The Impact Of Tenure Arrangements And Crop Rotations On Upper Gulf Coast Rice Farms

CONTENTS

PREFACE

This bulletin reports economic analyses of the effects of important variables affecting the viability of rice-soybean farming operations in the Texas Upper Gulf Coast region. The study attempts to recognize many factors that affect production decisions and, consequently, is heavily laden with descriptions of the required assumptions. To fully capture the benefit of such in-depth assumptions, analyses are reported across a wide range of topics relevant to rice-soybean producers in the Texas Upper Gulf Coast region. Appropriate interpretation of the results for any specific topic area requires understanding the study's methodology and the assumptions made for the base situation analyzed. All results discussed for specific topics should be considered relative to results presented for the base situation.

THE IMPACT OF TENURE ARRANGEMENTS AND CROP ROTATIONS ON UPPER GULF COAST RICE FARMS

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A representative rice-soybean farm in the Texas Upper Gulf Coast was analyzed for 1984-88 using a computerized simulation model that accounts for annual production, farm policy, marketing, and income tax aspects of an individual farm. Uncertainty in harvested yields and prices received is explicitly accounted for in the model. An econometric model of the U.S. rice industry (including export components) is used to project annual prices for rice and a somewhat similar but more integrated macroeconomic econometric model is used to project annual soybean prices as well as annual interest and inflation rates. The purpose of this study is to analyze common crop rotations and tenure arrangements used by Texas Upper Gulf Coast rice and soybean producers. In particular, the effects of various production management strategies, technology levels, financial lending credit policies, macroeconomic scenarios, and alternative provisions of the government agricultural program are examined in some detail. The study results should be useful to agricultural producers, researchers, policy makers, lenders, and landowners, among others.

Throughout the study, emphasis was directed towards highlighting differences in the effect on a farm's economic viability among combinations of two principal crop rotations (soybeans-rice (SR) and soybeans-soybeans-rice (SSR)) and two prevalent land tenure share rental arrangements for rice (1/7 and 1/2, with a large component of the variable expenses shared in the latter case by the landowner). All soybean acreage was leased on a 1/7 share basis. In the base farm situation analyzed, the 2,310 acre (A) representative farm was wholly leased on a share basis (except for a 10 A homestead). The primary standards used to evaluate results

of the analyses included the probability of survival, the probability of success, and the after-tax net present value of earnings over the 5-year planning horizon. In several analyses, the four combinations of crop rotations and rice rental arrangements were ranked for different producer risk preferences, using stochastic dominance decision criteria.

The analyses constituting this study included a base situation and numerous sensitivity analyses, each of which includes one or more modifications to the assumptions made for the base situation. Readers should interpret the results of the sensitivity analyses by comparing them to the base results, rather than by looking at absolute values for each scenario.

In the base scenario, probabilities of survival (i.e., the farm maintains debt/equity ratios acceptable to its creditors) during 1984-88 ranged from 50 to 82 percent, the highest probability being associated with the SSR 1/7 strategy. Probabilities of success (i.e., positive net present value of annual earnings discounted at a pre-tax rate of 11 percent) ranged from 12 to 52 percent, the highest probability being associated with the SSR 1/7 strategy. Expected net present value of annual earnings was negative for all strategies, the highest expected earnings being $-23,183 for the SSR 1/7 strategy. The SSR 1/7 strategy was preferred to the other strategies (SR 1/7, SR 1/2, and SSR 1/2) for most categories of risk preferences.

Results of the sensitivity analyses, based on the assumptions made about the farming operation, are as follows:
1. Production and Management
   - 10 percent Higher/Lower Non-Water Variable Production Costs
     - Increasing costs reduced probability of survival by 12

to 28 percent for the farm strategies.
   - Decreasing costs increased probability of survival by 12 to 32 percent.
   - 1/7 crop share strategies were most affected since the tenant bears the majority of the non-land expenses.
- Water costs (1/7 share strategies only—landowners pay for water under 1/2 share)
   - Reducing water costs by over $30/A enhanced the survivability of the farm and also made the SR rotations more preferable.
   - Increasing the annual inflation rate in water costs from 4.5 to 7.5 had little effect over the 5-year planning horizon.
   - Increasing water costs to $100/A in 1984, coupled with a 7 percent annual inflation rate on water costs, reduced the probability of survival for the 1/7 share arrangements and enhanced the appeal of the SR 1/2 strategy.
- Management Practices
   - Eliminating ratoon rice acreage improved the average annual cash farm income for the 1/7 share arrangements; beyond that, little overall impact was evident.
   - Reducing labor availability from full-time labor by 100 hours per month (necessitating additional part-time labor) reduced after-tax earnings but had no material effect on probabilities of survival and success.
   - Reducing the occurrence of red rice in the SR rotation from 2.5 to 1.5 percent resulted in SR becoming the preferred rotation. This result suggests red rice control is important when field infestations are of significant

magnitude.

- Land Tenure Arrangements
  - Part-owner and full-owner operations had a 100 percent probability of survival. Probabilities of success increased for both ownership situations under the 1/2 share arrangement. However, average after-tax net present value of earnings and annual net cash farm income figures were lower for both types of ownership tenure arrangements for most strategies (in particular for the 1/7 strategies). Preference for strategies was not as distinct as for the tenant farm situation.
  - Cash rents of $30/A were identified as approximately comparable to the base crop share arrangements with some differences according to individuals' risk preferences. Twenty dollar per acre cash rents were preferred to the 1/7 and 1/2 crop share arrangements and $40/A rents were generally inferior to the share arrangements. There was some evidence that cash rental arrangements tended to be a greater risk.
  - Reducing landowners' share of the crop (from 50 to 45 percent and from 1/7 to 1/10 on rice and from 1/7 to 1/10 on soybeans) significantly increased tenants' probability of survival, particularly for the 45 percent share strategies. Probabilities of success were positively affected in greater magnitudes.
  - Evaluation of the alternative crop rotation-share arrangement strategies from the landowner's perspective (annual returns equal net share rent) revealed higher returns were associated with the 1/2 share arrangement. Given the 1/2 share arrangement, both landowners and tenants preferred the SR rotation. For the 1/7 share arrangement,

the landowner preferred the SR rotation and the tenant preferred the SSR rotation.

- Technology/Management
  - Neither an accumulated gradual increase in ratoon rice yields of 450 lb/A by 1988 nor improvement in ratoon rice quality had much impact on overall results. Ratoon rice accounted for only about 8 percent of SSR gross revenues and 6 percent of SR gross revenues, thereby contributing to its relatively small influence on the farm's viability.
  - Examination of the effects of widespread adoption of Lemont (a new rice variety) throughout the southern rice producing region indicated an estimated nominal rough rice cash price decline of $0.35/cwt (because of burgeoning supplies), but also identified the offsetting protection afforded by the target price/loan rate provisions of the current government agricultural program for rice. Assuming this price protection through the government program remains available from 1984-88, Lemont is indicated to have enhanced the survivability of above-average managed operations by as much as 30 percentage points.
  - Irrigating soybeans appears to be economical, assuming higher average and slightly less variable yields.

2. Yields and Prices
- Average Yields
  - Increasing average soybean yields by 10 percent raised annual cash farm income by $14,000 or more for all strategies, the greatest gain being associated with the SSR rotations and the 1/7 share arrangements. Decreasing average soybean yields by 10 percent caused almost opposite results in both monetary returns and with respect to impact on results for the respective share arrangements—the 1/2 share

strategies were hurt relatively more, implying a good soybean yield is needed to assist in meeting general overhead costs.
  - Changes in rice yields affected results more than changes in soybean yields. Increasing average rice yields by 10 percent favored the SR rotations and significantly increased net present value of earnings (in excess of $164,000 for all cropping strategies), probability of survival (8 percent or more), and probability of success (14 percent or more). In marked contrast, decreasing average rice yields by 10 percent (approximating Liberty County average yields) favored the SSR rotations, with significant declines occurring in all evaluation measures. These results suggest county average yields are insufficient to assure a viable farm operation (probabilities of survival were 60 percent or less for the four respective cropping strategies).

- Average Prices
  - Changes in average prices for both rice and soybeans caused results similar to those for different average yields. The impact of changes in rice prices was partially offset by deficiency payments.
  - With respect to increasing versus decreasing either rice or soybean average yields and prices, absolute changes in the analysis criteria tend to be greater for decreasing scenarios as opposed to those involving increases. These results, at least in part, are attributable to the progressive income tax rate structure which disproportionately mitigates the gains associated with increases in prices and yields.
  - Regression results demonstrated that income from each strategy was an important factor influencing the

base results. When income was equivalent across strategies, the SSR rotation had more risk than the SR rotation. Similarly, holding income constant, the 1/2 share strategies had the least risk, followed by the 1/7 share and cash rent strategies. An estimated off-farm income of $90,000 to $122,000 was necessary to ensure a 98 percent probability of survival.

- Variability of Yields and Prices
  - Increasing the variability of rice and soybean yields generally caused probabilities of survival to decline. Increasing rice yield variability more adversely affected probabilities of success and net present value of earnings than did increasing soybean yield variability. SR rotations were more adversely affected than SSR rotations by increasing rice yield variability, with the SSR 1/2 strategy least affected.
  - Decreasing the variability of rice yields tended to increase both expected returns and probabilities of survival, with the greatest benefit accruing to 1/7 share strategies.
  - Decreasing the variability of soybean yields was less favorable than decreasing rice yield variability. The difference in results appears to be associated with the protection against downside variability afforded to soybeans with crop insurance and the loss of upside variability (i.e., high yields) when overall variance decreased.
  - Alternatively increasing and decreasing the variability of both rice and soybean prices suggests, with the current government program, increased price variability is beneficial to producers (due to the implicit price floors created by soybean and rice nonrecourse loan programs).

- Types of Yield and Price Distributions
  - The assumption of independence between and within prices and yields had different effects on the strategies. Those strategies most dependent on one crop (SSR 1/2 and SR 1/7) were hurt by the independence assumption because of the weaker influence of positive correlation between crop yields versus the negative correlation between prices and yields. When returns from crop enterprise were more balanced, the positive crop yield correlation was dominant, resulting in an improvement in results when independence was imposed.
  - The assumption of independent normal distributions greatly improved results for all four strategies. The results imply choice of a distribution may be one of the most critical assumptions made in simulation analyses.

3. Finance, Interest, and Inflation
  - Beginning Equity and Financial Lenders' Credit Policy
    - Financial lenders' credit policy was critical only to intermediate debt holders (i.e., 40 to 60 percent beginning equity).
    - Returns to tenants tended to be more variable than returns to part-owners.
    - A maximum permitted leverage ratio of 1.0 was restrictive, in that producers' probabilities of survival were reduced by up to 66 percentage points. Conversely, a 4.0 maximum permitted leverage ratio increased producers' probabilities of survival but also increased lenders' risk exposure (i.e., non-surviving producers tended to have larger debts when declared bankrupt).
  - Interest Rates
    - Lower rates (2 percentage points) on new loans during

1984-88 had modest effects on the farm operation.
    - Probabilities of success and average net present value of earnings were affected in greater amounts when interest rates for both new and existing loans were lowered by 2 percentage points.
  - Inflation Rates
    - A 2 percent increase in the annual inflation rate negatively affected all strategies, especially those with a 1/7 share arrangement (landowners paid their share of the higher costs under a 1/2 share arrangement). SR rotation strategies were affected more than SSR strategies.
  - 1978-81 Macroeconomic Policy
    - Repeating 1978-81 conditions of high inflation, low real interest rates, and high export demand positively affected all evaluation standards for all strategies, particularly the 1/2 share arrangement.

4. Government Farm Program
  - No Participation in Government Program
    - Survivability declined below 20 percent for all strategies. Probability of success was 0 percent for the SR rotations. Other evaluation standards were adversely affected, indicating government program benefits are essential to the viability of rice-soybean farms similar to the representative farm operation.
  - Strict Payment Limitation
    - Assuming the representative farm could only receive a maximum of $50,000 (instead of the $100,000 assumed in the base situation) significantly affected the 1/7 share strategies and the SR rotations. Results imply the proposed lowering of payment limitation could drastically affect viability of rice-soybean farms as well as encourage some shift in both rotations and tenure arrangements.

- Increasing Long-Grain Rice Premium
  - *Increasing the price differential for long grain rice by $0.53/cwt while maintaining the possibility of a $3.90/cwt maximum deficiency payment, increased returns for all strategies, especially SR rotations. Results indicate that whenever long grain rice stocks are in short supply and/or demand for long grain rice is high relative to medium and short grain rice, Texas long grain rice producers benefit.*
- Eliminating Target Prices
  - Eliminating the government's target price program for rice farmers had a significantly negative impact on the representative farm, lowering probabilities of survival by 12 to 20 percentage points.
- Eliminating Set-Aside
  - Farmers utilizing the 1/2 share strategies benefitted and those using the 1/7 share strategies lost when set-aside provisions of the government program were eliminated. These results are tied to assumptions regarding rice supply response to such an action, the related decline in market price, and reaching the maximum payment limitation. If a producer seldom reached the payment limitation, he fared relatively well.
- Reducing Target Price and Loan Rate
  - Reducing loan rates by 10 percent (i.e., $0.80/cwt beginning in 1986, while maintaining the possibility for a deficiency payment of up to $3.90/cwt (i.e., target price also reduced by $0.8/cwt), had a moderate impact on most analysis variables. Probability of survival declined by as much as 8 percentage points. Results indicate this policy would not be as detrimental as some of the other policy changes considered in this study.

- Allotment Program
  - Requiring all rice producers *to reduce their historical rice* acreage to about 65 percent of their base acreage, beginning in 1986, reduced production and increased prices slightly; but the effect on the representative farm was largely negative, decreasing probabilities of survival by 24 to 34 percentage points.
- Free Market
  - Assuming a return to the free market for rice (no government program provisions), beginning in 1986, adversely affected the representative farm during the remaining 3 years of the planning horizon. The SSR 1/7 strategy remained predominant but generated a mere 42 percent probability of survival, down from 82 percent under the base scenario.

Several conclusions and recommendations can be assimilated from the results:
- For Farm Managers
  - 1/7 share arrangements on rice are generally preferable to 1/2 share arrangements.
  - Cash rents of less than $30/A are preferred to the 1/2 or 1/7 share arrangements.
  - SSR rotations appear to be preferred to SR rotations, assuming government payment limitations are restricting, red rice is less of a problem in the SSR rotation, a 1/7 share arrangement is in effect, and soybeans are as profitable as assumed in the base situation.
  - Variable cost containment can be effective in enhancing the viability of a farm operation—cutting costs by as little as 10 percent, while maintaining yields, can be of significant benefit.
  - New technologies, such as Lemont and possibly irrigated soybeans, appear to be economical, providing a competitive edge that

would be needed to survive in the short run.
  - *Given the current production technology, ratoon rice* appears to be of marginal benefit in the Texas Upper Gulf Coast.
  - Off-farm income is an important source of funds to tenant farmers, especially those with a 1/2 share arrangement.
  - Increasing debt should be avoided unless the farm manager holds little or no debt.
  - Participation in the government farm program could benefit farmers in 1984-85. Participation in future programs depends on the program adopted in the 1985 farm bill.
- For Policy Makers
  - Financial assistance programs should be targeted only to those in need *and* to those who will benefit. Farmers in a low debt position will probably survive with or without a financial assistance program, while those in a high debt position will probably not survive unless a large amount of debt is retired.
  - All proposed changes in the government program for rice had negative impacts on the representative farm manager in the short run relative to provisions of the current government program. There are tradeoffs in macroeconomic benefits (i.e., savings to taxpayers) and micro-level costs (i.e., insolvent producers). This study did not examine the impact on local communities of producers going out of business, nor did it cover the longer-term effects of altering the current program.
- For Agricultural Lenders
  - Credit policies of a maximum 1.0 leverage ratio are restrictive, in that producers' probabilities of survival are low relative to a permitted leverage ratio of 2.0.

Conversely, allowing up to a 4.0 leverage ratio, while increasing the probability of survival for producers, also significantly increased the risk exposure of creditors.

- Agricultural lenders in the Upper Gulf Coast region should evaluate each operation on an individual basis—some operations are profitable while others are tentative.

• Landowners
- Landowners should be concerned regarding the crop mix planted on their acreage—their annual earnings are affected by the yield and price uncertainty associated with the respective crops.

- Landowners with a 1/2 share arrangement should be concerned with variable cost containment because they participate in a share of many such expenses.
- Landowners who currently have "good" tenants should consider granting rent concessions to assure their tenants' viability.

• For Researchers
- Short run versus long run and micro versus macro impacts of new technologies which increase yields need to be considered, especially when there is a lack of effective economic demand for the commodity. Such considerations should be evalu-

ated when determining the commitment level and direction of research resources.

- Evaluation of yield enhancing technology should consider the variance, skewness, and other characteristics of the distribution as well as the average yield.

- More information is needed regarding the correlation of yields among different crops in different rotations.

- Users of simulation models are encouraged to perform an array of sensitivity analyses to verify and validate their modelling procedures before accepting and publishing the results.

The Impact of Tenure Arrangements and Crop Rotations on Upper Gulf Coast Rice Farms

INTRODUCTION

The Upper Gulf Coast region of Texas has traditionally been a major rice-producing region. Located between Houston and the Louisiana state line, the region benefits from level land, a long growing season, close proximity to seaports, and a clay subsoil that is ideally suited for holding irrigation flood waters. These conditions make the area well suited for rice production.

Regional rice acreage, although generally increasing, varied greatly before World War II. A large increase in Texas rice acreage (from 347,000 to 642,000 acres (A)) occurred between 1941 and 1954. National rice acreage also approximately doubled during the same period. This tremendous increase in acreage was in response to high prices for rice during and immediately after the war. Additional production from the increased acreage resulted in declining rice prices, causing rice farmers to appeal to the federal government for assistance. In response, production controls and marketing quotas were imposed in 1955, remaining in effect through 1973 (Holder and Grant 1979). Government farm programs had a stabilizing effect on both rice acreage and price throughout the period (Grant et al. 1984). Stable prices, combined with moderately fluctuating yields, resulted in rice being a relatively low risk crop.

Since 1973, however, the situation for rice in the Upper Gulf Coast region has changed dramatically. Following sharp increases in rice prices during late 1972 and 1973, marketing quotas were suspended for the 1974 and 1975 crops. A target price program was initiated in 1976 and the rice loan rate was reduced, placing emphasis on deficiency payments as a means of income support to producers (Grant et al. 1984). Export demand for rice has increased since the early 1970's but has become more volatile. This combination of a change in government policy and fluctuating export demand has resulted in higher U.S. rice price volatility. The rice industry is now faced with a high level of price risk heretofore unknown to this generation of U.S. rice producers.

Texas rice producers traditionally use more energy inputs than producers in other states because of several factors. Surface water for irrigation is generally lifted from lower depths in Texas than in Louisiana and California. Groundwater wells are, on the average, deeper in Texas than in states such as Arkansas and Mississippi, thereby requiring greater lift. These factors make water more expensive in Texas than in other rice-producing states (Mullins et al. 1981). The combination of clayey soils and humid climate limits the number of field days available for land preparation and harvest, requiring larger equipment and higher per acre fuel costs (Gerlow 1983). Surveys have shown that more fertilizer and chemicals are used in Texas than in other rice-producing states (Mullins et al. 1981). The large increase in energy costs during the 1970's has contributed to Texas rice producers having higher production costs than rice producers in other states.

Traditionally, rice acreage in the Upper Gulf Coast region of Texas has been rotated with 1 or more years of pasture to maintain high productivity (Griffin et al. 1984). Higher costs and greater risk in prices caused producers to search for profitable crops that could be grown in rotation with rice. Crop diversification also reduces the farmer's production and marketing risks, since they are less dependent on a particular crop. The factors that make the region ideal for the production of rice, however, make it hostile to alternative crops. The hot humid climate, combined with poor drainage, severely limits the number of rotation crops that can be grown (Smith 1983). Soybeans are generally considered the best rotation crop for the region (Stansel 1983). Common rice-soybean rotations in the Upper Gulf Coast region include (1) rice followed by 1 year of soybeans, (2) rice followed by 2 years of soybeans, and (3) rice followed by 3 years of soybeans.

Soybean production expanded from 8,200 to 240,500 A in the Upper Gulf Coast area between 1970 and 1980. This increase was primarily because of: (1) high soybean prices, (2) improvements in soybean varieties, and (3) lower profit margins for rice production. Despite improvements in varieties, however, soybean yields remain highly variable from year to year, requiring producers to assume a high level of production risk. Federal crop insurance is available as protection against downside yield risk, but the program has been in operation for only a few years. Price risk is present in soybean production because of a low gov-

LOWER GULF COAST
LIBERTY COUNTY   UPPER GULF COAST
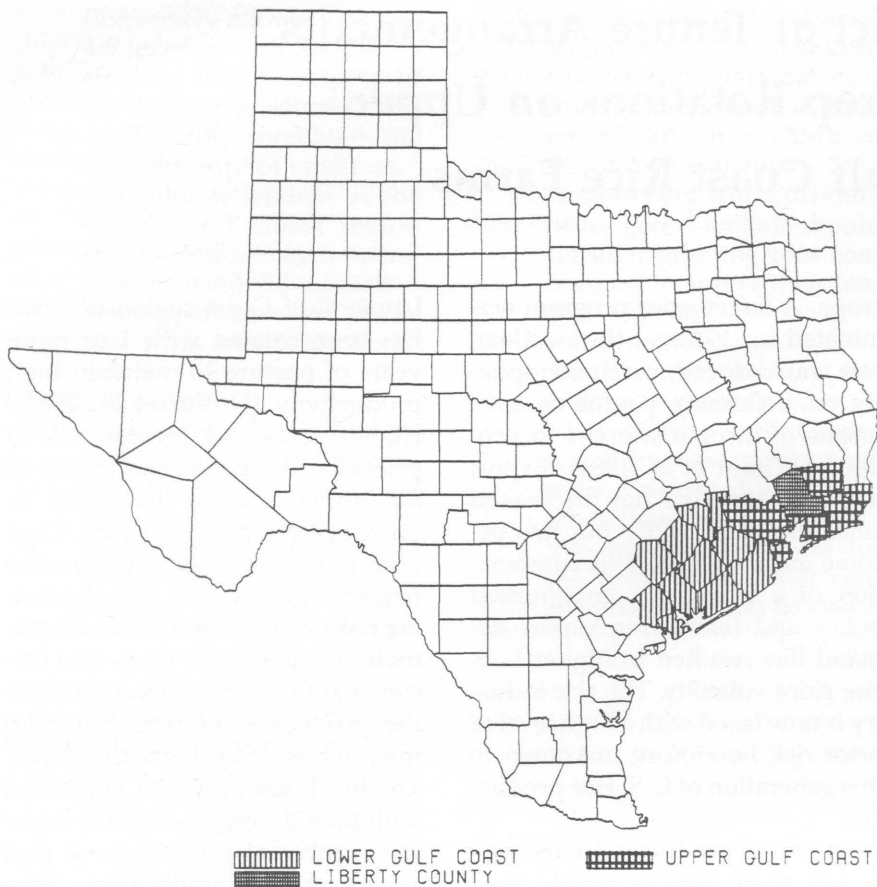
Figure 1. Rice belt and study area.

ernment loan rate and fluctuating export demand.

One method available for reducing production and marketing risk is crop-share land-lease arrangements. Crop-share arrangements allow the land rent to fluctuate in proportion to the per acre revenues received from the farming operation. This is beneficial in adverse years, when the producer is hard-pressed to cover all cash operating costs. In good years, however, more of the gross revenues go to the landowner, resulting in smaller profits for the tenant than would occur under a cash rent tenure arrangement.

