Holcomb