Liberty County crop rotations and crop-share arrangements are representative of the Upper Gulf Coast region (Stansel 1983). The location of Liberty County relative to the rest of the Upper Gulf Coast area and to Texas is illustrated in Figure 1. In 1981, farmers harvested 70,000 A of soybeans and 37,100 A of rice, comprising over 90 percent of total harvested crop acreage in Liberty County. On an acreage basis, Liberty County was the number one soybean-producing county and the number eight rice-producing county in Texas for 1981 (TDA—USDA 1982). Crop-share arrangements represented over 53 percent of the 1982 rice acreage farmed in Liberty County. Several different types of crop-share arrangements were used in 1982, ranging from 1/10 to 1/2 of the crop being received by the landowner (Griffin et al. 1984). The proportion of the crop going to the landowner was related to the amount of variable production costs (e.g., water, fertilizer) paid by the landowner.

Continued viability of Texas Upper Gulf Coast rice-soybean farming operations is threatened by price and yield risks and low profit margins for rice and soybeans. Unfortunately for producers, many factors must be evaluated to identify a production strategy that

achieves their personal goals. A detailed examination of the commonly used crop rotations and arrangements would provide useful information to farm managers, as well as those associated with agriculture in the Upper Gulf Coast region. This bulletin presents research analyzing the joint impact of some of these factors on the viability of a representative rice-soybean farming operation in Liberty County.

Objectives and Methodology

The objective of this study is to identify the impact of alternative tenure arrangements and crop rotations, as well as several additional important factors, on the continued viability of rice-soybean farms in the Upper Gulf Coast region of Texas. For purposes of simplicity, only two major crop rotations and two predominant crop-share arrangements are examined[1] in the base scenario. The specific study objectives are:

(1) To identify the particular crop rotation(s) and tenure arrangement(s) preferred, given a base set of assumptions for a representative farm. Producers' survivability, economic success, and ending equity position serve as principal criteria for evaluation of the results; and

(2) To identify and discuss impacts of alternative production and management strategies and technologies, alternative government macroeconomic and farm policies, and financial institutions' credit criteria on the continued viability of rice-soybean farming operations in the Upper Gulf Coast region of Texas.

Four crop rotation-tenure arrangement strategies were simulated over a 5-year period, 1984-88, using RICESIM, an updated and expanded version of the FLIPSIM V (firm level income tax and farm

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[1]Examination of only two crop-share arrangements and two rotations does not limit the applicability of results to other arrangements and (or) rotations. Many of the results could probably be extrapolated to similar types of farming situations in the Upper Gulf Coast area.

policy simulator) simulation model developed by Richardson and Nixon (1985). The optimal strategies in each scenario were determined by examining the probability of farm survival under each strategy, the ending equity position for each strategy, and the net present value (NPV) of the farming operation as an investment. Following an analysis of the base scenario, several additional analyses were conducted to examine sensitivity of the results to initial assumptions made in the base scenario.

Literature Review

Many studies have been conducted to identify optimal crop rotations. In these studies, it is generally assumed that producers attempt to maximize net returns, or minimize production and marketing risks, subject to a minimum acceptable net return. The modelling approaches commonly used in these analyses include whole farm budgeting (Johnson 1979), linear programming (Heady 1954), nonlinear programming (Freund 1956), and MOTAD (Hazell 1971). In general, these approaches identify rotations that meet or exceed producers' economic goals and objectives for a single year, ignoring longterm effects of pursuing particular rotations.

In contrast, many agronomists conduct studies to identify rotations satisfying a number of longterm objectives. In these studies, rotations that maximize per acre yields, minimize insect infestations, improve soil tilth, etc. are identified (*Crop and Soils Magazine* 1981). A recent study by Hoskin (1981) examined 16 different rotations commonly used in the Saginaw Valley of Michigan. Crop prices and yields were stochastically[2] generated using beta probability distributions, after which the rotations were ranked using sto-

chastic dominance[3] decision criteria.

Hamill and Lin (1982) evaluated three different rice-soybean rotations in the Mississippi Delta, using simple production budgets. The NPV of the income stream produced over a 12-year period was calculated for (1) a 1 year rice - 1 year soybean rotation, (2) a 1 year rice - 2 years soybean rotation, and (3) a 2 years rice - 2 years soybean rotation. Future prices and yields for both crops were deterministic in nature and were held constant throughout the study period. Hamill and Lin (1982) concluded the 1 year rice - 1 year soybean rotation offered the greatest potential return to farmers in the Delta area. They cautioned, however, this rotation might increase the incidence of red rice, thereby lowering rice quality.

In contrast to the many studies on crop rotations, few studies have identified optimal tenure arrangements for farm managers. Most studies of crop-share arrangements, for example, have focused on efficiency of share arrangements in motivating tenants to produce at profit-maximizing levels (Cheung 1969; Sutinen 1975). Most studies of tenure arrangements have ignored the influence of crop rotations on results. Pederson (1984) did evaluate optimal tenure arrangements and crop rotations for farm managers in North Dakota. He found that farm managers would prefer fully price-flexible and price-and-yield-flexible tenure arrangements. A simplistic accounting approach (i.e., price times yield minus costs) was used in the analysis, thus ignoring effects of taxes, government farm policy, firm financial situation, and other factors.

A study by Richardson and Bailey (1982) examined the debt servicing capacity of Upper Gulf Coast rice and soybean producers. A typical farm was defined and FLIPSIM V was used to deterministically simulate operation of the farm from 1982-91. The results in-

dicated tenant farmers at all levels of managerial ability probably would not generate sufficient after-tax income to meet their financial *obligations over the next 10 years*. A 1 year rice - 2 years soybean rotation was assumed in this study. Richardson and Bailey (1982) assumed a crop-share arrangement where 1/10 of the crop went to the landowner for both soybeans and rice, with the landowner providing only the land. Both the deterministic approach and the limited scenarios examined were limitations of the study.

Simulation Model and General Assumptions

The rice simulation model (RICESIM) was used to analyze a representative Liberty County rice farm under various scenarios. Simulation modelling is one of many techniques that has been used extensively in recent years for analysis of questions vital to firm level agriculture (Baum and Schertz 1983; Dent and Blackie 1979), as well as in other similar applications (Emshoff and Sisson 1970; Law and Kelton 1982). Microeconomic simulation models are the only type of model that generates probabilities of survival and pertinent financial data. Use of RICESIM is, therefore, appropriate given the study objectives.

The computer model is a firm level, recursive, Monte Carlo simulation model that simulates annual production, farm policy, marketing, management, and income tax aspects of a farm over a chosen planning horizon. The model recursively simulates the farming operation by using the current year's ending financial position as a beginning financial position for the next year. The Monte Carlo aspect of the model comes from repeating (iterating) simulations of farm operations over the planning horizon many times,[4] using pseudorandom crop prices and yields drawn from a multivariate empiri-

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[2]"Stochastic" indicates prices and yields are random or not known with certainty until the analysis is complete. This approach is the opposite of a deterministic approach, where variables are assumed to be known with certainty for the entire time period.

[3]The stochastic dominance approach is detailed in Appendix A.

[4]In this study, 50 iterations were used. The initial results were also examined using 100 iterations. No notable difference was observed between the two solutions.

cal probability distribution for these variables.[5]

Many general and specific assumptions concerning producer and firm behavior are typically made in a RICESIM analysis. The use of assumptions allows researchers to include significant factors in the analysis, while keeping the model size manageable.[6] In this section, a detailed description of the study assumptions is presented. Although lengthy, the section provides the foundation for the study results and therefore merits careful consideration. The accuracy and applicability of the results in addressing individual farm problems depend largely on how closely the study farm depicts an actual situation. Following the base analysis, impacts of many of the major assumptions are evaluated using sensitivity analyses.

General Model Assumptions

One criteria useful in evaluating the firm level impact of alternative production, financial, or government policy strategies is the *probability of survival*. The probability of survival, as used in this study, is the probability that the farm manager will maintain the farm's intermediate and long-term equity ratios[7] at greater than minimum levels established by local financial institutions. In RICESIM, the farm manager must have a positive cash balance at the end of each produc-

tion year. The farm manager is forced to liquidate farm assets if: (a) a negative cash balance exists at the end of a production year, (b) loans have been secured against crops held for marketing in the next year, and (c) no additional refinancing of equity is available (based on lenders' credit policies).

When refinancing a cash deficit, the model first attempts to finance the debt using long-term equity.[8] Because long-term interest rates are less than intermediate-term rates, refinancing using long-term debt assures a lower interest cost to the farm manager, thereby improving chances for survival. If the long-term equity ratio is at the minimum permitted level, the model will next attempt to refinance using intermediate term debt. Refinancing capabilities are terminated if the intermediate and long-term equity ratios reach a pre-set minimum level, assuming the financial institution approves loan refinancing for the farm strictly on the basis of financial ratios. In reality, bankers evaluate several factors before approving or denying a loan request. Officers of the Federal Credit System, for example, generally examine five factors when evaluating a loan request. These factors include: (1) the person requesting the loan, (2) purpose of the loan, (3) repayment capacity, (4) collateral taken as security, and (5) financial position and progress

(Federal Intermediate Credit Bank of Houston 1968). If a financial ratio is used as the sole criteria for acceptance or rejection of a loan, the result will be a bias against farm managers with other favorable factors.

The NPV for the farming operation is a second criteria useful in analyzing results and is calculated at the end of each iteration of the model. It represents the present value of ending net worth for the farm, plus yearly family withdrawals discounted to the present, minus beginning net worth and discounted annual off-farm income. A positive NPV value is denoted as an economic success since after-tax farm income, coupled with after-tax capital gains on assets, generated a return greater than after-tax return available from off-farm investments.

The per acre pattern of monthly labor demands for each crop remains constant over time, assuming no technological change occurs during the study period in per acre labor efficiency. Real equipment repair costs for all machinery remain constant, as does equipment efficiency. Equipment is assumed to have a known economic life. Each equipment piece is replaced when it has reached the end of its economic life, providing the purchase does not cause total debt to exceed the insolvency level. If replacement will cause insolvency,

[5]Probability is a measure of the chance that an uncertain event will occur. A probability distribution is a representation of all possible values of a random variable and the associated probabilities of occurrence. When a random number generated from one probability distribution is allowed to be influenced by random numbers generated from other distributions with which the first distribution is correlated, it is said to be multivariate. Such representation is needed in RICESIM to delineate the interrelated behavior of rice and soybean prices and yields. The prices and yields are *pseudo*-random because the *seeds* for the random number generator are preset by the researchers, thereby allowing many scenarios to be examined using the same set of random variables.

[6]Readers are cautioned to recognize the strengths and limitations of mathematical models in social science research applications. Mathematical models, such as RICESIM, have been developed to represent reality, to a degree. Because reality is complex and often not quantifiable, models are in fact representing a simplified version of reality. As such, the true value of analysis by modelling is "to help develop insights into system behavior which in turn can be used to guide the development of effective plans and decisions" (Geoffrion 1976). Absolute results are not as useful as directonal and/or magnitudal changes between two sets of results. In this light, the base results of this study should not be overly interpreted as favorable or detrimental to the future of the Texas rice industry. Rather, comparison of the

sensitivity analyses' results to those of the base analysis allows for inferences to be made regarding specific production management strategies, impacts of alternative government policies, and financial institutions' credit criteria, etc.

[7]The equity ratio is a financial ratio obtained by dividing total equity by total farm assets. The equity ratio is equal to the debt ratio (total debt divided by total assets) divided by the leverage ratio (total debt divided by total equity) (Penson and Lins 1980).

[8]Because long-term interest rates are less than intermediate-term rates, refinancing using long-term debt assures a lower interest cost to the farm manager, thereby improving chances for survival.

the equipment purchase is postponed until the following year.

Personal income taxes and social security taxes are calculated assuming the farmer is married, filing a *joint income tax return, and* itemizing personal deductions. The regular income tax liability is computed using either income averaging (if qualified) or the standard rate schedules. The model selects the tax strategy that results in the lower income tax liability, based on 1984 tax laws. All investment tax credit allowances are deducted from the regular tax liability with the result being compared to the income tax liability under the alternative minimum tax. The farm manager pays the excess of the alternative minimum tax over the regular income tax liability after credits. Income tax schedules for 1984 are included in the model, as well as a procedure to develop tax rate schedules for 1985 and beyond based on changes in the consumer price index.

Specific Study Assumptions

Data used and results generated for the base strategies are in Appendix B. The simulation analysis was conducted for the 5-year period 1984-88. This period was chosen because expected prices, yields, interest, and inflation rates could be predicted with some degree of confidence.

The farm size used in the study was 2,310 A. This size of operation was the same as that analyzed previously by Richardson and Bailey (1982). Only 8 percent of the 1982 Liberty County farms were larger than 1,000 A, but these few farms represented almost 73 percent of total harvested acreage. More importantly, 38 percent of the farms having irrigated acreage in the county were larger than 2,000 A. The average size of Liberty County farms with more than 2,000 A was almost 2,600 A (U.S. Department of Commerce 1984). The representative farm chosen is larger than the average Liberty County farm but is representative of the farms controlling most of the county's acreage.

It was assumed the farm acreage consisted of leased land, with only 10 A owned and used as the farmstead. Wholly-leased farms represent about one-half of all operating rice farms in the Upper Gulf Coast region (Mullins et al. 1981). Previous studies have suggested wholly-leased farms are most vulnerable to insolvency under current farm policy (Grant et al. 1984). About 5 percent (116 A) of the farm acreage was in buildings, roads, canals, etc., reducing tillable acreage to 2,194 A. The farmstead contained a home for the farmer, a smaller home for one full-time employee, and a 60- by 120-foot equipment shed.

The crop rotations examined have historically been two of the most common in Liberty County (Boldt and Kennedy 1982), namely (1) 2 years of soybeans followed by 1 year of rice (SSR), and (2) 1 year of soybeans followed by 1 year of rice (SR). The principal advantages of the SSR rotation are the lower incidence of red rice (Eastin 1983), higher expected rice yields, lower demand for inputs (particularly water and labor), and lower short-term demand for financing. The principal advantage of the SR rotation is the greater acreage of rice, the more profitable of the two crops.

The two crop-share land rental arrangements analyzed were (1) 1/2 of the crop to the landowner for rice acreage and 1/7 of the crop to the landowner for soybean acreage, and (2) 1/7 of the crop to the landowner for both rice and soybean acreage. The 1/2 share arrangement is the most common for Texas rice acreage (Mullins et al. 1981; Griffin et al. 1984). The 1/7 share arrangement is the typical tenure arrangement in Liberty County for land in soybean production and is also common for rice production (Boldt 1983).

Under a 1/2 share arrangement, the landowner provides land, water, and seed, and pays 1/2 of the fertilizer costs, chemical costs, chemical application costs, drying costs, and sales commissions. In return, the landowner receives 1/2 of the harvested crop or equivalent revenue. Under the 1/7 share arrangement, the landowner provides only land and pays 1/7 of the drying, hauling, and sales commission costs, receiving in return 1/7 of the harvested crop or equivalent revenue (McQuhae 1983).

Finance and Tax

In the base analysis, the 10 A farmstead was being purchased by the producer, with an initial purchase price of $133,600. The beginning (1984) market value of the farmstead was $167,000. Land was initially worth $1,200/A, an average price for cropland in the area (Yates 1983). Buildings were valued at $155,000, of which $105,000 were depreciable. The buildings were depreciated over a 30-year period with a 10 percent salvage value. Market value of the buildings declined by 22 percent per year. The initial debt-to-asset ratio on long-term debt was 0.40, a typical debt level for a wholly-leased farm in Liberty County (Jeffrey 1983).

Beginning market value of farm machinery was just over $565,000, with equipment purchases representing the sole source of intermediate-term debt. The initial debt-to-asset ratio for intermediate-term debt was an average position for a tenant farmer in Liberty County (Jeffrey 1983). New equipment purchases could be made with a 30 percent downpayment and financing available over a 5-year period.

Minimum equity levels were set in the model, assuming additional financing could not be obtained below these levels. These equity ratios were 0.33 for both long-term and intermediate-term credit.[9] This figure represents the minimum credit level allowed by Liberty County banks and is extended only to farmers with an otherwise excellent financial record (Jeffrey 1983).

The producer was 45 years old and married, with three children living at home. He was assumed to be an above-average manager. Twenty percent of the net farm

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[9]This ratio implies 1 out of every 3 dollars of farm assets is owned by the farm manager. This minimum equity ratio is equivalent to a debt-to-asset ratio of 0.67 and a leverage ratio of 2.0 (Penson and Lins 1980).

income was assumed to equal total personal itemized deductions on Schedule A of the Federal Income Tax forms. The deductions reduced taxable income to 80 percent of net farm income. The producer's spouse had a full-time off-farm job, earning $16,000 a year. Two children assisted with the farm labor, receiving no compensation. Family living expenses were allowed to vary from $18,000 to $25,000 per year, depending on farm income. The producer had $20,000 in off-farm investments, earning about 11 percent per year. Other fixed costs for the farm included $3,200 for insurance, $3,000 for accountant and legal fees, $600 for property taxes, and $5,000 for miscellaneous fixed costs. Social Security costs were calculated according to present legislative mandates through 1988.

Initial farm machinery purchased before 1982 was depreciated for tax purposes using the double-declining-balance method. Farm machinery purchased after 1981 was cost recovered over a 5-year period using the accelerated method. No first-year expensing was taken for capital items (primarily equipment) purchased after 1981. Instead, full investment tax credit was claimed on capital purchases, thereby requiring a reduction in the initial tax basis of new capital assets. The reduction consisted of one-half of investment tax credit claimed (Prentice-Hall, Inc. 1971).

A critical assumption in NPV analysis is the discount rate used to discount cash flows and ending net worth. The discount rate used in the study is the expected after-tax rate of return that *could* be earned if the farm manager's initial equity and borrowed capital were invested off the farm. A pre-tax rate of return equal to 11.24 percent, representing the geometric[10] mean of yearly returns assumed in the model for off-farm investments,

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[10]The geometric mean approach and the arithmetic mean approach are the two methods available to calculate an average return for a time period when returns differ within the time period.

TABLE 1. EXPECTED INTEREST AND INFLATION RATES 1984-88

	1984	1985	1986	1987	1988
Annual Interest Rates:			Percent		
Pre-1984 L.T. Loans*	11.7	11.7	11.7	11.7	11.7
Pre-1984 I.T. Loans*	15.0	15.0	15.0	15.0	15.0
New L.T. Loans	13.1	11.7	10.9	10.5	10.5
New I.T. Loans	14.8	14.9	14.1	13.7	13.7
Refinance L.T. Loans	13.1	11.7	10.9	10.5	10.5
Refinance I.T. Loans	14.8	14.9	14.1	13.7	13.7
Operating Loans	15.2	15.4	15.6	14.2	14.2
Return on Savings	11.8	11.9	11.1	10.7	10.7
Annual Inflation Rates:					
Used Machinery	0.0	0.0	0.0	1.0	1.0
Off-Farm Investments	11.8	11.9	11.1	10.7	10.7
Farmland Capital Gains	7.1	7.1	7.1	7.1	7.1
All Other Costs	5.4[a]	4.7	4.5	4.8	5.0
On-Farm Buildings	-2.0	-2.0	-2.0	-2.0	-2.0

Source: Penson (1983).

* L.T.: Long-Term Loans

* I.T.: Intermediate-Term Loans

[a]Initial prices used in the model for new farm machinery and off-farm storage costs are for 1984. Therefore, inflation rates for these costs were equal to zero in 1984.

was used in the discount rate calculations. A geometric mean for long-term interest rates of 11.14 percent was used in calculating the cost of borrowed capital. Interest was the only tax shield available for the off-farm investment. Based on these assumptions, an after-tax discount rate of 10.11 percent was used in NPV calculations for the base scenario.

Interest and Inflation Rates

Eight types of interest rates were used in the model. Annual values for these interest rates were set for each year in the 5-year simulation period. The various interest and inflation rates used are in Table 1. Interest rates on long-term loans obtained previous to the study period were 11.75 percent, with

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The principal difference between the two methods is the geometric mean accounts for the effect of compounding of returns over time (Weston and Brigham 1981).

interest rates on old intermediate-term loans set at 15 percent. New long-term, intermediate-term, and operating loan rates were calculated for 1984-87 using the COMGEM (Penson et al. 1984). These rates ranged from 10.5 to 13.1 percent for long-term loans, 13.7 to 14.9 percent for intermediate-term loans, and 14.2 to 15.6 percent for operating loans. For 1988, interest rates were held constant at 1987 levels.

Annual inflation rates for 14 different production costs and returns on investment were also specified in the model. In most cases, the general inflation rate predicted by COMGEM for farm inputs was used to inflate production costs. The annual rates used were: 5.4 percent in 1984, 4.7 percent in 1985, 4.5 percent in 1986, 4.8 percent in 1987, and 5.0 percent in 1988. Inflation rates for used equipment were 0 percent for 1984-86 and 1 percent in 1987-88. The 1987-88 rates reflected the expectation that used equipment will become

more scarce and, thus, more valuable during the latter part of the 1980's. Increases in land values were at a 7.1 percent annual rate and increased independent of changes in net farm income. The 7.1 percent rate was the approximate increase in the study area land values during 1982-83 (Gilliland 1984). Although some have argued that land values are closely tied to income (Skees and Reid 1984), others have maintained that farm income is only one of many factors influencing land values (Castle and Hoch 1983). Pope and Goodwin (1984) found agricultural productivity was the fifth most important characteristic considered by purchasers of rural land in Texas. Proximity of the representative farm to the Houston metropolitan area causes land values to be relatively immune to farm income variations.

Production and Management

A machinery complement was identified for the study farm, based on crop production requirements. Local farmers examined the complement and made final adjustments so it would be representative of the Liberty County area (Jeffrey 1983; Yates 1983). The complement was the same under both the SSR and SR rotations, recognizing the desired flexibility of producers to change rotations.[11] A list of the initial equipment complement is in Table 2.

A 7-year productive life was assumed for most equipment. Although equipment replacement after 7 years is more often than the optimal replacement rate identified in previous economic analyses (Chisholm 1974; Kay and Rister 1976; Bates et al. 1979), it appears appropriate, given the assumed level of annual equipment usage, timeliness, and anticipated high costs of breakdowns as the equipment ages. Exceptions (i.e., longer

replacement policies) to the 7-year replacement policy were made for assets with low annual usage or high durability, including the grain carts, one pickup truck, the small tractor, and the levee plow, push, and roller. Current market values, original purchase prices, and current replacement prices were obtained from a local implement dealer (Yates 1983) and from *The National Farm and Power Equipment Dealers Association Official Guide, Tractors and Farm Equipment (1983)*. All replacement equipment was new.

Cash production costs for first crop rice and soybeans in 1984 were calculated from 1983 budgets developed for Liberty County by Gerlow (1983) and Boldt and Kennedy (1982). (A study by Rister and Griffin (1984) yielded cash costs for ratoon rice.) These costs are presented in Table 3. The exception to using these budgets was water cost. Because water is an important and costly input in rice production, the actual 1984 rate charged by Liberty-Chambers Counties Navigation District was used in the base analysis. All costs of production were inflated over the 1984-88 period using the previously mentioned inflation rates.

The farm manager employed two men full-time, with part-time assistance assumed available during peak seasons. Because of high labor demands in rice production (Texas Agricultural Extension Service 1983), an additional man was employed for the SR rotation strategies. Each man worked from 250 to 350 hours per month, depending on the time of year.[12] The farm manager worked 200 to 300 hours per month, working more hours during spring, summer, and fall, than in the winter. In addition, two of the producer's children worked full-time (300 hours each per month) during May, June, July, and August. The two children worked part-time (100-200 hours per month each) the rest of the year. Monthly per acre requirements

used were 10 percent less than those reported in Texas Agricultural Extension Service (1983) budgets for the Upper Gulf Coast region, reflecting above average management of the farm and economies of scale. Monthly labor requirements and labor supplied are given in Appendix B.

Only 25 percent of the rice acreage produced a ratoon crop, consistent with 1982 averages for Liberty County (Griffin et al. 1984). It was assumed ratoon acreage was fertilized and irrigated before harvest. The farmer harvested 95 percent of the planted soybean acreage and 99 percent of planted rice acreage. Both harvested acreage percentages are typical for Liberty County (TDA—USDA 1982). All first crop rice was harvested and sold in August. Ratoon rice was harvested in October and sold the following January. Soybeans were harvested in October, with 70 percent of the beans sold in October and 30 percent sold in January (Grant et al. 1984). The percentage of the year operating loans were held varied by crop rotation-tenure strategy, from 36.9 percent for the SR rotation under a 1/7 share arrangement to 42.2 percent for the SSR rotation under a 1/2 share arrangement.

Crop Prices and Yields

Key assumptions in the study were the expected mean (average) prices and yields for rice and soybeans over time (Table 4), and the distributions about each mean. Annual mean values for rice and soybean prices and yields are used in RICESIM to account for expected changes over time caused by technology, long-term shifts in demand, etc. Distributions around the means represent price and yield uncertainty resulting from weather, insects, disease, changes in export demand, etc. Use of a random number generator[13] in

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[11]Although individual producers may have equipment complements different from that indicated in Table 2, the total dollar value of the other complements should be similar to the one used in the study.

[12]Work hours included maintenance and repair work, as well as normal field work.

[13]A random number generator is a computer routine that generates many random or uncorrelated standard deviates to be used in calculating stochastic variables. The use of

TABLE 2. EQUIPMENT COMPLEMENT FOR LIBERTY COUNTY RICE AND SOYBEAN FARM

Equipment	Year Purchased	Current Market Value	Original Purchase Price	Current Replacement Cost
160 H.P. Tractor	1980	$33,474	$39,798	$61,700
160 H.P. Tractor	1979	31,769	33,568	61,700
160 H.P. Tractor	1983	61,700	61,700	61,700
230 H.P. Tractor	1978	34,945	52,475	94,800
230 H.P. Tractor	1980	48,571	65,823	94,800
65 H.P. Tractor	1975	7,717	10,087	19,900
Combine	1979	51,909	53,886	94,000
Combine	1980	55,882	61,881	94,000
Combine	1983	94,000	94,000	94,000
1/2 Ton Pickup	1976	2,375	3,876	9,000
1/2 Ton Pickup	1978	3,425	4,538	9,000
1/2 Ton Pickup	1983	9,000	9,000	9,000
22' 9" Disk	1980	4,500	9,800	15,300
22' 9" Disk	1982	7,500	11,500	15,300
24' 4" Disk	1978	3,500	9,200	19,300
24' 4" Disk	1981	5,000	11,500	19,300
Rolling Cultivator	1979	1,500	3,900	5,200
Rolling Cultivator	1982	2,000	4,200	5,200
8' Bean Planter	1976	4,500	4,371	10,250
8' Bean Planter	1982	4,500	7,000	10,250
Grain Cart	1975	2,000	1,320	6,800
Grain Cart	1981	3,500	4,718	6,800
16' x 60' Land Plane	1977	3,000	8,000	17,500
16' x 60' Land Plane	1978	7,376	7,600	17,500
150 Levee Boxes	1982	6,000	7,500	11,250
Levee Plow	1981	1,547	1,563	2,800
Levee Push	1981	700	2,100	2,500
Levee Roller	1978	350	350	650
31' Field Cultivator	1981	4,500	5,800	9,800
31' Field Cultivator	1982	5,500	7,100	9,800
25' Field Cultivator	1978	2,500	5,800	9,800
8 Row Bedder	1976	1,036	1,100	5,400
8 Row Bedder	1979	1,500	3,500	5,400
Pipe Harrow	1979	1,000	1,020	2,100
Pipe Harrow	1980	1,100	1,600	2,100
Du-All	1978	3,500	8,600	11,500
Miscellaneous Trucks	1977	50,000	60,000	90,000

Source: Jeffrey 1983; Yates 1983.

combination with the distributions (also known as probability density functions) results in prices and yields that are random in a given year but which, when repeated

defined distributions in combination with random numbers allows random variables (e.g., prices and yields) to occur much as they would in actuality.

samplings are made, occur with about the same frequency as defined in the distribution.

Mean Soybean Yields and Prices

The 1984 mean yields for soybeans were obtained from the subjectively estimated yield distributions (see following section on development of distributions). Means for subsequent years were

calculated by increasing yields by 0.4 bu/A/year, based on expectations of agronomists working in the study region. The COMGEM model was used to predict annual national soybean prices through 1987. The 1987 price was increased by 4 percent to obtain the national soybean price for 1988. Historical data from 1973-82 were used to calculate the differential between

TABLE 3. 1983 PER ACRE CASH PRODUCTION COSTS FOR RICE AND SOYBEANS[a]

Item	First Crop Rice	Ratoon Rice	Soybeans
	Per Acre Costs		
Seed	$33.90	$0.00	$9.45
Fertilizer	51.00	13.50	14.36
Chemicals	67.56	10.00	45.45
Fuel-Lube	18.60	0.00	12.68
Repairs	6.76	0.00	6.17
Water	68.00	14.45	0.00
Harvest	11.20	8.55	9.14
Total	$257.02	46.50	$97.25
	Per Unit Costs		
Drying and Storage	$ .70/cwt	$ .70/cwt	$ .25/bushel
Custom Haul	.40	.40	.20
Sales Commission	.13	.13	0.00
Total	$ 1.23/cwt	$ 1.23/cwt	$ .45/bushel

[a]Additional variable costs (such as labor and interest on operating capital) are internally calculated by RICESIM.

Source: Texas Agricultural Extension Service (1983); Boldt and Kennedy (1983); Gerlow (1983); Griffin et al. (1984).

the local price and the national soybean price. A significant differential existed between the two prices and increased with time at the approximate rate of inflation. The estimated equation was

$$Y_T = -3.728 + 0.05048(T)$$
$$(1.562) \quad (0.0201)$$
$$\bar{R}^2 = 0.374$$

Durbin-Watson statistic
(D.W.) = 2.163

where Y_T = differential between Texas and U.S. soybean price, and T = time, as 73, 74, ..., 82.

Values reported in the parentheses are standard errors for the estimated coefficients. Using the regression equation, the 1984 local price was predicted to be $0.49/bu higher than the national average price. The predicted 1984 U.S. soybean price was adjusted upward by $0.49/bu to represent the Liberty County soybean price. The $0.49/bu differential was inflated over time at the same rate as soybean prices to adjust yearly U.S. soybean price to Texas soybean price.

Mean Rice Yields and Prices

As with soybeans, the 1984 mean rice yield was estimated using subjectively estimated yield distributions. Mean yields for rice over time were estimated based on expectations of agronomists working in the study region. A complicating factor in these estimations was the introduction in 1983 of Lemont, a new long-grain rice variety. In its first year of release, Lemont yielded about 11 cwt (25 percent) more rice than traditional varieties produced by the same farmers (Texas Rice Research Foundation 1983). Although this yield level was obtained by above average producers, Turner (1983) expects Lemont

yields 10 cwt (22 percent) above traditional varieties (i.e., Labelle and Lebonnet) for average producers.

The actual process of generating prices and yields in RICESIM consisted of (1) generating independent random normal deviates using the random number generator, (2) correlating the deviates, using the square root of the correlation matrix, (3) transforming the correlated random normal deviates into uniform correlated random deviates (i.e., transforming the result to a unit scale from 0.0 to 1.0), (4) using each transformed value in a table look-up function of its respective empirical distribution to obtain a number representing the deviation from the mean, and (5) adding the deviation value to the specified mean for that variable.

Government Program

Rice, similar to most other grains produced in the United States, is subject to a government commodity program. The current program is voluntary and specifies (1) a national target price, (2) a national loan rate, and (3) a maximum deficiency payment. The applicable deficiency payment rate for rice is calculated using either the national target price minus the weighted average national rice price for the *first 5 months of the marketing* year (i.e., August-December) or the target price minus the loan rate, whichever is lower (Johnson et al. 1982). The maximum deficiency payment that can be received by one person is $50,000. Because it is common for the farm affairs of an operation of this size to be arranged so that two persons qualify for government payments (Lin et al. 1981), a $100,000 payment limitation was assumed for the farm. It was assumed the farm manager participated in the farm program during all years analyzed in the simulation period.

The national loan rate for rice is a weighted average based on the applicable loan rates for short, medium, and long grain rice. The national rice loan rate is used for calculating deficiency payments in all rice-producing states (if higher

TABLE 4. EXPECTED (MEAN) AVERAGE RICE AND SOYBEAN PRICES AND YIELDS 1984-88

| | Cwt of Rice | | | | | | Bu of Soybeans | | | |
| | Following 1 Year of Soybeans | | Following 2 Years of Soybeans | | Ratoon Rice | | Following Soybeans | | Following Rice | |
	Price	Yield[a]	Price	Yield[a]	Price[b]	Yield[a]	Price	Yield[a]	Price	Yield[a]
1984	9.28	46.17	9.54	50.03	8.00	7.76	6.33	22.84	6.33	23.69
1985	9.78	52.31	10.05	56.69	9.34	7.84	7.45	23.31	7.45	24.17
1986	10.14	56.04	10.40	60.73	9.68	7.92	7.92	23.78	7.92	24.67
1987	10.56	56.61	10.83	61.34	10.07	8.00	8.01	24.27	8.01	25.17
1988	11.02	57.18	11.29	61.96	10.50	8.08	8.34	24.76	8.34	25.68

[a]Yield figures are on a per acre basis.

[b]Prices are for ratoon rice in a SSR rotation and are 93 percent of first crop prices. Ratoon rice prices are also 93 percent of first crop rice prices for the SR rotation.

Sources: Penson 1983; Grant, Beach, and Lin 1984; Liberty County Farmers and other Agricultural Professionals.

than the 5-month average market price). In determining the appropriate loan rate for long grain rice, however, the effective long grain loan value factors are applicable.

To simulate the rice farm program for the representative farm, it was necessary to project Texas long grain rice loan rates and target prices for 1984-88. Because the current political climate suggests future government programs will be more austere (Adams 1984), national loan rates and target prices were held constant throughout the study period. Assuming a long grain rice turnout of 55/70 (i.e., head rice/total milling yield) (Brorsen et al. 1984), the average long grain loan rate has averaged 107.894 percent of the national rice loan rate over the 1974-83 period. This percentage was used to adjust the national loan rate in 1984 ($8.00/cwt) to a Texas long grain loan rate equivalent. As a result, the loan rate and target price used in the study were $8.63/cwt and $12.53/cwt, respectively.

Stansel (1983) estimates about 100,000 A of Lemont will be planted in 1984, with most Texas acreage planted to Lemont in 1985 and after. To account for the introduction of this variety, 25 percent of the representative farm's 1984 rice acreage was assumed planted to Lemont, with the remaining 75 percent in Labelle. Lemont acreage was increased to 75 percent in 1985

and constituted all rice acreage in 1986 and after. As a result, rice yields for the representative farm increased 22 percent by 1986. Based on recommendations by Turner (1983), an additional 40 lb of nitrogen were applied to the Lemont acreage, as well as one additional fungicide treatment, relative to Labelle acreage. After 1986, Turner (1983) estimated yields would increase only 1 percent per year through 1988. Ratoon rice yields were unaffected by the introduction of Lemont, increasing at a 1 percent per year rate.

The additional supply of rice attributed to Lemont is expected to have a negative effect on domestic rice prices. The extent of the impact will depend on quantity of additional yield per acre achieved under field conditions and popularity of Lemont among Southern rice farmers. Based on estimates by Stansel (1983), Lemont was assumed to constitute 80 percent of all Texas rice acreage and 50 percent of all non-Texas rice acreage in the South by 1988. Using these figures, an econometric simulation model developed by Grant, Beach, and Lin (1984) was used to estimate expected rice prices for 1984-88.

The model predicted nominal U.S. rice prices would slowly rise during the period, assuming no change in the government farm program. The predicted prices per hundredweight were: $9.29 in

1984, $9.77 in 1985, $10.11 in 1986, $10.52 in 1987, and $10.96 in 1988. Production was predicted to reach a high of 138 million hundredweight in 1986, falling to 136 million hundredweight by 1988. The continued increase in production costs, coupled with an unchanging target price, were responsible for the decline in production. Public and private carryover stocks were predicted to increase from about 51 million hundredweight in 1984 to 56.6 million hundredweight in 1988. The Grant, Beach, and Lin (1984) model predicted surplus stocks would continue to increase throughout 1984-88, with a resulting depressing effect on prices. The decline in production after 1986 suggests stocks may begin to decrease after 1988.

Monthly historical data from 1974-81 was used to estimate the relationship between Texas long grain prices and national prices.[14] The relationship was

Texas = −0.1840 + 1.0469 (National
Price   Price)

(0.1986) (0.0198)
$\bar{R}^2 = 0.961$
D.W. = 0.623

This equation was used to convert

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[14]Data for September 1976 to July 1979 were unavailable.

16
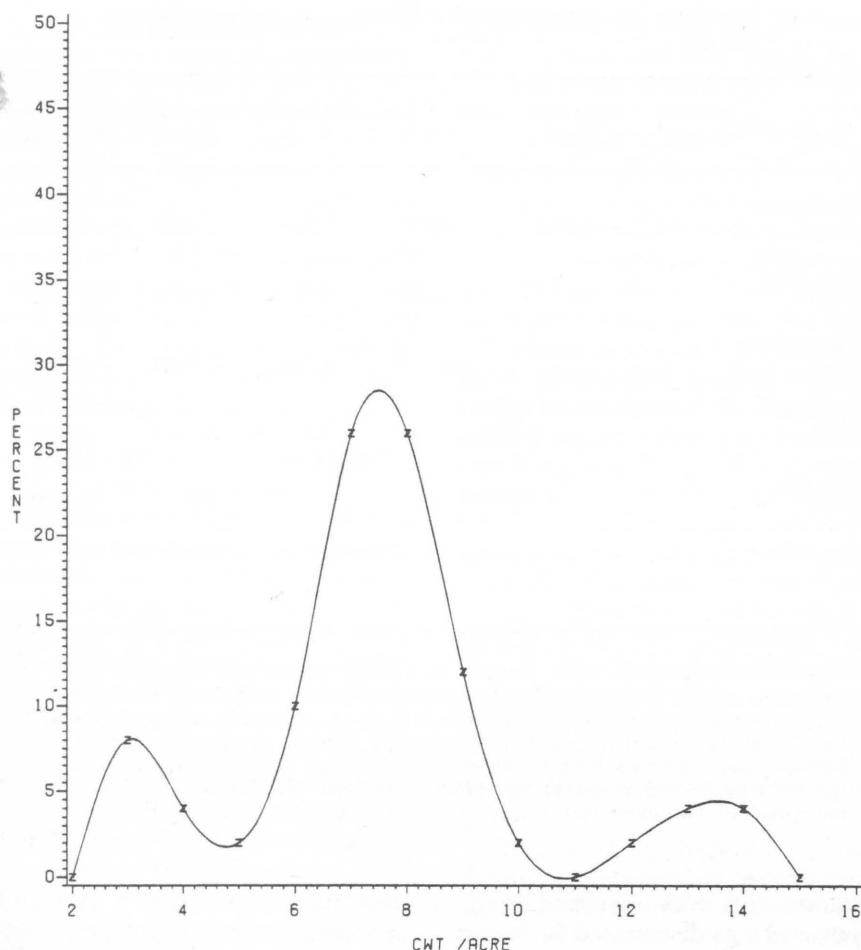
Source: Subjectively estimated by farmers and agricultural experts
in Liberty Co, Texas

Figure 2. Yield distribution for ratoon rice.

the projected national average price to a Texas long grain price. Ratoon rice prices were 7 percent less than first crop prices because of lower quality (Gerlow 1983; Brorsen et al. 1984).

As mentioned previously, one of the principal advantages of the SSR rotation is the reduced incidence of red rice in the rice crop. Eastin (1983) estimates that an incidence of 2.5 percent red rice is expected in rice following 1 year of soybeans, whereas only 0.5 percent red rice is expected when rice follows 2 years of soybeans. Brorsen et al. (1984) found rice prices in Lower Gulf Coast bid/acceptance auction markets were discounted $0.134/cwt for each 1 percent of red rice present during 1979-81. Based on these

observed discounts, mean prices for rice produced in the SR rotation were discounted $0.268/cwt from prices received for rice produced in the SSR rotation. The discount was held constant over time.

Development of Distributions

An example plot detailing the probability density function (pdf) for ratoon rice yields is displayed in Figure 2. The figure illustrates probability of yields within a particular range. The probability of ratoon yields between 7 and 9 cwt is about 30 percent, for example, while the probability of yields between 11 and 13 cwt is only about 2 percent. The mean for this distribution is the 1984 mean for ra-

toon rice (about 8 cwt). When the mean increases, the distribution shifts to the right, making higher yields possible, while eliminating the possibility of very low yields. Plots of all other yield and price distributions are found in Appendix C. Methods used to develop the means and their corresponding distributions are discussed below.

The distribution for soybean prices was based on behavior of soybean prices during 1973-82. Thus, the probability of randomly drawing a very high price for soybeans in a given year of the planning horizon was the same as the percentage occurrence of that high price during 1973-82. The Grant, Beach, and Lin (1984) model was used to predict rice prices between 1973-83. The differences or deviations between the predicted price and actual price were used to develop a distribution for first crop ratoon rice prices.

Unfortunately, only a few years of farm level data are available in Liberty County from which to estimate empirical yield distributions. To overcome this problem, several producers and agricultural-related *professionals from the Liberty* County area were asked to subjectively estimate (November 1983) the probability of 1984 crop yields falling within 1 of 10 yield intervals. This procedure is similar to that used by Bessler (1977) to estimate producers' price expectations. The resulting data were combined to form composite distributions for the following five crops: (1) soybeans following soybeans, (2) soybeans following rice, (3) rice following 1 year of soybeans, (4) rice following 2 years of soybeans, and (5) ratoon rice.[15] Means

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[15]The distributions for rice were estimated assuming Labelle rice was used. Lemont is expected to have a different distribution around the mean, but only a few years of field data exist with which to estimate the new distribution. Because of the lack of data, the Lemont distribution was assumed to be the same as the Labelle distribution. Sensitivity analyses are given in a later part of the report to determine the impact of this assumption on the results.

for the respective empirical distributions were used as the 1984 means in the model. The mean values were close to county average yields for soybeans and ratoon rice. For first crop rice, the means were 3 to 5 cwt above the county average, reflecting the assumed above average management level of the farmer in rice production.

A correlation matrix[16] was estimated for all rice and soybean price and yield variables used in the study (Table 5). Liberty County annual price and yield data for 1973-82 were used as the principal source for estimating the correlation matrix. The square root of the correlation matrix was used with means of the yield and price distributions to generate random multivariate prices and yields. As expected, first crop and ratoon crop rice prices were positively correlated (0.87), as were first crop and ratoon crop rice yields (0.63). First crop and ratoon rice yields and prices were negatively correlated (-0.42 and -0.24). First crop and ratoon rice and soybean yields exhibited a positive correlation (0.57 and 0.46). Correlation coefficients between other variables were less significant. Because coefficients between current and past yields and prices were not significant, autoregressive influences on current prices were assumed zero.

The presence of 2.5 percent red rice in rice grown in the SR rotation caused this rice to be lowered to a number three grade rice. According to farm program regulations, grade three rice is discounted $0.30/cwt from the base loan rate.

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[16]"Correlation measures the closeness of a linear relationship between two variables. If one variable x can be expressed exactly as a linear function of another variable y, then the correlation is 1 or -1, depending on whether the two variables are directly related or inversely related. A correlation of 0 between two variables means that each variable has no linear predictive ability for the other." (SAS Institute, Inc. 1982). A correlation matrix consists of correlation coefficients for all variables, the number of variables determining the size of the matrix.

TABLE 5. CORRELATION COEFFICIENTS[a] FOR RICE AND SOYBEAN PRICES AND YIELDS.

	Soybean Yield	First Rice Yield	Ratoon Rice Yield	Soybean Price	July Rice Price	January Rice Price
Soybean Yield	1.0	0.5714	0.4698	0.3055	-0.4209	-0.2476
First Rice Yield		1.0	0.6323	-0.1485	-0.4289	-0.5923
Ratoon Rice Yield			1.0	-0.1543	-0.7809	-0.8397
Soybean Price				1.0	0.1172	0.2420
July Rice Price					1.0	0.8709
Jan. Rice Price						1.0

"Correlation" measures the closeness of a linear relationship between two variables. If one variable x can be expressed exactly as a linear function of another variable y, then the correlation is 1 or -1, depending on whether the two variables are directly related or inversely related. A correlation of 0 between two variables means that each variable has no linear predictive ability for the other" (SAS Institute, Inc. 1982). The lower half of the diagonal is the reciprocal of the upper half.

Ratoon rice was assumed grade four and was discounted $0.60/cwt from the base loan rate (USDA 1983). The discounts were held constant throughout 1984-88.

Yields for the previous 5 years from a Liberty County farm of similar size and production levels were used to calculate proven yield levels used in the farm program. Participation in the rice farm program required setting aside 20 percent of farm acreage, with an additional 5 percent of the rice acreage placed in paid diversion. The set-aside and paid diversion was 80 percent effective in reducing production, i.e., a slippage rate of 20 percent was assumed. The soybean farm program consisted solely of a loan rate. The loan rate ($5.02/bu) was also held constant over the study period.

Participation in the Federal Crop Insurance Program on only soybeans was assumed in the base analysis. Rice was not included since examination of the yield distributions used indicated the probability of yields falling below the guaranteed minimum was small

(less than 5 percent).[17] The low probability was a result of the large increase in expected rice yields as compared with proven rice yields. For soybeans, the insurance initially guaranteed a 14 bu/A yield, about 65 percent of the initial mean soybean yield or level two of the insurance program (USDA-FCIC 1982).

Federal Crop Insurance price election for soybeans was at the highest level ($6.50/bu). The landowner shared in the cost of the insurance premium in proportion to the crop-share arrangement for soybeans. The insurance policy included protection against hail and fire damage. Base yields for crop insurance increased over time (Table 4). Price election was also increased at the same rate as was assumed for mean soybean prices

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[17]When rice was insured in the model, probabilities of survival and success, NPV, and other analysis criteria fell for all four strategies. Dropping crop insurance seemed justified, based on this result.

in the model. Premiums were increased over time in accordance with the increased prices, increased yields, and loss experience (Pfluger 1984). The producer was assumed to have participated in the soybean crop insurance program during the previous 3 years (1981-83). The farm used in calculating proven yields for rice was also used for historical soybean yields. The actual farm reported yields below the guaranteed minimum during 1982 and 1983.

RESULTS AND ANALYSES
Base Scenario

Simulation results for the four crop rotation-tenure arrangement strategies are in Table 6. The soybean-soybean-rice rotation with a 1/7 crop-share arrangement (SSR 1/7) offered the highest probability of survival (82 percent) of the four strategies examined. As indicated in the previous section, the probability of survival is the probability that the producer will maintain the farm's equity level above the minimum levels (established by local financial institutions) throughout the 5-year study period. The soybean-rice rotation under a 1/7 crop-share arrangement (SR 1/7) offered a 78 percent probability of survival, highest for the two soybean-rice rotation strategies. All four strategies exhibited a 50 percent or greater probability of survival.[18]

Probabilities of survival under each strategy for each year of the 5-year study period are presented in Table 7. Survivability fell rapidly in the second year for the SSR 1/2 strategy, the farm operation failing because of back-to-back years of poor soybean yields and prices or below average soybean and rice yields and prices. The greatest decrease in survivability for the other three strategies occurred in year 3,

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[18]The reader is cautioned not to misinterpret these and subsequent results. The results do not imply 82 percent of farms using the SSR 1/7 strategy will still be in operation in 1988, while the remaining 18 percent will be bankrupt. Nor should the results be interpreted as absolute. The results should be viewed as an approximation of the farm manager's probabili-

again because of combinations of low soybean and rice prices and (or) low yields several years in succession.

Preference rankings between strategies were also the same when using the mean ending equity ratios. The mean ending equity ratios for all iterations include iterations that became insolvent during the 5-year study period. The two 1/7 share strategies performed much better, with average ending equity ratios above 0.55. The mean ending equity ratios for iterations surviving the 5-year period were higher than those for all iterations, but were much closer between strategies. However, the 1/7 share strategies had higher ending equity ratios than the 1/2 share strategies. Initial equity ratios were 0.60 for all four strategies. It can be concluded that, if a farm of the type modelled survives the 1984-88 production period, the farm manager will probably improve his/her equity position.

The SSR 1/7 strategy also offered the highest probability of economic success. Economic success is defined as generating a positive after-tax net present value for the farm. The SSR 1/7 strategy was the only strategy with a probability of economic success greater than 50 percent. By contrast, the SSR 1/2 strategy offered only a 12 percent probability of success, less than one-fourth that of the SSR 1/7 strategy. Both 1/7 share arrangements offered probabilities of economic success that were more than twice those of the 1/2 share arrangements. The much higher probability of success is not surprising, since land rental costs are less variable under the 1/7 arrangement. The farm manager using the 1/7 arrangement receives more of the benefits accrued in a good year

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ty of still being in farming at the end of 1988, and should be used largely for comparison between results. In this instance, the results indicate the farm manager following the SSR 1/7 strategy has a high probability of survival through 1988 and that the strategy offers a relatively higher probability of survival than do the three alternative strategies.

than does the farmer using the 1/2 share arrangement.

As expected from examining probability of success figures, the average after-tax NPV was highest for the SSR 1/7 strategy. Because the discount rate represents the after-tax return if an equivalent investment was made in a risk-free off-farm investment, the results imply the farm manager may not receive a return to his investment greater than the return from the off-farm investment.

The after-tax NPV cumulative distributions[19] generated for each strategy are illustrated in Figure 3. One approach frequently used in ranking stochastically-generated observations is stochastic dominance. An explanation of the theoretical framework supporting stochastic dominance as a decision criteria is in Appendix A. Stochastic dominance uses paired comparisons to identify strategies preferred by persons with different attitudes towards risk. In this study, a particular type of stochastic dominance approach, known as stochastic dominance with respect to a function (SDRF), was in the ranking process. SDRF permits identification of preferred strategies over differing ranges of risk preference levels (Meyer 1977a). Five intervals were chosen for analysis to permit identification of optimal strategies for farm managers with different risk preferences. These intervals were: (1) risk preferring, with Pratt coefficient bounds of -0.0003 and 0.0; (2) risk neutral, with coefficient bounds of 0.0; (3) risk averse, with coefficient bounds of 0.0 to 0.0003; (4) risk preferring and risk averse (combination), with coefficient bounds of -0.0001 to 0.0001; and (5) strongly risk averse, with coefficient bounds of 0.0001 to 0.0003. Results of SDRF rankings for the base scenarios are presented in Table 8.

In general, the SDRF rankings

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[19]The cumulative distribution indicates the probability that returns are below a certain level. For example, in Figure 3, the probability of a NPV below zero for SSR 1/7 strategy is 0.48, or 48 percent.

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TABLE 6. RESULTS FOR SIMULATING A 2,300 A LIBERTY COUNTY RICE-SOYBEAN
FARM UNDER DIFFERENT CROP-SHARE AND CROP ROTATION
STRATEGIES--BASE SCENARIO

	SSR Rotation		SR Rotation	
Analysis Variables	1/2 Share[a]	1/7 Share	1/2 Share[a]	1/7 Share
Probability of Survival (%):[b]	50	82	72	78
Probability of Success (%):[c]	12	52	20	40
After-Tax Net Present Value($):[d]				
Mean	-207,167.	-23,183.	-132,641.	-52,266.
Standard Deviation	188,318.	213,605.	177,131.	193,744.
Maximum	225,998.	456,226.	250,238.	350,701.
Minimum	-531,767.	-478,900.	-490,366.	-487,218.
Mean Ending Equity Ratio (Surviving Iterations):	0.606	0.679	0.596	0.659
Mean Ending Equity Ratio (All Iterations):	0.381	0.586	0.473	0.555
Mean Yearly Government Payments ($):	29,820.	47,750.	44,003.	56,702.
Mean Yearly Cash Farm Income ($):	-25,958.	23,677.	-3,459.	16,536.

[a]Share for rice only; share for soybeans is 1/7.

[b]Probability of survival is the probability that the farm will maintain its equity
ratios at greater than minimum levels established for local financial
institutions.

[c]Probability of success is the probability of generating a positive after-tax net
present value for the farm.

[d]After-tax net present value is the present value of the net annual family
withdrawals plus the present value of change in net worth over the 5-year
planning horizon.

varied depending on the assumed risk attitudes of the farm manager. The SSR 1/7 strategy was preferred or equally preferred for all categories of decisionmakers. The SR 1/7 strategy was preferred or equally preferred with the SSR 1/7 strategy, for risk preferring and combination categories. The SSR 1/2 strategy was, in most cases, the least preferred strategy. The importance of knowing an individual farmer's risk preferences is demonstrated in these results. When widely divergent Pratt coefficient bounds were used in the ranking process (implying little knowledge about the individual's risk preferences) clear-cut rankings of strategies were not possible. When the bounds were very narrow (as in the risk neutral and strongly risk averse categories), clear identification of preferred strategies was possible.

Major factors influencing the general superiority of the 1/7 share strategies in farm survival, economic success, and ending equity position are assumptions regarding the price discount for red rice, high intermediate-term financial demands, rental arrangements, differences in yields, and the value of diversification. The SSR rotations both benefit from higher rice prices because of the lower incidence of red rice in the rice crop. Expected yields for rice are also about 4 cwt (8 percent) per acre higher under the SSR rotation.

The result is higher revenue per hundredweight of rice and an approximate $0.60/cwt (or 5 percent) decrease in production costs.

Government deficiency payments to the tenant were much higher for the 1/7 share strategy, resulting in more cash income. Under the 1/2 share arrangement, 1/2 of total government payments went to the landowner. The result was higher per acre rents and lower net returns for the 1/2 share operators. The government program protected all strategies from price risk, although the payment limitation was reached in some years under the SR 1/7 strategy.[20]

As mentioned before, one important risk in soybean production is high yield variability. On a per acre basis, the Federal Crop Insurance program protected producers operating under each strategy equally well from this risk. As a result, yield risk was not a major concern for soybean acreage. Rice yields were much less variable so yield risk was less of a concern. Major risks were associated with soybean prices (where near free market conditions prevail) and combinations of low to moderate yields and prices for soybeans and rice.

Producers operating under all four strategies had to meet high levels of principal and interest payments, particularly for farm machinery and equipment. Under the 1/2 share arrangements, not enough profit was generated to meet these high fixed cost cash flows during a bad year. The government program provided some protection against large losses in the operation for the 1/7 share producer, while still allowing the producer to receive most of the benefits from a good year. Good years tended to generate enough surplus income to meet financial obligations during adverse years. In sev-

[20]Although per acre government payments were less under the SR rotations, the larger number of rice acres caused the manager using the 1/7 share arrangement to have more total government payments and thus reach the payment limitation sooner than other strategies.

eral instances, insolvency occurred for the SSR 1/2 strategy as a result of bad soybean prices and/or yields, even when rice prices and/or yields were excellent. Because the share received by the landowner was so large for rice acreage, soybeans became the principal crop for the SSR 1/2 and SR 1/2 strategies. The 1/2 share arrangement seemed to counteract the principal benefit of crop diversification (i.e., risk reduction).

Production and Management Sensitivity Analyses

In this and subsequent sections, sensitivity analyses are presented for the four strategies examined in the base scenario. The purposes of sensitivity analyses are threefold. The first is to explore the effect of major assumptions on the results. Researchers usually have more confidence in some assumptions than others. If the model is sensitive to an assumption researchers are confident in, important and perhaps new recommendations can be made to other researchers and farm managers. Do changes in beginning equity position, for example, cause large changes in survivability of the farm operation? When the model is sensitive to an assumption researchers do not feel confident in, the results can provide evidence for the need to do further research in the area.

A second purpose of sensitivity analyses is to address some of the "what if . . ." questions generated while identifying the initial set of assumptions. In the base scenario, for example, the farm manager was assumed to participate in the government farm program for rice. What if the farmer chose not to participate in the farm program? Would he/she be better or worse off? Addressing "what if . . ." questions allows examination of different farming situations and management practices, assisting farm managers in designing a management strategy and broadening the applicability of the study results beyond farms defined in the base analysis.

Third, sensitivity analyses allow identification of areas of the model that may not accurately reflect the

TABLE 7. PROBABILITY OF 2,300 A LIBERTY COUNTY RICE-SOYBEAN FARM SURVIVING[a] A GIVEN NUMBER OF YEARS UNDER DIFFERENT CROP-SHARE AND CROP ROTATION STRATEGIES - BASE SCENARIO

	SSR Rotation		SR Rotation	
Year	1/2 Share[b]	1/7 Share	1/2 Share[b]	1/7 Share
1984	100	100	100	100
1985	78	96	92	94
1986	68	86	84	86
1987	54	86	78	84
1988	50	82	72	78

[a]Survivability is defined as a positive net cash flow at the end of a production year with farm intermediate and long-term equity ratios above 0.33.

[b]Share for rice only; share for soybeans is 1/7.
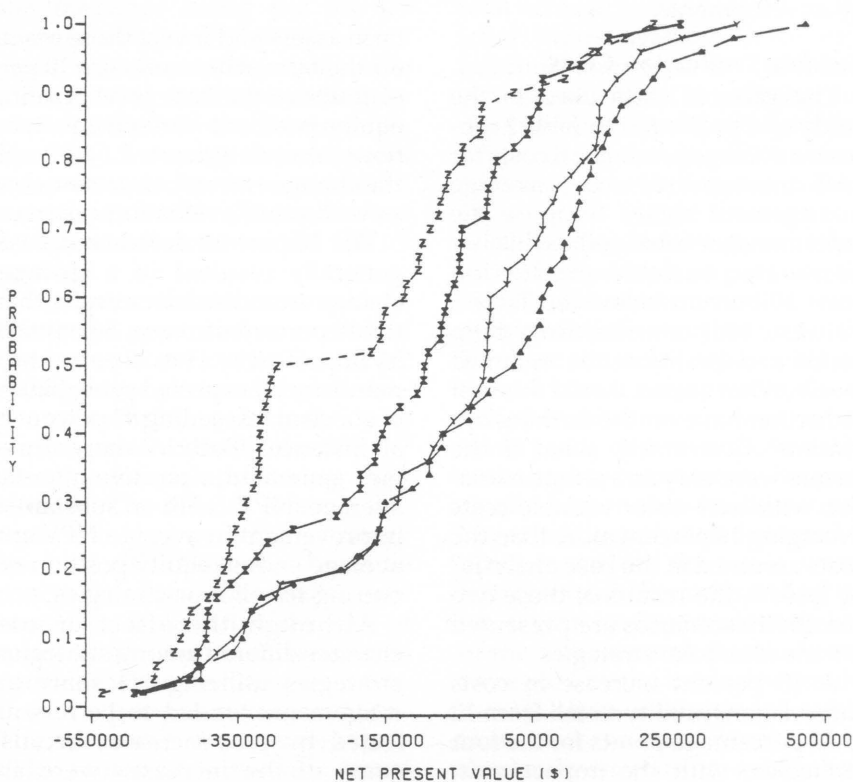
LEGEND: Z = SSR 1/2   ▲ = SSR 1/7
             X = SR 1/2   Y = SR 1/7

Figure 3. Net present values associated with each strategy of base scenario.

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actual farming situation. If reducing variable production costs does not generate results different from the base scenario, for example, researchers should re-examine both the design of the model and assumptions made in the part of the model dealing with variable production costs. Sensitivity analyses are one way of validating the model as a research tool, as well as identifying its strengths and limitations in addressing research problems (McCarl and Nelson 1983). Although the following sensitivity analyses are extensive, they represent only a fraction of the analyses that could be performed with the model. The following analyses focus on major assumptions and potential criticisms of the model.

In this section, sensitivity results are presented for variable production costs, management practices of farm managers, alternative land tenure arrangements, and effects of present and potential technology developments.

Variable Production Costs

The variable costs used in the study and presented in Table 3 represent average production costs for farm managers of above average management ability. Suppose the farm manager could reduce his/her non-water variable production costs 10 percent below the Table 3 values, still maintaining crop yields and quality at the assumed levels. What impact would this cost reduction have on the farming operation? Conversely, what if the farmer were only an average manager, with non-water variable costs averaging 10 percent more than the costs assumed in the base analysis? In Table 9, the results of these two sensitivity scenarios are presented for the four base strategies.

A 10 percent increase in costs caused survivability to fall from 12 to 28 percentage points for the four strategies, with the impact most severe on the SR 1/7 strategy. Substantial changes also occurred in probabilities of economic success and average after-tax NPV. All mean NPV values were highly negative, indicating the farmer would be better off to liquidate

TABLE 8. PREDICTED PREFERENCE FOR CROP ROTATION AND TENURE ARRANGEMENT STRATEGIES - BASE SCENARIO

Preference Sets	Risk Preference Class[a]				
	Risk Preferring	Risk Neutral	Risk Averse	Combination	Strongly Risk Averse
Most[b]	SSR 1/7	SSR 1/7	SSR 1/7	SSR 1/7 SR 1/7	SSR 1/7
Second	SR 1/7	SR 1/7	SR 1/7 SR 1/2	SSR 1/2 SR 1/2	SR 1/7
Third	SSR 1/2 SR 1/2	SR 1/2	SSR 1/2		SR 1/2
Fourth		SSR 1/2			SSR 1/2

[a]Risk aversion coefficients were (-0.0003 to 0.0) for risk preferers, (0.0) for risk neutral, (0.0 to 0.0003) for risk averters, (-0.0001 to 0.0001) for combination preferences, and (0.0001 to 0.0003) for strong risk averters. The results were quite robust to changes in the risk aversion coefficients values (McCarl and Bessler 1986).

[b]The second most preferred set is developed assuming the strategies in the most preferred set were not available. Next strategies in sets one and two were excluded when selecting strategies for the third most preferred set, and so on. Two or more strategies appear together when they are equally preferred; that is, neither strategy dominates the other over the entire range of the risk preference class.

farm assets and invest those assets off the farm when costs are 10 percent above the base level. Ending equity positions for solvent iterations also deteriorated, although the change was not as pronounced as with other evaluation criteria.

The 10 percent decrease in costs generally resulted in a stronger change from the base results than the 10 percent increase. Survivability improved by 12 to 32 percentage points for all expected probabilities of survival, exceeding 82 percent in all instances. Both 1/7 share strategies generated a positive after-tax average NPV, with a substantial improvement in average NPV and average ending equity position occurring for all four strategies.

Although the effect of cost changes differed among strategies, strategies utilizing 1/2 share arrangements tended to be less affected by cost increases because some of the increases were absorbed by the landowner. Changes in costs would also have a greater impact on the SR strategies, since the cost of rice production is higher than that of soybean production, with a notable exception being the SSR 1/2 strategy when costs de-

creased 10 percent. For this strategy, large gains were obtained in survivability, and NPV results, because of the extra cash flow cushion provided by lower production costs. In years of below average, but not disastrous, prices and yields, the additional cash flow was sufficient to ensure another year of farm survival.

Water Costs

Three different scenarios were examined in the area of water costs: (1) water costs were reduced to $40/A and $10/A for first and ratoon crop rice, respectively; (2) the inflation rate for water was increased from 4.5 to 7 percent per year (i.e., a 50 percent increase); and (3) water costs were increased to $100/A and $25/A for first and ratoon crop rice, respectively, with a 7 percent inflation rate for water also assumed. These scenarios compare with the base scenario in which water costs were $68/A for first crop and $14.45/A for ratoon rice. These water costs represent the extremes for the Liberty County area (Griffin, Perry, and McCauley 1984). Results for these three scenarios are given in Table 10.

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TABLE 9. SENSITIVITY ANALYSIS FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - CHANGES IN NON-WATER COSTS

Analysis Variables	10% Increase In Costs				10% Decrease In Costs			
	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	38	62	48	50	82	94	90	94
Change from Base:	-12	-20	-24	-28	+32	+12	+18	+16
Probability of Success (%):	8	26	8	20	48	78	56	80
Change from Base:	-4	-26	-12	-20	+36	+26	+36	+40
Mean NPV ($):	-267,653.	-132,883.	-224,613.	-195,197.	-57,868.	143,638.	-669.	127,636.
Change from Base:	-60,486.	-109,700.	-91,972.	-142,931.	+149,299.	+166,821.	+131,972.	+179,902.
Mean Ending Equity Ratio (Solvent Iterations):	0.561	0.638	0.570	0.594	0.651	0.772	0.672	0.763
Change from Base:	-0.045	-0.041	-0.026	-0.065	+0.045	+0.093	+0.076	+0.104
Mean Yearly Cash Farm Income ($):	-44,395.	-5,836.	-27,336.	-25,638.	15,356.	69,653.	33,247.	67,666.
Change from Base:	-18,437.	-29,513.	-23,877.	-42,174.	+41,314.	+45,976.	+36,706.	+51,130.

See Table 6 for definition of the analysis variables.

Because water costs are paid by the landowners under 1/2 crop-share arrangements, the analysis was limited to strategies employing the 1/7 crop-share arrangement.

Reducing water costs had a significant effect on both 1/7 share strategies, particularly on the SR 1/7 strategy. Probabilities of survival and success and ending average equity position for the SR 1/7 strategy actually exceeded corresponding values for the SSR 1/7 strategy. The stochastic dominance rankings also changed, with the SR 1/7 strategy being preferred by all risk neutral and extremely risk-preferring individuals, and co-preferred with SSR 1/7 in the other three risk classifications.

Very little change resulted from an increase in the inflation rate for water. By 1988, the higher inflation rate had made only a $9/A difference in water costs. The effect of increased inflation would be greater if the study horizon were extended to a 10- or 15-year period.

An extreme case was examined in the third situation. The effect of $100/A water costs with a 7 percent per year inflation rate was to greatly reduce almost all analysis variables. In the SR 1/7 strategy, probability of survival was reduced by more than half and probability of

success to 10 percent. The prospect for long-term farm survival (should the manager using the SR 1/7 strategy survive until 1988) was not good, with the ending equity ratio for surviving iterations falling by almost 0.08 from the base results. The SSR 1/7 strategy also suffered a substantial decline in survivability, success, and NPV, although not as severe as occurred for the SR 1/7 strategy.

Stochastic dominance rankings changed a great deal as a result of the higher water costs. The SR 1/2 strategy was preferred by all risk-neutral and risk-averse individuals and co-preferred with the SSR 1/2 strategy for risk-preferring individuals. The SR 1/7 strategy became the least preferred strategy for most risk categories. It can be concluded from the results presented in Table 9 that the cost of water is an important variable to consider when deciding on a tenure arrangement or crop rotation. The 1/2 share arrangement provides protection to the farm manager from high water costs.

Management Practices

Three scenarios were examined under the general heading of man-

agement practices: (1) reducing ratoon acreage from 25 percent of total acreage to none, (2) reducing labor hours available from each full-time employee by 100 hours per month, and (3) reducing red rice present in the SR rotation from 2.5 to 1.5 percent. Results for these scenarios are summarized in Table 11.

Eliminating ratoon acreage had very little overall impact on the results. The most surprising result of this scenario occurred under the 1/7 share strategies, where elimination of ratoon acreage actually resulted in an improvement in the mean yearly cash farm income. The cost-sharing component was principally responsible for this result. Major additional costs incurred to produce ratoon rice were water, fertilizer, and chemicals. All of the water costs and approximately half of the fertilizer and chemical costs were paid by the landowner under the 1/2 share arrangement, while none of these costs were paid by the landowner using a 1/7 share arrangement. As a result, average returns to the farmer for ratoon rice were positive under the 1/2 share arrangement and negative under the 1/7 share arrangement. In both cases, however, the effect of ratoon rice on the representative farm op-

Analysis Variables	$40/A Water Cost		7% Water Inflation		100/A Water and 7% Inflation	
	SSR 1/7	SR 1/7	SSR 1/7	SR 1/7	SSR 1/7	SR 1/7
Probability Survival (%):	90	90	82	76	54	38
Change from Base:	+8	+12	0	-2	-28	-40
Probability Success (%):	64	68	52	34	26	10
Change from Base:	+12	+28	0	-6	-26	-30
Mean NPV ($):	61,851.	65,216.	-31,866.	-68,036.	-162,184.	-247,214.
Change from Base:	+85,034.	+117,482.	-8,683.	-15,770.	-139,001.	-194,948.
Mean Ending Equity Ratio (Solvent Iterations):	0.717	0.724	0.669	0.648	0.654	0.581
Change from Base:	+0.038	+0.065	-0.010	-0.011	-0.025	-0.078
Mean Yearly Cash Farm Income ($):	46,812.	49,548.	20,656.	12,756.	-12,499.	-38,275.
Change from Base:	+23,135.	+33,012.	-3,021.	-3,780.	-36,176.	-54,811.

See Table 3 for base water prices and Table 1 for base inflation rates.

eration was small.

Above average labor efficiency was assumed in the base analysis to be the result of above average managerial ability. Reducing available labor hours for each full-time employee (and increasing part-time labor requirements as a result), however, had little impact. After-tax NPV's were reduced for all strategies examined, but the probabilities of survival and economic success generally did not change, indicating the base results were not sensitive to the assumptions made concerning labor supply and demand.

In the final scenario, red rice was reduced to 1.5 percent in the SR rotations. The reduction in red rice halved the market price discount for rice produced under the SR rotation and eliminated the differential between SSR and SR loan rates and target prices. The values for the analysis variables increased under this scenario for both strategies, particularly for the SR 1/7 strategy. In the stochastic dominance analysis, one or both of the 1/7 share strategies were preferred at all risk preference intervals. The amount of red rice present in the rice crop, therefore, was an important variable in the study results and was partly responsible for preventing the SR 1/7 strategy from dominating the base scenario.

Tenure Arrangements

In the base scenario, two crop-share arrangements common to the Upper Gulf Coast area were compared. Many different arrangements are available to farmers, however, including other share arrangements, cash rent, and ownership of all or part of the farm. In this section, the analysis of tenure arrangements is extended to include cash rental arrangements and land ownership. In addition, the effect of reducing the landowner's share in the base crop-share arrangements is also examined. Finally, the roles are reversed and optimal strategies for the landowner are identified.

Land Ownership

Two scenarios were examined for land ownership, both maintaining farm size at 2,310 A. In the first scenario, the farm manager owned 1,160 A of the farm and leased the remaining 1,150 A. In the second scenario, the manager owned all 2,310 A. In both scenarios, all other assets were held constant. The overall beginning equity ratio for both scenarios was the same as in the base analysis (i.e., 0.60). NPV discount rates were calculated using the methodology detailed on page 11. A 9.25 percent discount rate was used in calculating after-tax NPV figures for the part-owner, while a 8.97 percent rate was used for the fully-owned farm. Results for these scenarios are presented in Table 12.

Results from both scenarios were different from the base results. On one hand, probabilities of survival were 100 percent for all strategies, an increase of as much as 50 percentage points above base results. Probabilities of success also increased for the 1/2 share strategies. On the other hand, average after-tax NPV and yearly net cash farm income figures fell for most strategies. Net cash farm income, in particular, declined by large amounts for both 1/7 share strategies. Mean ending equity ratios for solvent iterations were also reduced, but the equity ratios were higher for the part-owner strategies when insolvent iterations were included. Since probabilities of survival were 100 percent for all strategies, the mean ending equity ratio for solvent iterations includes those iterations declared insolvent for the tenant because of low prices and yields. A comparison between mean equity ratios for all iterations provides a more accurate picture of the situation indicating the part-owner fared better than the tenant.

Despite the large negative average net cash farm income, the part-owner farm operation maintained an equity position close to the initial position because of the high capital gains rate on land.[21] The greater improvement in the part-

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[21]Recall that a 7.1 percent per year capital gain rate on land was assumed in the base analysis because of the study area's location relative to the Houston metropolitan area.

TABLE 11. SENSITIVITY ANALYSES FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - EFFECTS OF SELECTED MANAGEMENT PRACTICES

Analysis Variables	No Ratoon Acreage				Poor Labor Management				Reduce Red Rice to 1.5%	
	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	50	82	72	78	50	80	68	78	80	84
Change from Base:	0	0	0	0	0	-2	-4	0	+8	+6
Probability of Success (%):	12	52	20	42	10	52	20	40	32	58
Change from Base:	0	0	0	+2	-2	0	0	0	+12	+18
Mean NPV ($):	-211,862.	-23,586.	138,366.	-51,014.	-216,516.	-35,302.	-144,175.	-58,491.	-101,587.	-4,320.
Change from Base:	-4,695.	-403.	-5,725.	-1,252.	-9,349.	-12,119.	-11,534.	-6,225.	+31,054.	+47,946.
Mean Ending Equity Ratio:	0.600	0.683	0.589	0.662	0.591	0.672	0.591	0.649	0.603	0.686
Change from Base:	-0.006	+0.004	-0.007	+0.003	-0.015	-0.007	-0.005	-0.010	+0.007	+0.027
Mean Yearly Cash Farm Income ($):	-26,011.	25,065.	-3,667.	19,113.	-29,488.	20,252.	-6,777.	14,746.	5,141.	29,940.
Change from Base:	-53.	+1,388.	-208.	+2,597.	-3,530.	-3,425.	-3,318.	-1,790.	+8,600.	+13,404.

See Table 6 for definition of the analysis variables.

owner 1/2 share strategies over base results was because of higher land rent cost paid when renting the land and using a 1/2 share arrangement versus purchasing the land (with 40 percent of the land value still under mortgage). This conclusion can be clearly seen when comparing the full-ownership results with those from the base.

When comparing base results with those for full-owners, average NPV for the SSR 1/2 strategy was almost $85,000 more than SSR full-owner strategy, but the SSR 1/7 strategy's NPV was $100,000 less than the SSR full-owner strategy. Similar results occurred for the SR strategies. Superior performance of the 1/7 share strategies suggests that, if the farm manager were interested in maximizing returns to investment, he/she would be better off selling land and leasing it back under a 1/7 share arrangement. Selling land would provide capital for farm expansion, thereby allowing the manager to take advantage of returns to scale benefits. Such a strategy would, however, also increase the risk of farm insolvency.

Stochastic dominance results were not as distinct for the part-owner as in the base analysis. The

TABLE 12. SENSITIVITY ANALYSES FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - PART-OWNER AND FULL-OWNER TENURE SCENARIOS

Analysis Variables	50% Owned - 50% Leased				100% Owned[a]	
	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7	SSR	SR
Probability of Survival (%):	100	100	100	100	100	100
Change from Base:	+50	+18	+28	+22		
Probability of Success (%):	18	38	22	34	32	34
Change from Base:	+6	-14	+2	-6		
Mean NPV ($):	-159,284.	-82,577.	-140,189.	-93,535.	-123,039.	-119,508.
Change from Base:	+47,883.	-59,394.	-7,548.	-41,269.		
Mean Ending Equity Ratio (Solvent Iterations):	0.584	0.617	0.594	0.614	0.675	0.677
Change from Base:	-0.022	-0.062	-0.002	-0.045		
Mean Yearly Net Cash Farm Income ($):	-28,590.	-5,702.	-19,626.	-6,388.	-14,007.	-9,688
Change from Base:	-2,632.	-29,379.	-16,167.	-22,924.		
Mean Ending Equity Ratio (All Iterations):	0.584	0.617	0.594	0.614	0.675	0.677
Change from Base:	+0.203	+0.031	+0.121	+0.059		

See Table 6 for definition of the analysis variables.

[a] No "Change from Base" values are presented for these scenarios inasmuch as there are no comparable scenarios in the base scenario.

SSR 1/7, SR 1/2, and SR 1/7 strategies were all co-preferred in the combination and risk averse risk classifications. The SSR 1/7 strategy dominated in the risk neutral and risk preferring classifications, and the SR 1/7 strategy dominated in the extremely risk averse classification.

Cash Rental Arrangements

Three cash rental arrangements were examined in the analysis: (1) $20/A, (2) $30/A, and (3) $40/A. Almost one-half of the 1982 cash rented acreage in the Texas Rice Belt was obtained for $20 to $40/A (Griffin et al. 1984). Average cash rent was $29.30/A. Cash rents used in the analysis, therefore, were representative of land rental costs in the rice-producing region. Results for the three cash rent scenarios are given in Table 13.

It comes as no surprise to find that lowering rents improved survival, success, and ending equity position. A comparison between the SSR and SR rotation strategies, however, reveals that the SR rotation strategies generated virtually identical probabilities of survival and average after-tax NPV's as the SSR strategies. The choice between rotations, then, does not seem important from a risk management standpoint since neither rotation seems to reduce risk more than the other.

Comparison of stochastic dominance rankings between cash rent and base results demonstrated that the $30/A cash rent strategies were roughly co-preferred with the base share rent results for most risk classes. The $30/A cash rent strategies tended to rank above base results for risk preferring persons and below base results for risk averse persons. The $20/A cash rent strategies were preferred over all base strategies, but the $40/A strategies were generally not preferred to the base strategies. Riskiness of the cash rent strategies relative to crop-share strategies can be seen in a comparison of the SSR 1/7 and SSR $30/A strategies. The SSR $30/A strategy averaged about $4,000 more in after-tax NPV but had a probability of survival that

was 8 percentage points lower than the SSR 1/7 strategy.

A comparison between the SSR 1/2 and SSR $40/A strategies yields more impressive results. The SSR $40/A strategy offered an average after-tax NPV that was $40,000 more than the SSR 1/2 strategy, yet both strategies offered the same probability of survival. The use of the 1/2 crop-share rental arrangements reduces the probability of farm insolvency when incomes are the same. The value of share-arrangements in reducing risk are quantified in a later section of the report.

Reducing Landowner's Rental Shares

Although the 1/7 and 1/2 share arrangements are examined in the base scenario, they are not the only arrangements used for rice and soybeans in the study region. Griffin et al. (1984) found 1/6, 1/8, 1/9, and 1/10 are also common crop-share arrangements for rice. The particular crop-share arrangement used depends on many factors including land quality, size of acreage being leased, relative bargaining positions of tenant and landowner, and traditional arrangements used in the area.

In this sensitivity scenario, the landowner's share of the rice crop was reduced from 1/7 to 1/10 and from 1/2 to 45 percent. The landowner's share arrangement for soybeans was reduced from 1/7 to 1/10 for all strategies. Changing the 1/7 arrangement to a 1/10 arrangement results in the manager receiving 4.2 percent more of the crop, a smaller change than the 5 percent increase when moving from the 1/2 arrangement to the 45 percent arrangement. The larger increase was made recognizing the inferiority of the 1/2 arrangement to the 1/7 arrangement in the base solution from the farm manager's perspective. Results are reported in Table 14.

Small changes in the crop-share rental arrangements caused large changes in analysis variables. Probabilities of survival increased to 80 percent or more for all strategies, with large increases noted for 45 percent share strategies. Probabilities of success increased by more than probabilities of survival. All strategies except the SSR 45 percent generated positive average after-tax NPV's. Average ending equity ratios for solvent iterations also registered significant gains for all strategies.

TABLE 13. SENSITIVITY ANALYSES FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - CASH RENTAL ARRANGEMENTS

Analysis Variables	SSR Rotation			SR Rotation		
	$20/A	$30/A	$40/A	$20/A	$30/A	$40/A
Probability of Survival (%):	90	74	50	90	78	52
Probability of Success (%):	68	56	28	72	60	28
After-Tax Net Present Value:						
Mean ($)	104,315.	-19,178.	-166,728.	112,820.	-5,401.	-161,275.
Standard Deviation	231,064.	249,279.	252,079.	213,451.	216,176.	230,898.
Maximum	608,878.	525,835.	430,921.	547,284.	457,557.	360,593.
Minimum	-455,988.	-526,723.	-597,458.	-438,427.	-468,846.	-537,519.
Mean Ending Equity Ratio (Solvent Iterations):	0.755	0.718	0.687	0.760	0.696	0.646
Mean Ending Equity Ratio (All Iterations):	0.696	0.574	0.395	0.701	0.587	0.397
Mean Yearly Net Cash Farm Income ($):	58,137.	23,708.	-16,251.	61,418.	21,674	-17,877.

See Table 6 for definition of the analysis variables.

Analysis Variables	SSR 45%[a]	SSR 1/10	SR 45%[a]	SR 1/10
Probability of Survival (%):	80	90	88	90
Change from Base:	+30	+8	+16	+12
Probability of Success (%):	46	64	62	70
Change from Base:	+34	+12	+42	+30
Mean NPV ($):	-69,250.	85,144.	20,278.	87,400.
Change from Base:	+137,917.	+108,327.	+152,919.	+139,666.
Mean Ending Equity Ratio (Solvent Iterations):	0.644	0.734	0.692	0.746
Change from Base:	+0.038	+0.055	+0.096	+0.087
Mean Government Payment Received ($):	34,097.	49,502.	46,416.	58,290.
Change from Base:	+4,277.	+1,752.	+2,413.	+1,588.

[a]Share for rice only; share for soybeans is 1/10.

See Table 6 for definition of the analysis variables.

Although shares were not reduced by equal amounts for all four strategies, SDRF rankings between strategies did not change from the base scenario. It is interesting, however, to compare the SSR reduced share strategies with those in the base scenario. The SSR 45 percent and SSR 1/7 strategies generated roughly the same probabilities of survival and success and average ending equity ratios, with average NPV and SDRF results favoring the SSR 1/7 strategy. The closeness of results does suggest, however, that the farm manager may be more or less indifferent between the two strategies.

Landowner's Perspective

The base analysis was conducted under the assumption the farm manager had a choice of four possible crop rotation-tenure arrangement strategies and that the optimal strategy could be implemented by the farm manager. In the case of the tenure arrangements, this assumption implicitly assumes the landowner has no voice in the ten- ure decision. In fact, tenure arrangements are a result of negotiation between tenant and landowner, with the landowner often dictating the rental terms. In most theoretical models, the landowner is assumed to make the tenure decision, choosing an arrangement that gives the farmer just enough to entice him/her to rent the land (Sutinen 1975; Cheung 1969). Based on theoretical research above, examining the four strategies from the landowner's viewpoint is also important. In this section, the base results from the landowner's perspective are presented.

As part of this sensitivity analysis, several assumptions were made about the landowner. All acreage leased by the farm manager was assumed to be owned by one landowner. The landowner inherited the farm and in 1984 owned the land, worth $1,200/A, free of any debt. The landowner had an off-farm income of $40,000/year and used $30,000 to $45,000 of his/her on- and off-farm incomes for family living expenses. An after-tax discount rate of 7.32 percent was used in NPV calculations. The landowner was 45 years old, married, with three children.

Analysis results for the landowner are presented in Table 15. Probabilities of survival were 100 percent for all four strategies, a result that was not surprising given the initial debt-free position of the landowner.[22] After-tax NPV figures were positive for all 50 iterations of each strategy, because the capital gains rate for land (7.1 percent) plus returns to land from farming exceeded the 7.32 percent discount rate. A graph of the NPV figures for all four strategies is given in Figure 4.

Given the 100 percent probabilities of survival and success, the major difference between strategies was the amount by which each strategy exceeded the desired rate of return. The 1/2 share arrangements offered an expected return to the landowner nearly double that offered by the 1/7 share arrangements. The SR cropping strategies for each share arrangement generated higher returns than the SSR rotation strategies for corresponding share arrangements.

In comparing tenant and landowner results, areas of both harmony and disagreement can be found. The best strategy for the tenant (SSR 1/7) was the worst for the landowner. The 1/7 strategies were preferred by the tenant, the 1/2 strategies by the landowner. If tenant and landowner agreed to follow the 1/7 share arrangement, conflict would still arise over the best rotation. If both agree to follow the 1/2 share arrangement, however, both would prefer the SR rotation.

The 1/2 share arrangement is not always practical for some landowners, since it requires substantial involvement in the farming opera-

[22]When debt was increased to 50 percent of assets (i.e., a 0.50 equity ratio) probability of survival remained 100 percent. NPV results were lower, however, as returns were used to service debt. Rankings among strategies did not change.

TABLE 15. SENSITIVITY ANALYSIS FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - BASE RESULTS FROM LANDOWNER'S PERSPECTIVE

Analysis Variables	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	100	100	100	100
Probability of Success (%):	100	100	100	100
After-Tax Net Present Value($):				
Mean	419,538.	181,023.	484,670.	230,223.
Standard Deviation	68,584.	31,145.	83,661.	32,046.
Maximum	594,517.	257,754.	658,389.	300,275.
Minimum	263,035.	109,097.	294,730.	152,585.
Mean Ending Equity Ratio (All Iterations):	1.0	1.0	1.0	1.0
Mean Yearly Government Payments ($):	32,039.	9,163.	44,871.	13,386.
Mean Yearly Cash Farm Income ($):	134,628.	73,432.	151,515.	86,714.

See Table 6 for definition of the analysis variables.

tion. Nevertheless, about 50 percent of the 1982 Texas share-cropped rice acreage utilized the 1/2 share arrangement (Griffin et al. 1984). Assuming these results hold in general for Texas rice farms, it appears that landowners in many cases make the final decision concerning the type of share arrangement used. This supports assumptions made in theoretical models of tenure arrangements.

Effects of Technology

Effects of current and potential technology are examined next. Three major technological issues were identified as particularly relevant to Upper Gulf Coast farm managers: (1) increasing ratoon rice yields or quality, (2) the effect of Lemont, and (3) irrigating soybeans.

Ratoon Rice

In the base scenario, average ratoon rice yields increased 1 percent per year throughout the 5-year study period, resulting in a 32-lb increase in yields from 1984 to 1988. The small annual rate of yield increase was based on the assumption Lemont would have no effect on ratoon rice yields. In this scenario, Lemont (or some other new technology) was assumed to have a significant impact on ratoon yields, with a yield increase of 200 lb occurring from 1984 to 1988. Costs of production were assumed to remain the same as a result of the additional yield. Results are presented in Table 16.

Although ratoon yields increased 25 percent, the increase had almost no impact on the sensitivity results. This outcome was partly because of the gradual phasing in of the yield increases, the full benefits realized only in the last year of the study period. For the most part, however, the small change in results was because of the relatively small role ratoon rice had in the farming operation and the small profits generated from each acre of ratoon rice. For the representative farm, ratoon rice averaged less than 8 percent of gross farm revenues under the SSR rotation and less than 6 percent of revenues under the SR rotation. In addition, because of the high costs of production, each acre of ratoon rice in 1984 generated an average net return above variable costs of

less than $4/A. Because of these factors, increasing ratoon rice yields had little impact on the results.[23]

A similar result was obtained in a sensitivity analysis involving ratoon rice quality. In the base scenario, ratoon rice was discounted 7 percent below first crop rice because of quality factors. One might assume this price differential could be eliminated through varietal selection, improved management, better weed control, etc. In this sensitivity scenario, the price differential between first crop and ratoon rice was eliminated completely for all four strategies. As reported in Table 16, the change in quality had little impact on results. This result was because of the relatively small role ratoon rice played in the overall farm operation.

Effect of Lemont

In the base scenario, the Grant, Beach, and Lin (1984) rice econometric model accounted for the effect of Lemont on rice supplies when generating mean rice prices. To test the price impact of widespread Lemont adoption, the simulation was repeated assuming that Lemont was not widely adopted in the South. The result indicated a difference between the Lemont-influenced price and the price assuming no Lemont price effect, a difference that increased over time to a maximum level of $0.35/cwt in 1988. The increased difference between prices was caused by increased Lemont acreage in the South over time.

Two scenarios were examined in connection with Lemont: (1) What was the effect of the negative price differential on base results? and (2) Given the positive increases in yields, increases in production costs, and the negative impact on prices, has development of Lemont made the farm manager better or

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[23] An additional analysis was performed with ratoon yields increasing 450 lb over the base scenario. Little change occurred in the results, with probabilities of survival remaining unchanged for all four strategies.

worse off? Results for these two analyses are found in Table 17.

Eliminating the negative price effect caused almost no change in the results. Probabilities of survival did not change for three strategies and probabilities of success changed by two percentage points or less for three strategies. Changes in NPV and ending equity ratio were also small for most strategies. Two explanations account for this insensitivity. First, the price differential, although $0.35/cwt in 1988, averaged less than $0.21/cwt for the entire 5-year study period. More importantly, however, revenues lost as a result of the price effect were almost totally replaced by increased deficiency payments from the federal government. The price effect was most severe for the SR 1/7 strategy because this was the only strategy that sometimes reached the $100,000 government payment limitation imposed in the model. The other strategies never reached the payment limitation in any of the base simulation iterations.

In examining the scenario in which Lemont was assumed to not have been developed, there is no doubt that farmers are better off with Lemont. Without Lemont, probabilities of survival declined as

LEGEND: Z = SSR 1/2   ▲ = SSR 1/7
         X = SR 1/2   Y = SR 1/7
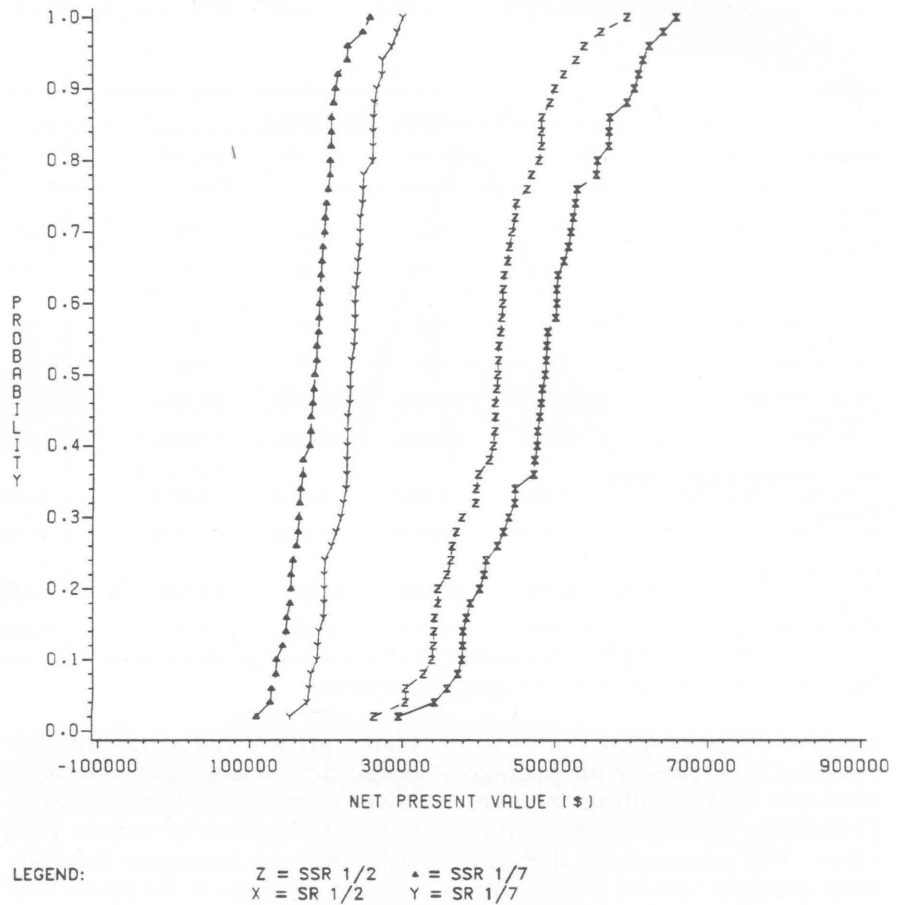
Figure 4. Net present values associated with each strategy— landowner's perspective.

TABLE 16. SENSITIVITY ANALYSES FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - TECHNOLOGY CHANGES IN RATOON RICE PRODUCTION

	Increase Ratoon Yields				Improve Ratoon Rice Quality			
Analysis Variables	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	50	82	72	78	50	82	70	78
Change from Base:	0	0	0	0	0	0	-2	0
Probability of Success (%):	12	52	20	40	12	52	20	40
Change from Base:	0	0	0	0	0	0	0	0
Mean NPV ($):	-206,002.	-20,567.	-129,931.	-47,695.	-205,471.	-20,291.	-136,486.	-48,377.
Change from Base:	+1,165.	+2,616.	+2,710.	+4,571.	+1,696.	+2,892.	-3,845.	+3,889.
Mean Ending Equity Ratio (Solvent Iterations):	0.608	0.682	0.598	0.661	0.609	0.682	0.595	0.662
Change from Base:	+0.002	+0.003	+0.002	+0.002	+0.003	+0.003	-0.001	+0.003
Mean Yearly Cash Farm Income ($):	-25,778.	24,143.	-3,117.	17,234.	-25,509.	24,448.	-4,707.	17,373.
Change from Base:	+180.	+466.	+342.	+698.	+449.	+771.	-1,248.	+837.

See Table 6 for definition of the analysis variables.

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Analysis Variables	No Lemont Price Effect				Lemont Not Developed			
	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	52	82	72	78	34	52	44	42
Change from Base:	+2	0	0	0	-16	-30	-28	-36
Probability of Success (%):	12	54	22	52	8	18	8	8
Change from Base:	0	+2	+2	+12	-4	-34	-12	-32
Mean NPV ($):	-201,298.	-17,725.	-125,796.	-34,674.	-284,487.	-187,056.	-240,223.	-241,161.
Change from Base:	+5,869.	+5,458.	+6,845.	+17,592.	-77,320.	-163,873.	-107,582.	-188,895.
Mean Ending Equity Ratio (Solvent Iterations):	0.607	0.684	0.601	0.677	0.546	0.625	0.552	0.544
Change from Base:	+0.001	+0.005	+0.005	+0.018	-0.060	-0.054	-0.044	-0.115
Average Yearly Government Payments ($):	28,358.	44,999.	41,531.	53,335.	28,552.	44,088.	40,652.	54,591.
Change from Base:	-1,462.	-2,751.	-2,422.	-3,367.	-1,268.	-3,662.	-3,351.	-2,111.

See Table 6 for definition of the analysis variables.

much as 30 percentage points for the four strategies, with average after-tax NPV's falling by over $160,000 for the two 1/7 share strategies. The assumption that the farm manager was an above average manager was an important factor in this result. The farm manager adopted the Lemont variety more quickly than other farmers (100 percent of all rice acreage in 1986 for the manager, versus 40 percent for the South as a whole). Consequently, he/she was able to benefit from the positive yield increases before the negative price effects were felt. Because the government commodity program shielded the manager from negative price effects, the farmer benefitted greatly from the development of Lemont. The results also illustrate the emphasis farmers should make on keeping abreast of and quickly adopting new technology in order to remain competitive in agriculture.

Irrigated Soybeans

Uncertainty associated with timing and amount of rainfall is a serious problem for soybean producers in the Upper Gulf Coast region. Irrigation is the principal method available to ensure adequate supplies of water to the plant, greatly reducing drought-induced plant stress and associated lower crop yields. Despite availability of irrigation to reduce yield risk, few farm managers currently irrigate soybeans in the Upper Gulf Coast region.

Three types of irrigation delivery systems could be used to irrigate soybeans. Field flushing, similar to flushing rice, allows levees to be left in the field but requires a precision-levelled field to ensure uniform water application. Furrow irrigation requires development of a system that delivers water to each furrow, requiring the elimination of levees. The third type of delivery system, sprinkler irrigation, does an excellent job of delivering water to the soybean crop, but requires an expensive capital investment and may not be feasible for rice irrigation.

In this analysis, the potential for irrigated soybeans was examined for the representative farm. The representative farm was assumed precision-levelled; therefore, flush irrigation was the least cost approach. Water was assumed available from the local canal company at a cost currently charged for flushing rice fields ($8/A). Two irrigations were used on the soybean crop, the first in late July and the second in August. Labor demands were increased accordingly in July and August. Non-water production costs were increased by $6.32/A, mostly because of slightly higher fertilizer and harvesting costs.

Yield distributions for irrigated soybeans were developed by Sij (1984). Plots of the distributions for irrigated soybeans following rice and non-irrigated soybeans following rice are given in Figure 5. The distribution for irrigated soybeans was narrower, reflecting the advantage of irrigation in reducing yield variance. In addition, expected yield for irrigated soybeans following rice and irrigated soybeans following soybeans increased about 45 percent to 34 and 33.5 bu/A, respectively.

Results for the irrigated soybean scenario are given in Table 18. All four strategies gained tremendously from irrigating soybeans. Probabilities of survival exceeded 86 percent for all strategies, with average NPV also positive in all four cases. The SSR 1/2 strategy benefitted most and the SR 1/2 strategy least from soybean irrigation. Soybean irrigation for the representative farm definitely seems profitable, given the assumptions made about yields and production

costs. The results also suggest another reason for the poor performance of the SSR 1/2 share strategy in the base was its high dependence on soybeans to generate profits to keep the farm in business. When soybeans became more profitable as a result of irrigation, those strategies most dependent on soybeans realized the greatest gain in survivability and NPV. In SDRF rankings, however, the SSR 1/7 strategy remained the prefered strategy for all but the combination risk preference classification, when the SSR 1/7 and SR 1/7 were the co-preferred strategies.

An important point is that the assumptions made in developing this scenario were based on a researcher's expectations, not on field data or farmers' experiences. Whether mean yields can be greatly improved and yield variance reduced while minimizing cost increases remains unknown. In particular, the cost of water is an important factor that must considered when evaluating soybean irrigation.[24] The profitability of soybean irrigation as a means of partially paying for precision land levelling also remains questionable. The results do suggest, however, that irrigation may substantially help soybean farmers and that additional research could further quantify benefits and costs of irrigating soybeans.

Yield and Price Sensitivity Analyses

The major advantage in using a farm-level Monte-Carlo simulation model in agricultural economics research is the ability to evaluate a farm operation in an environment of uncertainty. In RICESIM, for ex-

[24]When water costs for soybean irrigation were increased to $30/A while maintaining the same yield distribution, probabilities of survival for each strategy were about the same as in the base analysis. Mean NPV figures, however, were approximately $40,000 above base results for each strategy. At higher water costs the farm manager's expected returns would still exceed that for non-irrigated soybeans, but risk of farm insolvency would be greater.
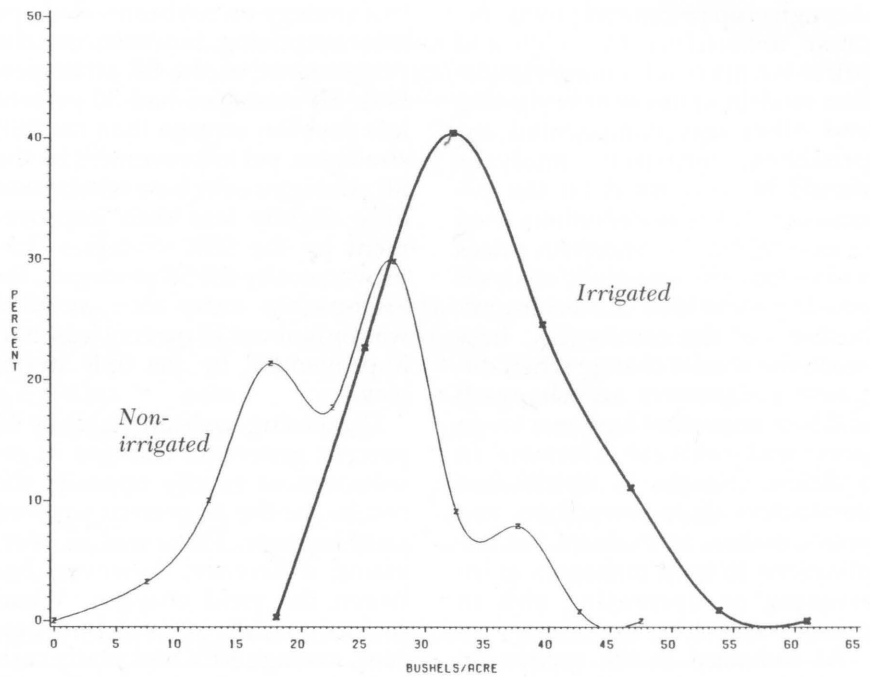
Figure 5. Irrigated versus non-irrigated soybean yield distributions.

TABLE 18. SENSITIVITY ANALYSIS FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - IRRIGATING SOYBEANS

Analysis Variables	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	86	94	88	92
Change from Base:	+36	+12	+16	+14
Probability of Success (%):	64	86	64	78
Change from Base:	+52	+34	+44	+38
Mean NPV ($):	31,671.	195,076.	28,736.	114,892.
Change from Base:	+238,838.	+218,259.	+161,377.	+167,158.
Mean Ending Equity Ratio (Solvent Iterations):	0.715	0.809	0.700	0.754
Change from Base:	+0.109	+0.130	+0.104	+0.095
Mean Yearly Net Cash Farm Income ($):	34,245.	80,129.	37,809.	57,671.
Change from Base:	+60,203.	+56,452.	+41,268.	+41,135.

See Table 6 for definition of the analysis variables.

ample, uncertainty is introduced through crop prices and yields. Because uncertainty in yields and prices is a major advantage simulation modelling has over budgeting and other less complicated approaches, sensitivity analyses should be performed on the parameters of the distributions used in generating the uncertain prices and yields. The sensitivity analyses provide some idea concerning robustness of the results (i.e., how much the results change when different parameters are changed) and how important higher or lower prices and yields are to farmers. In addition, changes in distribution parameters allow researchers and policy makers to evaluate the implications to farm managers of increasing or decreasing risk in prices and yields.

As indicated in the section on model assumptions, the principal parameters used in generating the random variables were: (1) mean values for each random variable, (2) deviations used to develop an empirical distribution about each mean, and (3) a correlation matrix to introduce interaction between random variables. The focus of this section is on evaluation of the means and deviations used in the model. Sensitivity analysis on the values used in the correlation matrix was not performed, although analyses relating to the assumptions of interaction between variables and the existance of empirical distributions are reported at the end of the section.

Analyses of Mean Yields and Prices
Changes in Soybean Yields
Mean soybean yields were increased and decreased by 10 percent for each strategy, with the results summarized in Table 19. Increasing soybean yields caused average yearly cash farm income to increase by $14,000 or more for all strategies, with the largest gain associated with the SSR strategies. Average ending equity ratio for solvent iterations also increased significantly for all strategies. The SSR 1/2 strategy realized significant increases for all analysis variables,

underscoring the dependence of this strategy on soybeans. Perhaps most surprising, however, was the performance of the SR strategies. Both SR strategies had 50 percent less soybean acreage than the SSR strategies, yet improvement by the SR strategies over base results was only slightly less than improvement by the SSR strategies. Improvement by the SR strategies, for example, in mean after-tax NPV was only about 15 percent less than improvement by the SSR strategies.

Decreasing soybean yields by 10 percent generated changes in results almost exactly opposite the results for the 10 percent soybean yield increase. There was an interesting difference, however, between the yield changes. When soybean yields increased 10 percent, average NPV and yearly cash farm income figures for the 1/7 share strategies increased more than corresponding 1/2 share strategies for each rotation. When soybean yield was decreased 10 percent, however, the 1/2 share strategies were hurt more than the 1/7 share strategies. Thus, the 1/2 share strategies require a good yield from soybeans just to meet overhead operating costs.

Changes in Rice Yields
First crop and ratoon crop yields were initially increased by 10 percent and then decreased by 10 percent to examine sensitivity of the base results to these changes. Results for both scenarios are reported in Table 20.

A large change in the results occurred with changes in rice yields. Unlike the change in soybean yields, strategies with the most rice (i.e., SR 1/2 and SR 1/7) definitely outperformed their counterpart SSR strategies when rice yields were increased and fared worse when yield declined. In addition, decreasing rice yields 10 percent from the base generally had a larger absolute effect on the results than a 10 percent increase in yields. Under the SSR 1/7 strategy, for example, the absolute change in probability of survival resulting from a 10 percent rice yield de-

crease was three times that of the change when yield was increased. In part, the negative bias in results was generally caused by a good base position from which comparisons were made (i.e., probability of survival could only increase 18 percentage points, but could also decrease 82 percentage points). The farm manager's average tax payments more than tripled when rice yields were increased 10 percent, reducing the farm manager's after-tax profit.

An important point is that a 10 percent decrease in base rice approximates average yields for Liberty County. Probabilities of survival were 60 percent or less for all four strategies at this yield level, suggesting that prospects are not favorable for farm manager survival should they continue obtaining county average or less rice yields.

Changes in Crop Prices
In the final scenarios of this series, prices for all crops were alternately increased and decreased 10 percent from the base scenario. Results for both scenarios are given in Table 21. As was the case with changes in mean yields, the absolute changes in analysis criteria were greater for the 10 percent decrease in crop prices versus the 10 percent increase in prices. Reasons for the off-balanced results are favorable base position and changes in tax payments.

Changing both soybean and rice prices in the same scenario would be expected to have a greater impact than the yield scenarios, since changes in soybean yields were made holding rice yields constant and vice versa. This expectation generally did not hold true, however, for the SR rotation strategies. The 10 percent changes in rice yields had about the same impact on the SR strategy results as the 10 percent change in rice and soybean prices. Recall the analyses dealing with the Lemont rice variety (see previous section on technology) to explain this result. The SR strategies are more dependent on rice as the major source of farm revenue than are the SSR strategies. The government program for rice is de-

Analysis Variables	10% Increase in Yields				10% Decrease in Yields			
	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	58	86	78–	84	36	74	58	74
Change from Base:	+8	+4	+6	+6	-14	-8	-14	-4
Probability of Success (%):	26	62	34	58	8	34	8	32
Change from Base:	+14	+10	+14	+18	-4	-18	-12	-8
Mean NPV ($):	-145,110.	44,953.	-77,865.	4,893.	-273,746.	-89,169.	-193,166.	-95,288.
Change from Base:	+62,057.	+68,136.	+54,776.	+57,159.	-66,579.	-65,986.	-60,525.	-43,022.
Mean Ending Equity Ratio (Solvent Iterations):	0.650	0.716	0.631	0.690	0.543	0.638	0.559	0.608
Change from Base:	+0.046	+0.037	+0.035	+0.031	-0.063	-0.041	-0.037	-0.051
Mean Yearly Cash Farm Income ($):	-10,443.	40,580.	10,060.	31,339.	-44,538.	7,243.	-19,162.	2,440.
Change from Base:	+15,515.	+16,903.	+13,519.	+14,803.	-18,580.	-16,434.	-15,703.	-14,096.

See Table 6 for definition of the analysis variables.

TABLE 20. SENSITIVITY ANALYSES FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - CHANGES IN MEAN RICE YIELDS

Analysis Variables	10% Increase in Yields				10% Decrease in Yields			
	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	60	90	86	92	36	58	42	44
Change from Base:	+10	+8	+14	+14	-14	-24	-30	-34
Probability of Success (%):	26	68	44	72	8	26	8	16
Change from Base:	+14	+16	+24	+32	-4	-26	-12	-24
Mean NPV ($):	-142,834.	95,479.	-40,116.	105,098.	-280,969.	-155,673.	-244,440.	-231,066.
Change from Base:	+64,333.	+118,662.	+92,525.	+157,364.	-73,802.	-132,490.	-111,799.	-178,800.
Mean Ending Equity Ratio (Solvent Iterations):	0.644	0.745	0.639	0.750	0.550	0.641	0.561	0.582
Change from Base:	+0.038	+0.066	+0.043	+0.091	-0.056	-0.038	-0.035	-0.077
Mean Yearly Cash Farm Income ($):	-6,671.	56,636.	21,235.	60,960.	-48,233.	-12,305.	-32,322.	-33,011.
Change from Base:	+19,287.	+32,959.	+24,694.	+44,424.	-22,275.	-35,982.	-28,863.	-49,547.
Mean Yearly Government Payments ($):	31,552.	49,169.	44,443.	57,749.	29,884.	46,385.	43,010.	56,817.
Change from Base:	+1,732.	+1,419.	+440.	+1,047.	-64.	-1,365.	-993.	-115.

See Table 6 for definition of the analysis variables.

signed to stabilize farm income by guaranteeing a price (subject to the payment limitation). As a result, changing the mean rice price caused changes in the government payments received by the farm manager, but usually had little impact on per acre net farm revenues for rice.

A Parting Analysis of Mean Results

In most of the scenarios presented thus far, changes in variables have affected the farm operation primarily by causing changes in net farm income. It is not surprising to learn that the level of net farm income is linked to farm survival; this linkage is apparent to any farmer. It is not clear from the results, however, just how important on- and off-farm income is to survival. How much, for example, can the farm manager improve his/her probability of survival by increasing average yearly cash farm income by $1,000?

In virtually all scenarios analyzed, the 1/7 share strategies (and in particular the SSR 1/7 strategy) have dominated as preferred strategies, generating a second question: Do the 1/2 share strategies inherently offer lower probabilities of survival, or is the poorer performance of the 1/2 share strategies

TABLE 21. SENSITIVITY ANALYSES FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - CHANGES IN RICE AND SOYBEAN PRICES

Analysis Variables	10% Increase in Prices				10% Decrease in Prices			
	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	68	90	84	88	26	54	50	48
Change from Base:	+18	+8	+12	+10	-24	-28	-22	-32
Probability of Success (%):	38	72	52	70	4	20	8	14
Change from Base:	+26	+20	+32	+30	-8	-32	-12	-26
Mean NPV ($):	-99,014.	114,768.	-29,968.	93,403.	-316,011.	-169,806.	-231,424.	-208,186.
Change from Base:	+108,153.	+137,951.	+102,673.	+145,669.	-108,844.	-146,623.	-98,783.	-155,920.
Mean Ending Equity Ratio (Solvent Iterations):	0.661	0.771	0.663	0.759	0.526	0.601	0.543	0.583
Change from Base:	+0.055	+0.092	+0.067	+0.100	-0.080	-0.078	-0.053	-0.076
Mean Yearly Government Payments ($):	22,674.	36,162.	32,491.	42,409.	42,948.	66,608.	61,153.	78,681.
Change from Base:	-7,146.	-11,688.	-11,512.	-14,293.	+13,128.	+18,858.	+17,150.	+21,979.
Mean Yearly Net Cash Farm Income ($):	2,773.	61,906.	24,608.	56,098.	-53,315.	-13,956.	-25,608.	-23,070.
Change from Base:	+28,731.	+38,229.	+28,067.	+39,562.	-27,357.	-37,633.	-22,149.	+39,606.

See Table 6 for definition of the analysis variables.

directly linked to net cash farm income? Would a farmer utilizing the SSR 1/2 strategy, for example, have the same probability of survival as a farmer using the SSR 1/7 strategy, if both strategies generated the same net cash farm income? If not, how much does the 1/2 share arrangement increase or decrease probability of survival when net cash farm income is the same across all strategies?

The six scenarios dealing with changes in mean prices and yields provide a good data set for analysis because changes in each scenario had a direct effect on net cash farm income, while other factors of production (e.g., variable costs, machinery complement, etc.) were constant. In addition to these six scenarios (with four observations each), the three scenarios (with two observations each) dealing with cash rent tenure arrangements were added to the data set. Inclusion of the cash rent scenarios allowed examination of three different tenure arrangements (i.e., cash, 1/2 share, and 1/7 share). The base scenario (with four observations) was also added to the data set, increasing the data set to 34 total observations. Variables used

in the regression were probability of survival, mean yearly net cash farm income for all 50 iterations, and class variables for the different rotations and tenure arrangements.

Analysis of covariance was used to test the hypothesis that intercept terms and slope coefficients were equal across rotations and rental arrangements. Standard regression procedures were used to estimate the regression coefficients. The equation represents a two-way fixed effects analysis of covariance model with one covariate. Rotation and rental arrangement are the two class factors, with two and three levels respectively. Consistent with the analysis criteria suggested by Candler and Cartwright (1969), models for all possible variable combinations were estimated and the model that maximized $\bar{R}^2$ was selected as the best model to represent the data.

A logit functional form was used in the regression estimation. The function estimated was as follows:

$$Survival_i = \frac{\gamma}{1 + \exp(\alpha_i + \beta_i NETI_i)}$$

where $Survival_i$ = probability of survival for the ith strategy,
γ = the maximum possible probability of survival (100),
α_i = intercept term for the ith strategy,
β_i = slope coefficient on income for the ith strategy,
$\exp$ = exponential function e, and
$NETI_i$ = average yearly net cash farm income for the ith strategy.

The estimated α_i and β_i values for the six strategies are given in Table 22. The $\bar{R}^2$ value was 0.976 for the empirical model.

Several insights into the previous results can be gained from analysis of the model. The average net cash farm income variable had the same effect on survival, regardless of the crop rotation followed. When net cash farm income is zero, probability of survival is 2.0 to 2.4 percentage points higher for the SR rotation. By this measure, the SSR

TABLE 22. ESTIMATED PARAMETERS FOR SURVIVAL FUNCTION

Strategy	Parameter	Std. Error
SSR 1/2		
Intercept:	-0.80026	0.0588*
Slope Coefficient:	-3.2928×10^{-5}	1.75×10^{-6}
SSR 1/7		
Intercept:	-0.65629	0.05519
Slope Coefficient:	-2.7353×10^{-5}	1.28×10^{-6}
SSR Cash		
Intercept:	-0.46986	0.07887
Slope Coefficient:	-2.7986×10^{-5}	1.94×10^{-6}
SR 1/2		
Intercept:	-0.90231	0.05069
Slope Coefficient:	-3.2929×10^{-5}	1.75×10^{-6}
SR 1/7		
Intercept:	-0.75833	0.05307
Slope Coefficient:	-2.7353×10^{-5}	1.28×10^{-6}
SR Cash		
Intercept:	-0.57190	0.07885
Slope Coefficient:	-2.7986×10^{-5}	1.94×10^{-6}

* The standard errors are reported for the convenience of the reader. They should not be used to perform t-statistic tests of significance.

is a riskier rotation. This result is not surprising, since soybeans (the dominant crop in the SSR rotation) are subject to both price and yield risk, whereas price risk for rice is largely eliminated by the government program.

When average yearly net cash farm income is equal to zero, the SR 1/2 strategy has the highest probability of survival (71 percent) and the SSR cash strategy has the lowest probability of survival (61.5 percent). In general, the 1/2 share strategies have a three percentage point survival advantage over the 1/7 share strategies, which, in turn, have a four percentage point advantage over the cash rent strategies. The share rental strategies, then, do reduce risk to the farmer. They also reduce income, however, and the reduction in income is primarily responsible for the poor performance of the 1/2 share strategies examined in the previous sensitivity analyses. This result suggests the need for a readjustment of traditional crop-share arrangements to more accurately reflect current production and marketing

conditions.

The effect of average net cash farm income on survival differed with changes in rental arrangements. Each additional $1,000 of income, at a zero income level, raises probability of survival from 0.7 to 0.8 percentage points. To raise probability of survival by 1 percentage point (again at the zero average income level) requires income be increased by as little as $1,434 for the SSR 1/2 strategy to $1,697 for the SR strategy. In general, each dollar of additional income was most beneficial to the 1/2 share arrangements and least beneficial to the 1/7 share arrangements. When average yearly net cash farm income is $30,000, increasing probability of survival by 1 percentage point requires increasing income by from $2,173 to $2,755 for the different strategies. At an average income of $-30,000, however, raising probability by 1 percentage point necessitates only $1,216 to $1,473 in additional income. Income is much more important to survival when at a very low level than at a very high level and is

more important to the 1/2 share strategies than to the 1/7 and cash rent strategies.

In all scenarios, the farm manager's spouse was assumed to earn $16,000/year in off-farm income. Off-farm income has the same value to the farm manager (in terms of survival) as on-farm income, since both contribute to the total farm-family cash flow needs. The off-farm income raised probability of survival (assuming a zero on-farm income level) from 8.7 to 10 percentage points. Similarly, by raising off-farm income to $30,000/year (an increase of $14,000), probability of survival would be expected to improve by an additional 6.1 to 6.7 percentage points. The value of this off-farm income becomes even more valuable as net cash farm income becomes negative, because of the farm's sensitivity to additional income at negative income levels. An off-farm income of about $90,000 to $122,000 is necessary to ensure a 98 percent probability of survival.[25] The level of off-farm income, then, is an important factor in farm survival, even for a relatively large farm such as the representative farm.

Distribution Changes

The scenarios in this section were analyzed to examine changes in probability density functions for crop yields and prices. For most scenarios, each change involved multiplying deviations of each empirical distribution being examined by a scaler, or single number. Multiplying each distributional deviation by the same number is equivalent to changing the distribution variance by that same amount.

In Figure 6, the base scenario yield distribution is given for rice following soybeans. Superimposed over this base distribution is

[25]Because of the nature of the functional form used in the estimation procedure, a 100 percent probability of survival cannot be achieved unless income is at a positive infinity. The 98 percent survival level provides a good approximation of the income needed to obtain the 100 percent probability of survival.

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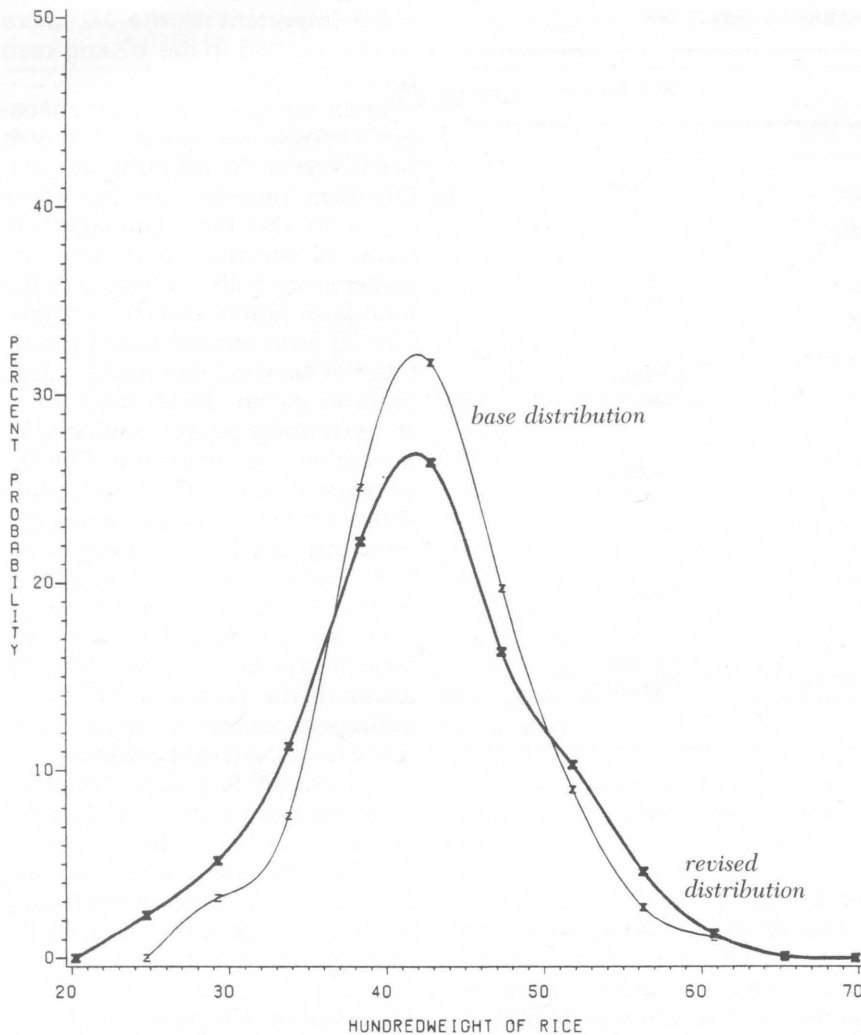
Figure 6. Effect of increasing rice following soybean yield variability by 25 percent.

the same distribution, except each deviation from the mean is 25 percent more than the associated deviation in the base. Increasing the yield deviations 25 percent decreases the chance that a random yield will fall within 20 percent of the mean and increases the chance that a random yield will be above or below 20 percent of the mean. In addition, high and low extremes not attainable in the base are possible with the modified distribution, although the chance of a random yield falling in these extreme areas is small (less than 4 percent).

In essence, increasing the distribution variance increases the potential for the farm manager to attain high yields (and high returns per acre), while also increasing the

potential for low yields (and potentially serious financial trouble). Increasing variance is generally considered undesirable, since most individuals are assumed averse to risk, choosing not to risk the potential for lower incomes, even if the potential for high incomes is also increased (Barry 1984). The purposes of these scenarios are twofold: (1) To determine how sensitive the results are to the price and yield distributions, and (2) to determine whether the farm manager is better or worse off when yield and price variances are increased or decreased.

Changes in Rice Yield Distributions

In the first set of distribution sensitivity scenarios, the influence

of the variance parameters was examined for the rice yield distributions. Variance was alternately increased and decreased by 25 percent for both first crop and ratoon rice yields. Figure 6 illustrates the effect of a 25 percent increase in yield variance for the rice following soybeans distribution. Results for each strategy for the two scenarios are presented in Table 23.

Increasing variance in rice yields generally caused probabilities of survival and success and NPV to decline for the farm manager. The SR rotation strategies suffered most from the increase in variance, with probabilities of survival falling by 8 and 10 percentage points for the 1/2 and 1/7 share arrangements, respectively. The SSR 1/2 strategy showed almost no response to the increase in variance because rice is least important to this strategy of the four strategies examined and because yield risk is shared with the landowner. The change in analysis variables was caused by a fall in net cash farm income. Rice yield distributions, although exhibiting a higher variance in the base analysis, had the same mean yields as in the base. Expected total revenue is a function of the price and yield means multiplied, plus the covariance between prices and yields.[26] Increasing yield variance increased yield-price covariance. Because covariance was negative, the net effect of increasing yield variance was to reduce expected gross revenue.

A 25 percent decrease in variance had a favorable effect on all four strategies. The results for decreasing variance, however, were not the inverse of the results that were generated when yield variance was increased. The 1/7 share strategies benefitted most from the decrease in variance, with changes in probabilities of survival and success both being twice those of the corresponding 1/2 share strategies. Mean ending equity ratios rose for all four strategies. In

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[26]This result is demonstrated for normal distributions by Mood, Graybill, and Boes (1974).

TABLE 23. SENSITIVITY ANALYSES FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - CHANGES IN RICE YIELD DISTRIBUTIONS

Analysis Variables	25% Increase in Variance				25% Decrease in Variance			
	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	50	80	64	68	54	86	76	86
Change from Base:	0	-2	-8	-10	+2	+4	+4	+8
Probability of Success (%):	12	50	20	34	12	54	26	56
Change from Base:	0	-2	0	-6	0	+2	+6	+16
Mean NPV ($):	-212,640.	-37,105.	-156,255.	-90,259.	-190,167.	-687.	-115,991.	-24,837.
Change from Base:	-5,473.	-13,922.	-23,614.	-37,993.	+17,000.	+22,496.	+16,650.	+27,429.
Mean Ending Equity Ratio (Solvent Iterations):	0.602	0.672	0.590	0.647	0.618	0.685	0.594	0.659
Change from Base:	-0.004	-0.007	-0.006	-0.012	+0.012	+0.006	-0.002	0.000
Mean Yearly Cash Farm Income ($):	-29,496.	18,033.	-11,405.	1,988.	-21,675.	29,509.	1,392.	25,247.
Change from Base:	-3,538.	-5,677.	-7,946.	-14,548.	+4,283.	+5,832.	+4,851.	+8,711.

See Table 6 for definition of the analysis variables.

summary, farmers would prefer to reduce yield variance because expected returns and probabilities of survival are increased.

Changes in Soybean Yield Distributions

The scenarios examined for rice yield distributions were also examined for soybean yields. Results for soybean scenarios are given in Table 24. Increasing soybean yield variance had a different effect on the four strategies than the same percentage increase in rice yield variance. Although an increase in variance caused probabilities of survival to fall for both soybeans and rice, probabilities of success and average after-tax NPV rose for soybeans. The reason for the difference in results between the two crops was the farm manager's use of crop insurance for soybeans. When rice yield variance was increased 25 percent, the manager had no protection from increased incidence of low crop yields. As a result, increases in rice yield variance were more harmful than beneficial. When soybean yield variance increased 25 percent, however, the crop insurance-guaranteed minimum yield level was assumed to remain in place. The manager was able to achieve

high yields more often without realizing the effects of increased incidence of lower yields. The net effect of increasing the variance was to increase expected mean yield, the guaranteed minimum yield being substituted into the mean yield calculation when yields fell below the minimum. Despite the increases in NPV, the small decreases in probability of survival suggest crop insurance does not provide 100 percent protection from increased incidence of very low soybean yields. When comparing the soybean results with those for rice, however, one can conclude that crop insurance for soybeans is beneficial to the farm manager.

A decrease in soybean yield distribution variance also generated some surprising results. Probabilities of survival increased for three of the farm strategies, but probabilities of success actually fell for the SSR strategies. NPV increased for the SSR 1/7 strategy but the absolute increase was much smaller than when variance was increased. NPV for the SSR 1/2 strategy actually fell when variance was reduced. Average ending equity ratios fell for all strategies, as did mean yearly cash farm income. Unlike the changes in variance for rice yields, changes in soybean yield variance

did not result in clear-cut recommendations. If the farm manager is risk preferring, he/she would prefer an increase in yield variance; if risk averse, a reduction in variance would be preferred.

Changes in Crop Price Distributions

Variances for soybean and rice prices were alternately increased and decreased by 25 percent, in line with the sensitivity analyses for the yield distributions. Results for these two scenarios are given in Table 25. The changes in the analysis variables were greater in these scenarios than in the previous scenarios that dealt with soybean yield distributions. The changes were less pronounced, however, than those occurring for changes in the rice yield distributions. Results from the price distribution changes were also inversely related to rice yield distribution results. As with soybean yield variance, the producer is generally better off with increased price variance because of the guaranteed minimum return for both rice and soybeans. In this case, the guarantee is in the form of the government loan and target price program. The results also support theoretical work done in the area of agricultural policy, suggesting producers are better off

TABLE 24. SENSITIVITY ANALYSES FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - CHANGES IN SOYBEAN YIELD DISTRIBUTIONS

Analysis Variables	25% Increase in Variance				25% Decrease in Variance			
	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	48	82	66	78	52	84	74	78
Change from Base:	-2	0	-6	0	+2	+2	+2	0
Probability of Success (%):	14	52	24	44	10	50	20	42
Change from Base:	+2	0	+4	+4	-2	-2	0	+2
Mean NPV ($):	-203,396.	-12,665.	-132,000.	-45,878.	-208,199.	-19,205.	-131,245.	-47,207.
Change from Base:	+3,771.	+10,518.	+183.	+6,388.	-1,032.	+3,978.	+1,396.	+5,059.
Mean Ending Equity Ratio (Solvent Iterations):	0.628	0.693	0.616	0.670	0.578	0.666	0.584	0.656
Change from Base:	+0.022	+0.014	+0.020	+0.011	-0.028	-0.013	-0.012	-0.003
Mean Yearly Cash Farm Income ($):	-25,506.	26,843.	-2,881.	18,819.	-26,400.	23,196.	-3,465.	16,378.
Change from Base:	+452.	+3,166.	+578.	+2,283.	-442.	-481.	-6.	-158.

See Table 6 for definition of the analysis variables.

with fluctuating demand for their crop (hence fluctuating price) and stable production (Tweeten 1979). The demand side is represented in the model by crop prices, the supply side by crop yields. The results provide further validation of the model as an analysis tool, since they conform with accepted economic theory. In summary, all farmers of the type represented in the study would prefer more price variance, since the government provides protection from the negative effects of price variance.[27]

Alternative Types of Distributions

The scenarios examined in this section have dealt with changes in the variance of empirical distributions used in the base analysis. The base assumption that random prices and yields can best be described with multivariate empirical distributions has not yet been examined. Many different types of distributions can be employed to describe the behavior of random variables, each distribution possessing a particular set of properties. Researchers attempt to select the distributional form to most closely depict the actual situation. In this study, the choice of multivariate empirical distributions was made based on several beliefs, including (1) prices and yields were correlated with one another within a year (i.e., a good rice yield likely occurred simultaneously with a good soybean yield), (2) farmers and agricultural experts could make subjective estimates of yield variance that were more accurate than information available from historical or experimental sources, (3) historical behavior of prices provided the best source for predicting future price behavior, and (4) the multivariate empirical distribution best described the behavior of the subjective and historical data.

The normal distribution is the most commonly used to describe random events in research. It requires knowledge of only two parameters (mean and variance), is easily understood, highly useable, and has been used in many settings, including distribution estimations for test scores, diameter of a hole made by a drill press, and the length of a newborn baby (Hogg and Craig 1978). As Day

(1965) has shown, however, the normal distribution may not accurately represent some random variables, such as crop yields. The use of the normal distribution, in both independent and multivariate situations, nevertheless, is common in simulation modelling (Pederson 1984; King 1979).

Two scenarios were examined to determine the influence of distribution choice on the study results. In the first scenario, empirical distributions were used, but were assumed independent (i.e., not multivariate). The assumption of independence means any random price or yield had no influence on any other random price or yield. Results for this scenario are in Table 26. The change to independent empirical distributions did not cause a large change in results, but did have some impact. The results also varied from strategy to strategy. Probabilities of survival rose and the probabilities of success fell for the SSR 1/2 and SR 1/7 strategies, suggesting risk increased in the absence of covariance. The opposite results occurred for the SSR 1/7 and SR 1/2 strategies. The SSR 1/2 and SR 1/7 represent extreme strategies in the study; the SSR 1/2 is the strategy most dependent on soybeans, the SR 1/7 is the strategy

[27]This result ignores the effect of price risk on marketing margins. As Grant et al. (1984) have demonstrated, increased price risk increases marketing margins, with most of the increased margin passed to farm managers.

TABLE 25. SENSITIVITY ANALYSES FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - CHANGES IN RICE AND SOYBEAN PRICE DISTRIBUTIONS

Analysis Variables	25% Increase in Variance				25% Decrease in Variance			
	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	52	82	72	82	46	80	70	78
Change from Base:	+2	0	0	+4	-4	-2	-2	0
Probability of Success (%):	16	58	30	58	10	46	16	38
Change from Base:	+4	+6	+10	+18	-2	-6	-4	-2
Mean NPV ($):	-190,039.	5,819.	-112,865.	-11,651.	-230,251.	-55,676.	-151,707.	-71,769.
Change from Base:	+17,128.	+29,002.	+19,776.	+40,615.	-23,084.	-32,493.	-16,934.	-19,503.
Mean Ending Equity Ratio (Solvent Iterations):	0.626	0.700	0.623	0.678	0.580	0.653	0.576	0.646
Change from Base:	+0.020	+0.021	+0.027	-0.022	-0.026	-0.026	-0.020	-0.013
Mean Yearly Cash Farm Income ($):	-22,419.	32,567.	2,595.	27,417.	-32,208.	14,715.	-8,070.	11,250.
Change from Base:	+3,539.	+8,890.	+6,054.	+10,881.	-6,250.	-8,962.	-4,611.	-5,286.

See Table 6 for definition of the analysis variables.

TABLE 26. SENSITIVITY ANALYSES FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - CHANGES IN TYPE OF DISTRIBUTION USED

Analysis Variables	Independent Empirical				Independent Normal			
	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	48	90	76	72	88	100	100	98
Change from Base:	-2	+8	+4	-6	+38	+18	+28	+20
Probability of Success (%):	12	46	20	46	18	84	46	76
Change from Base:	0	-6	0	+6	+6	+32	+26	+36
Mean NPV ($):	-200,620.	-10,977.	-126,221.	-46,884.	-90,539.	112,028.	-20,069.	101,096.
Change from Base:	-6,547.	+12,206.	+6,420.	+5,382.	+116,628.	+135,211.	+112,572.	+153,362.
Mean Ending Equity Ratio (Solvent Iterations):	0.545	0.627	0.577	0.660	0.561	0.703	0.591	0.696
Change from Base:	-0.061	-0.052	-0.019	+0.001	-0.045	+0.024	-0.005	+0.037
Mean Yearly Government Payments ($):	30,935.	46,861.	43,125.	58,383.	35,268.	54,107.	49,237.	63,908.
Change from Base:	+1,115.	-889.	-878.	+1,681.	+5,448.	+6,357.	+5,234.	+7,206.

See Table 6 for definition of the analysis variables.

most dependent on rice. High dependence on a particular crop causes correlation between prices and yields to have the most impact of all the correlation values. In both cases, price and yield correlations are negative, providing a stabilizing influence on net farm income for those strategies. When yields for soybeans were up, for example, prices were down, and vice versa. When correlation was assumed to be nonexistent, returns became more variable and risk increased.

The SSR 1/7 and SR 1/2 strategies were more evenly dependent on both crops, causing correlation between yields to become more important. Because yields were positively correlated, imposing the assumption of independence between distributions increased the probability that low yields for one crop could occur at the same time high yields occurred for the other crop. In other words, the assumed positive correlation between crop yields increased the volatility of net cash farm income, thereby increasing risk for the farm manager.

The results have several implications. First, researchers need to consider multivariance when developing yield and price distributions. Second, farmers need to

understand that correlation exists between different crops both for yields and prices. A knowledge of correlation can help the farm manager identify a cropping plan that is optimal in reducing income risk and enhancing survival.

In the second scenario, independence between variables was also assumed, but the normal distribution was used instead of the empirical distribution. Results for this scenario are reported in Table 26. The use of independent normal distributions had a large positive impact on results for all strategies examined. Probabilities of survival were 88 percent or greater for the four strategies, and actually reached 100 percent for the SSR 1/7 and SR 1/2 strategies. Although the 1/7 share strategies realized the greatest gains in NPV and probability of economic success, the analysis variables for the 1/2 share strategies also showed marked gains. A large increase was also observed for government payments.

The reason for marked improvement in all strategies was the skewedness present in most of the base analysis empirical distributions. Although the possibility of very high prices and yields was present, most of the weight (or probability of occurrence) of the distribution was below the mean. By design, the normal distribution places an equal amount of weight on both sides of the distribution, hence its bell-type shape. The results illustrate the influence of the distribution type on results obtained from simulation models. An erroneous choice can cause results that are too optimistic or pessimistic.

Financial, Interest, and Inflation Sensitivity Scenarios

An important component in a farming operation is the amount and type of debt held by the farm manager. Debt has become a common means to finance farm growth, replacement of machinery, and day to day farm operations. During the 1960's and 1970's, farmers converted many of their short-term assets into assets of a more long-term nature (Boehlje and Eid-

man 1983), leaving themselves financially exposed to liquidity and cash flow problems. The recent financial problems of many U.S. farmers are indicative of the effect debt can have on farm survival (Knutson and Richardson 1984).

Because debt is such an important factor, results for the representative farm were undoubtedly influenced by the financial assumptions made in the base scenario. It is not clear from the results, however, what effect changes in the farm's financial position would have on analysis variables. For example, how much equity must initially be held by the farm manager to ensure survival for the next 5 years? Also, what effect does a lender's credit policy have on the viability of a farming operation? Examining other financial positions also broadens the applicability of results, facilitating comparisons between the representative farm and actual farms in the study area.

In the base scenario, several assumptions were made concerning the behavior of the U.S. economy during the 1984-88 period, particularly in regard to future interest and inflation rates. While care was taken to obtain the best estimates of what these variables will be, they are, nonetheless, estimates. It is useful, then, to examine how sensitive the results for the representative farm are to these interest and inflation rates. In this part of the sensitivity analyses, some of the assumptions dealing with macroeconomic and financial variables are examined.

Beginning Equity and Credit Rationing Effects

A sequence of bad income years may force highly leveraged farm managers to seek additional capital or liquidate their farm holdings. Although wanting to assist a farmer in a weak financial position, lenders may believe the risks inherent with such loans are too great. When refinancing is refused and insolvency occurs, credit policy of the financial institution involved frequently becomes the farmer's

scapegoat. It is often unclear, however, if the decision to withhold credit prematurely forced the farm manager out of business or saved him from losing additional equity.

In the RICESIM model, credit policy is represented as the minimum equity required to maintain solvency. The farm manager is considered to have survived in each iteration that equity remains above the minimum level each year. The minimum required equity level chosen, then, would be expected to have a significant influence on the results. The initial equity with which the farm manager begins the 5-year period would also be expected to have significant influence on results. Several questions can be raised about both variables. When is a producer's beginning equity position important and when does it have no effect on the survivability of the farm? When is a lender's credit policy important? When is a lender's credit policy more important than a producer's beginning equity level, and vice versa? How does the importance of equity and credit policy differ between tenant and a farm manager who owns part of his/her farm? In this section, these and other related questions are examined.

Six different beginning equity levels were examined for the 100 percent tenant operation assumed in the base scenario, one level of which was that assumed in the base. The same equity ratios were also used to examine a 50 percent owned-50 percent leased farm. That is, even though the dollar value of assets owned by the part-owner was much greater than for the tenant, the ratio of owned assets to total assets was the same for part-owner and tenant at each equity level. Description of the six beginning equity positions for tenant and part-owner are presented in Tables 27 and 28, respectively, along with the after-tax discount rates used for each position.

Six different lender's credit rationing policies were also identified for analysis, one of which was used in the base scenario (i.e., a leverage ratio of 2.0). The remaining five credit policies represented

both tighter and less restrictive levels than the base level. The six policies examined were leverage ratios (equity ratios) of 1.0 (0.50), 1.5 (0.40), 2.5 (0.286), 3.0 (0.25), and 4.0 (0.20). All six beginning equity levels were examined for each credit policy, making a total of 36 different beginning equity-credit policy scenarios for each strategy. Because the number of scenarios was so large, only the SSR 1/7 strategy was examined in the analyses. Results are reported by each analysis criterion.

Farm Survival

Probabilities of survival for the tenant at each combination of beginning equity and credit policy examined in the study are indicated in Table 29. Survival was above 90 percent at all credit policy levels, when initial equity positions were 90 percent and above. Survival was also above 90 percent for all but one of the 0.75 beginning equity ratio positions. Conversely, at a 0.25 beginning equity ratio position, probability of survival for all credit policies was less than 20 percent.

Credit policy had little impact on survival of the tenant when beginning equity ratios were 0.75 or more. Credit policy also had little effect on tenant survival at a 0.25 equity ratio, with farm liquidation occurring over 80 percent of the time even at a 4.0 leverage ratio credit policy. Only at intermediate equity levels did credit policy play a significant role in farm survival. At 60 percent initial equity, a four-fold increase in the maximum permitted leverage ratio (from 1.0 to 4.0) caused survivability to increase from 26 to 92 percent.

Higher probabilities of survival occurred at lower beginning equity levels for the part-owner versus the tenant farmer (Table 29). Survival was 100 percent for all but one of the 0.60 beginning equity ratio scenarios, and was 100 percent for all part-owner equity ratios above 0.60. As with the wholly-leased farm, the part-owner had little chance of survival at low beginning equity levels. The probabilities of survival at a 0.25 beginning equity

TABLE 27. FINANCIAL POSITIONS AND DISCOUNT RATES FOR A REPRESENTATIVE TENANT RICE AND SOYBEAN FARM IN LIBERTY COUNTY, TEXAS

	Initial Farm Equity Positions					
	0.25	0.40	0.60	0.75	0.90	1.0
Total On-Farm Assets:						
Intermediate ($)	570,200	570,200	570,200	570,200	570,200	570,200
Long-Term ($)	167,000	167,000	167,000	167,000	167,000	167,000
Intermediate-Term Debt:						
Debt ($)	421,948	332,937	226,081	134,536	53,848	0
Leverage Ratio	2.85	1.40	0.67	0.31	0.10	0.00
Equity Ratio	0.26	0.42	0.60	0.76	0.91	1.00
Long-Term Debt:						
Debt ($)	130,928	109,385	66,800	49,766	19,873	0
Leverage Ratio	3.63	1.90	0.67	0.42	0.14	0.00
Equity Ratio	0.22	0.35	0.60	0.70	0.88	1.00
Overall Debt:						
Debt ($)	552,876	442,322	292,881	184,302	73,721	0
Leverage Ratio	3.00	1.50	0.67	0.33	0.11	0.00
Equity Ratio	0.25	0.40	0.60	0.75	0.90	1.00
Discount Rate[a] (%):	10.96	10.60	10.18	9.62	9.08	8.69

[a]The discount rate represents the after-tax rate of return that could be earned if the farmer were to invest his equity and borrowed capital in an off-farm investment with a pre-tax return of 10.97 percent.

ratio the tenant exceeded or were equal to the probabilities of survival for the part-owner. An important assumption influencing this result is the capital gain rate on land.[28] To perform sensitivity analysis on the relative effects of credit and beginning equity on farm survival, data in Table 29 were used to estimate survivability equations for the tenant and part-owner farm scenarios. The estimated equations are:

$$S_T = -7.637 + 2.7974BE - 0.0159BE^2$$
$$\quad (19.207) \quad (0.4640) \quad\quad (0.0032)$$

$$-2.0049ME + .0168BE \cdot ME$$
$$(0.4736) \quad\quad (0.0067)$$

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[28]When the capital gain rate for land becomes smaller, beginning equity becomes more important to the part-owner. When the capital gain rate is small, and especially when it is negative, the tenant operation offers a higher probability of survival, even at intermediate debt levels. For more information on the effect of the land capital gain rate, see Perry et al. (1985).

for $0 \leq BE \leq 100$ and

$$S_P = -48.740 + 5.4017BE - 0.0423BE^2$$
$$\quad (42.8) \quad\quad (1.405) \quad\quad (.0126)$$

$$-2.4310ME + 0.0256BE \cdot ME$$
$$(0.9694) \quad\quad (0.0183)$$

for $0 \leq BE \leq 75$,

where S_T is the probability of survival for the tenant, S_P is the probability of survival for the part-owner, BE is initial equity ratio (times 100), and ME is the minimum equity ratio (times 100) required by financial institutions (i.e., lender's credit policy). The values in parentheses indicate standard errors for the corresponding coefficients.[29] The $\overline{R}^2$ values were 0.930 and 0.861 for the tenant and part-owner, respectively. The 90 and 100 percent equity level data were not used in the equation estimated for the part-owner because

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[29]The standard errors cannot be used in tests of significance because RICESIM results are not stochastic in the classical sense (Skees et al. 1985).

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no variation in survivability occurred between these higher equity levels and the 75 percent equity level.

For the tenant, a 1 percentage point increase in minimum required equity (e.g., changing ME from 33 to 34 percent) decreases the probability of survival by (-2.0049 + 0.0168BE) percentage points. When BE is 25 percent, for example, the decrease in survival is 1.58 percentage points. At a beginning equity level of 75 percent, however, the 1 percentage point change in ME causes probability of survival to decrease by 0.74 percentage points. On the average, changes in credit policy have a greater effect at low levels versus high equity levels. The results indicate that a tenant farm manager in a weak financial position is more sensitive to a lender's credit policy than a manager in a good financial position. A 1 percentage point increase in ME for the part-owner, evaluated at a BE value of 25 percent, decreases survivability by 1.79 percentage points. When evaluated at a BE value of 75 percent, however, a 1 percentage point increase in ME decreases survivability by 0.51 percentage points. When beginning equity is low, the part-owner is more sensitive to credit policy than the tenant, but at high beginning equity levels the reverse is true.

A 1 percentage point increase in beginning equity, evaluated at a beginning equity level of 25 percent (and a minimum equity of 33 percent) causes survivability to increase by 2.56 percentage points for the tenant and 4.13 percentage points for the part-owner. When beginning equity is 60 percent, an increase in equity to 61 percent increases the probability of survival for the tenant by 1.44 percentage points, while raising the probability of survival for the part-owner by only 1.17 percentage points.

Several conclusions can be made from these results: (1) Beginning equity is more important for survival to the low-equity-level part-owner, but is more important to the tenant at moderate to high equity levels (above 55 percent), (2) begin-

TABLE 28. FINANCIAL POSITIONS AND DISCOUNT RATES FOR A REPRESENTATIVE PART-OWNER RICE AND SOYBEAN FARM IN LIBERTY COUNTY, TEXAS

	Initial Farm Equity Positions					
	0.25	0.40	0.60	0.75	0.90	1.0
Total On-Farm Assets:						
Intermediate ($)	570,200	570,200	570,200	570,200	570,200	570,200
Long-Term ($)	1,547,000	1,547,000	1,547,000	1,547,000	1,547,000	1,547,000
Intermediate-Term Debt:						
Debt ($)	421,948	332,937	226,081	134,536	53,848	0
Leverage Ratio	2.85	1.40	0.67	0.31	0.10	0.00
Equity Ratio	0.26	0.42	0.60	0.76	0.91	1.00
Long-Term Debt:						
Debt ($)	1,166,438	937,482	528,455	394,485	157,794	0
Leverage Ratio	3.06	1.54	0.67	0.34	0.11	0.00
Equity Ratio	0.246	0.394	0.60	0.745	0.898	1.00
Overall Debt:						
Debt ($)	1,588,386	1,270,419	754,536	529,021	211,642	0
Leverage Ratio	3.00	1.50	0.67	0.33	0.11	0.00
Equity Ratio	0.25	0.40	0.60	0.75	0.90	1.00
Discount Rate[a] (%):	10.67	10.10	9.25	8.60	7.93	7.49

[a]The discount rate represents the after-tax rate of return that could be earned if the farmer were to invest his equity and borrowed capital in an off-farm investment with a pre-tax return of 10.97 percent.

ning equity has a greater influence on farm survival credit policy when equity levels are low, and (3) at all levels of beginning equity and minimum required equity, the effect of a 1 percentage point change in beginning equity is greater than the effect of a 1 percentage point change in credit policy.

Ending Equity Position

From the survivability results presented, it appears both tenant and part-owner farmers in the intermediate debt range (i.e., 0.40 to 0.60 equity ratios) are particularly sensitive to credit policy. If the lender relaxes credit policy, the farmer has a greater chance of still being in operation at the end of 1988. Survivability statistics do not, however, provide an indication as to where the farmer will be financially at the end of the 5-year period for different credit policy levels. The surviving farm manager could be either on the brink of bankruptcy in 1988 or free of any debt.

Survivability results also do not provide insight into whether tight-

er credit policies tend to prematurely force operations into insolvency. A prematurely insolvent operation is one that would be forced out of business at an initial credit policy but, when given additional credit, is able to recover from its precarious financial position. In this study, farms forced out prematurely are those whose leverage ratios rise above the cutoff level for credit in 1 year (causing farm liquidation), but survive under a more liberal credit policy and finish the 5-year period with a lower leverage ratio than at which they were previously forced out of business.

Ending equity ratios for the scenarios sensitive to credit policy are summarized in Table 30 for a credit policy with a maximum leverage ratio of 4.0. The 4.0 leverage ratio was used because it was the least restrictive, allowing large losses in equity before forcing the manager out of business.[30] At a

[30]Results for other credit policies were not reported because they would be much the same as those reported for the 4.0 leverage ratio. The major dif-

TABLE 29. PROBABILITY OF SURVIVAL[a] FOR A REPRESENTATIVE TEXAS RICE AND SOYBEAN FARM WITH DIFFERENT BEGINNING EQUITY POSITIONS AND CREDIT RATIONING POLICIES

Credit Rationing Policies[b]	Initial Farm Equity Positions											
	Tenant						Part-Owner					
	0.25	0.40	0.60	0.75	0.90	1.0	0.25	0.40	0.60	0.75	0.90	1.0
1.0	0	0	26	78	96	100	0	0	74	100	100	100
1.5	0	2	58	92	100	100	0	4	100	100	100	100
2.0	2	20	82	96	100	100	0	42	100	100	100	100
2.5	8	36	86	98	100	100	0	70	100	100	100	100
3.0	6	40	88	98	100	100	2	84	100	100	100	100
4.0	18	54	92	98	100	100	16	92	100	100	100	100

[a]Probability of survival is the probability that the farm manager will maintain the farm's intermediate and long-term leverage ratios at less than maximum levels established by local financial institutions.

[b]Maximum permitted leverage ratios.

TABLE 30. PROBABILITY OF ENDING EQUITY RATIOS FALLING BETWEEN INDICATED INTERVALS FOR SELECTED BEGINNING EQUITY POSITIONS WHEN REQUIRED LEVERAGE RATIO IS 4.0

Ending Equity Ratio Intervals	40% Beginning Equity		60% Beginning Equity	
	Tenant	Part-Owner	Tenant	Part-Owner
Above 0.50	38%	6%	72%	86%
Below 0.50 and Above 0.33	12%	58%	16%	14%
Below 0.33 and Above 0.20	4%	22%	4%	0%
Below 0.20	46%	14%	8%	0%

beginning equity ratio of 0.40, neither tenant nor part-owner operations were successful in the long run. The part-owner operation appeared to maintain its initial financial position, with a 58 percent chance that ending equity ratio will be within the 0.33 to 0.50 range. The tenant's ending equity ratios were more volatile than the part-owner's, with a 38 percent chance of an ending equity ratio in excess of 0.50 and a 48 percent chance of an ending ratio less than 0.20.

Results were more favorable at a beginning equity ratio of 0.60. Chances of ending equity ratio being greater than 0.50 exceeded 70 percent for both tenant and part-owner and were as high as 86 per-

ference would be that tighter policies would prevent equity levels from falling below 20 percent, since credit would be cut off sooner.

cent for the part-owner. The part-owner farm operator with a 0.60 beginning equity ratio appeared to have a good chance of improving his/her equity position, when capital gain rates for land were negative, providing credit policies are sufficiently liberal to allow the manager a chance to recover from a bad year.

The harshness of the 1.0 leverage ratio credit policy when beginning equity was 60 percent is borne out in examining the iterations forced into insolvency at that credit level. At the 1.0 credit policy, 37 iterations were forced out in the tenant scenario (i.e., a probability of survival equal to 26 percent). Of these 37 iterations, 62 percent ended the study period below the 1.0 leverage ratio threshold.[31] Of the 13

[31]The 62 percent figure was calculated as follows: for the tenant with a 0.60

part-owner simulation iterations forced out at a 1.0 credit policy leverage ratio, 54 percent were below the 1.0 leverage ratio at the end of 1988. These results suggest a 1.0 credit policy has a better than even chance of prematurely terminating a farm operation that probably will recover if given additional credit.

When beginning equity is 40 percent, tight credit policy appears more appropriate. As mentioned before, the part-owner has little hope of increasing equity in his/her farming operation, but stands a good chance of losing remaining equity. From these results, it appears that optimal credit policy is inversely related to beginning equity position, tightening as equity falls and loosening as equity is increased.

A leverage ratio of 2.0 performed much better as a credit policy. When beginning equity was 40 percent, the tenant was prematurely forced into insolvency in 38 percent of the iterations at a 2.0 credit policy leverage ratio. For the same beginning equity level, the 2.0 credit policy prematurely forced the part-

beginning equity ratio, 36 iterations (72 percent in Table 30) ended the 5-year period with leverage ratios less than 1.0. Of these, 13 survived when the credit policy leverage ratio was 1.0. The remaining 23 iterations rose above 1.0 sometime during the 5-year period, but were below the 1.0 leverage ratio in 1988.

Therefore, 23 of 37 iterations (62 percent) were prematurely declared insolvent.

	Leverage Ratio					
	1.0	1.5	2.0	2.5	3.0	4.0
I. Tenant						
(1) Solvent Iterations						
Percent of All Iterations:	26	58	82	86	88	92
Average Ending Liabilities ($):	299,600.	317,601.	370,696.	382,543.	385,643.	402,852.
Change from Beginning ($):	6,719.	24,720.	77,815.	89,662.	92,762.	109,971.
(2) Insolvent Iterations						
Percent of All Iterations:	74	42	18	14	12	8
Average Ending Liabilities($):	535,374.	620,032.	652,954.	673,729.	671,065.	825,131.
Change from Beginning($)	242,493.	327,151.	360,073.	380,848.	378,184.	532,250.
II. Part-Owner						
(1) Solvent Iterations						
Percent of All Iterations	74	100	100	100	100	100
Average Ending Liabilities($):	1,059,635.	1,157,124.	1,155,503.	1,155,245.	1,155,222.	1,155,222.
Change from Beginning($):	305,099.	402,588.	400,967.	400,709.	400,686.	400,686.
(2) Insolvent Iterations						
Percent of All Iterations:	26	0	0	0	0	0
Average Ending Liabilities($):	1,407,643.	---	---	---	---	---
Change from Beginning($):	653,107.	---	---	---	---	---

owner out of business 42 percent of the time.

Another method of illustrating the impact of different credit policies is reporting total debt held by the farm manager in the last year of operation. These debt levels are particularly important to the lender, because they represent potential gains or losses to his/her financial institution that accompany the credit policy decision. These debt levels are reported in Table 31 for both tenant and part-owner at a beginning equity level of 60 percent. The results are separated into solvent and insolvent categories to illustrate average changes in debt when the farm survives through 1988 and when insolvency occurs in or before 1988.

In every instance, because beginning equity was only 60 percent, average ending debt exceeded beginning debt. Liberalizing credit policy for tenants and part-owners resulted in ending debt for surviving iterations increasing by about $100,000, while debt for insolvent tenant iterations increased by about $300,000. Ending debt for all iterations was minimized at leverage ratios of 2.0 to 3.0 for tenants and was approximately the same across all leverage ratios for the part-owner.

Net-Present Value

The after-tax NPV results for the tenant and part-owner at each level of beginning equity and credit policy appear in Tables 32 and 33, respectively. Both the tenant and part-owner farming operations generated a higher average rate of return than the available off-farm investments when beginning equity was greater than or equal to 75 percent. Average NPV returns were highest at the 100 percent equity levels for both scenarios. Because assets were held constant across all equity positions, total returns were highest when cash outflows to lenders were lowest. At equity positions of 75 percent or less, NPV returns per dollar of equity were greater for the tenant than the part-owner, suggesting a farmer desiring to maximize returns to equity should consider renting all his/her land if unable to acquire high initial equity in owned land.

The NPV standard deviations tended to be highest at intermediate levels of debt for the part-owner and tenant, again reflecting sensitivity of the farm in an intermediate debt-level position to external circumstances. The farm manager can significantly increase his/her debt load in 1 or 2 bad years, resulting in large losses for the farm and a negative NPV. The high equity farm, by contrast, has lower fixed costs and can suffer through several years of low crop yields and prices without adding additional debt. The low equity farm manager has little equity to lose, with farm liquidation occurring in most cases after only 1 or 2 bad years. Ending net worth differed little from beginning net worth. Although returns and losses were much smaller for the tenant than the part-owner, standard deviations at each equity

position and credit policy were roughly the same for both, reflecting a greater risk in being a tenant farmer, regardless of the financial position or credit policy.

Changes in credit policy had no effect on the part-owner's financial performance at equity levels of 75 percent or more and had only a minor effect at the 60 percent level. Liberalized credit at low equity levels resulted in a decline in NPV, as farm managers were allowed to go deeper in debt during adverse years before being forced to liquidate their holdings. Conversely, credit policy had an impact on the tenant farm at all six levels of beginning equity, although the impact was quite different at low and high equities. As with the part-owner, more liberal credit policies at low beginning equity levels allowed the farm manager to go farther in debt before reaching insolvency. At high equity levels, however, liberalized credit caused average NPV to increase because of (1) continued refinancing of a farm that reached the tight credit policy level, with the farm subsequently recovering and (2) the relative advantage of long-term refinancing of debt.[32] When extending liberal credit terms, a financial institution is, in effect, making available more long-term liquidity to be used in adverse years. The net result is higher annual profits and a higher NPV for the operations.

Changes in Interest Rates

The increased dependence on borrowed capital has caused greater sensitivity by farm managers to interest rates. During the late 1970's, real interest rates (i.e., nominal interest rates less inflation) were very low or even negative, encouraging managers to use borrowed capital to finance farm operations. By 1983, the situation had reversed. The Federal Re-

[32]Refinancing debt on a long-term loan results in a 1.5 to 3 percent difference in interest rate and lower yearly principal, both of which improve farm cash flow. Because the yearly cost is lower, profits are enhanced and the need for future refinancing is reduced.

TABLE 32. NET PRESENT VALUE RESULTS FOR REPRESENTATIVE TEXAS RICE AND SOYBEAN FARM WITH DIFFERENT BEGINNING EQUITY POSITIONS AND CREDIT RATIONING LEVELS-TENANT FARM

Credit Rationing Policies[a]		Initial Farm Equity Positions					
		0.25	0.40	0.60	0.75	0.90	1.0
1.0	Mean	-77,539.	-97,877.	-80,297.	34,538.	104,038.	116,218.
	Std.Dev.	134,936.	120,306.	179,846.	202,335.	174,212.	183,881.
	P(NPV>0)[b]	28	18	34	62	68	72
1.5	Mean	-92,730.	-101,995.	-46,590.	40,206.	89,327.	115,665.
	Std.Dev.	123,823.	134,192.	221,253.	202,474.	188,011.	185,310.
	P(NPV>0)	24	16	48	60	68	72
2.0	Mean	-106,915.	-110,928.	-51,743.	45,377.	89,528.	115,721.
	Std.Dev.	130,214.	157,865.	152,650.	195,968.	187,820.	185,208.
	P(NPV>0)	14	24	52	60	68	72
2.5	Mean	-100,866.	-98,574.	-18,554.	43,317.	88,932.	116,584.
	Std.Dev.	140,775.	189,900.	210,400.	202,209.	188,981.	183,604.
	P(NPV>0)	16	32	52	60	68	72
3.0	Mean	-123,358.	-126,038.	-18,346.	44,456.	89,541.	116,609.
	Std.Dev.	136,446.	209,058.	213,204.	202,152.	187,856.	183,560.
	P(NPV>0)	12	34	52	60	68	72
4.0	Mean	-115,059.	-106,079.	-12,921.	45,060.	89,574.	117,379.
	Std.Dev.	149,825.	224,287.	211,203.	201,989.	187,846.	182,279.
	P(NPV>0)	18	40	52	60	68	72

[a]Maximum permitted leverage ratios.

[b]Represents the probability of NPV being greater than zero (i.e., probability of success).

TABLE 33. NET PRESENT VALUE RESULTS FOR REPRESENTATIVE TEXAS RICE AND SOYBEAN FARM WITH DIFFERENT BEGINNING EQUITY POSITIONS AND CREDIT RATIONING LEVELS-PART OWNER FARM

Credit Rationing Policies[a]		Initial Farm Equity Positions					
		0.25	0.40	0.60	0.75	0.90	1.0
1.0	Mean	-211,088.	-202,062.	-94,965.	13,877.	153,007.	235,692.
	Std.Dev.	156,359.	156,941.	220,497.	204,593.	208,385.	199,790.
	P(NPV>0)[b]	10	12	38	58	78	86
1.5	Mean	-211,088.	-237,245.	-82,838.	13,877.	153,007.	235,692.
	Std.Dev.	156,359.	156,570.	198,440.	204,593.	208,385.	199,790.
	P(NPV>0)	10	8	38	58	78	86
2.0	Mean	-211,086.	-260,688.	-82,553.	13,877.	153,007.	235,692.
	Std.Dev.	156,361.	231,453.	197,814.	204,593.	208,385.	199,790.
	P(NPV>0)	10	10	38	58	78	86
2.5	Mean	-226,167.	-226,597.	-82,398.	13,877.	153,007.	235,692.
	Std.Dev.	140,136.	249,847.	197,524.	204,593.	208,385.	199,790.
	P(NPV>0)	6	12	38	58	78	86
3.0	Mean	-241,496.	-206,015.	-82,387.	13,877.	153,007.	235,692.
	Std.Dev.	147,100.	242,063.	197,499.	204,593.	208,385.	199,790.
	P(NPV>0)	6	12	38	58	78	86
4.0	Mean	-316,847.	-193,439.	-82,387.	13,877.	153,007.	235,692.
	Std.Dev.	167,680.	232,511.	197,499.	204,593.	208,385.	199,790.
	P(NPV>0)	6	12	38	58	78	86

[a]Maximum permitted leverage ratios.

[b]Represents the probability that NPV will be greater than zero.

TABLE 34. SENSITIVITY ANALYSES FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - DECREASES IN INTEREST RATES

Analysis Variables	2% Decrease All Rates				2% Decrease-New Loans Only			
	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	54	88	80	82	54	86	78	82
Change from Base:	+4	+6	+8	+4	+4	+4	+6	+4
Probability of Success (%):	22	62	30	58	16	56	30	52
Change from Base:	+10	+10	+10	+18	+4	+4	+10	+12
Mean NPV ($):	-168,613.	27,658.	-85,728.	-318.	-178,603.	12,233.	-105,303.	-26,602.
Change from Base:	+38,554.	+50,841.	+46,913.	+51,948.	+28,564.	+35,416.	+27,338.	+25,664.
Mean Ending Equity Ratio (Solvent Iterations):	0.650	0.693	0.620	0.682	0.635	0.687	0.610	0.665
Change from Base:	+0.044	+0.014	+0.024	+0.023	+0.029	+0.008	+0.014	+0.006
Mean Yearly Cash Farm Income ($):	-13,453.	36,215.	9,734.	3,0839.	-17,275.	32,853.	4,490.	23,524.
Change from Base:	+12,505.	+12,538.	+13,193.	+14,303.	+8,683.	+9,176.	+7,949.	+6,988.

See Table 6 for definition of the analysis variables.

serve's decision to stabilize growth of the money supply, growth in the federal government's budget deficit, and uncertainty about the future level of the deficit all combined to cause real interest rates to rise to historically high levels.

In the base scenario, real interest rates were assumed to remain at high levels throughout the 1984-88 study period, although rates were lower than 1983 levels. If the deficit were reduced and (or) financial institutions felt more confident about the future, both nominal and real interest rates would be expected to decline. The decline in interest rates would affect agriculture in two ways: (1) Interest costs would be reduced and (2) the flow of foreign capital into the United States would decrease, causing the exchange rate to become more favorable for U.S. exporters. The more favorable exchange rate would increase overseas demand for U.S. agricultural products, thereby increasing U.S. farm prices. In this section, the sensitivity of base results to a decrease in interest rates is examined for the cost side only, assuming the interest rate change has no effect on prices. Although this assumption is not accurate, it allows examination of the interest rate effects

alone, without the price effects occurring simultaneously.

In the first scenario, all interest rates listed in Table 1 were reduced 2 percentage points in each year. If pre-1984 loans were made at fixed interest rates, a decrease in the deficit would have no effect on rates for these loans. A second scenario, therefore, was also analyzed, where the pre-1984 longterm and intermediate-term rates were held constant at the base levels and all other rates were reduced 2 percentage points. Results for these scenarios are summarized in Table 34.

The 2 percentage point drop in all interest rates had a significant positive impact on all four strategies. The strategies benefitting most from lower interest rate costs differed, depending on the analysis variable examined; the SR strategies realized the largest gains in average after-tax NPV, the SR 1/2 strategy had the largest increase in probability of survival, and the SSR 1/2 strategy realized the largest increase in ending equity ratio.

Results were different for some strategies when the 2 percentage point reduction was limited to new loans versus being applied to all loans. Probabilities of survival were within 2 percentage points of

the results when all interest rates were reduced, but changes in NPV varied 25 to 50 percent of the all-interest-rate change scenario.

Results suggest that, despite about $300,000 in outstanding debt at the beginning of the simulation period, the farm manager is more sensitive to future interest rates than past rates. In this study, the farm manager was not permitted to buy land and only gradually replaced machinery over time. The remaining reasons for borrowing new capital are for operating and refinancing to pay operating losses. Both are likely at work in reducing annual costs and increasing probability of survival. In several instances, the farm was declared insolvent in the base scenario when the farm manager's equity position was only slightly below the minimum requirement for continued operation. In these analyses, the farm manager survived and was able to continue operation for another year because the 2 percent lower interest rate reduced losses enough to enable the farm manager to finance his/her losses with remaining farm equity.

Changes in Inflation Rates
Aside from reducing the federal deficit or increasing financial in-

TABLE 35. SENSITIVITY ANALYSES FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - CHANGES IN INFLATION RATES

Analysis Variables	2% Increase in All Inflation Rates				2% Increase Only in Cost Inflation			
	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	44	70	62	62	36	62	54	58
Change from Base:	-6	-12	-10	-16	-14	-20	-18	-20
Probability of Success (%):	10	44	16	34	8	30	8	22
Change from Base:	-2	-8	-4	-6	-4	-22	-12	-18
Mean NPV ($):	-229,120.	-64,825.	-169,290.	-116,397.	-279,019.	-131,654.	-216,012.	-161,182.
Change from Base:	-21,953.	-41,642.	-36,649.	-64,131.	-71,852.	-108,471.	-83,371.	-108,916.
Mean Ending Equity Ratio (Solvent Iterations):	0.557	0.644	0.551	0.612	0.530	0.625	0.550	0.590
Change from Base:	-0.049	-0.035	-0.045	-0.047	-0.076	-0.054	-0.046	-0.069
Mean Yearly Cash Farm Income ($):	-42,366.	-2,009.	-25,497.	-13,318.	-46,990.	-5,065.	-24,844.	-11,054.
Change from Base:	-16,408.	-25,686.	-22,038.	-29,854.	-21,032.	-28,742.	-21,385.	-27,590.

See Table 6 for definition of the analysis variables.

stitutions' confidence about the future, a third method to reduce real interest rates is to increase the inflation rate. Inflation is created principally by increasing the economy's monetary base (e.g., demand deposits, currency, savings deposits, etc.) at a faster than normal rate. In the 1980's era of high federal deficits and constant increases in the monetary base, inflation could be increased if the Federal Reserve financed a larger amount of the federal government's borrowings.

The effects of inflation can be harmful or beneficial to a farm manager, depending on his/her circumstances. During an inflationary period, costs of production rise more rapidly, as do living costs. Crop prices also rise, but may not rise enough to maintain the farm manager's standard of living at pre-inflation levels. Inflation also weakens the exchange rate for the dollar, a positive benefit for farmers who produce exportable commodities. Overseas demand for U.S. farm products increases, raising farm price for these products. Perhaps the most important benefit of inflation is received by managers owing fixed debts to others. The effect of inflation is to reduce the real amount of fixed debt owed by the farm manager. If a farmer owed 20 percent of his/her

farm's value to a bank, for example, and the value of the farm doubled because of inflation, the farmer would owe only 10 percent of the farm's value to the bank. The manager has done nothing to earn the transfer of additional equity to his/her ownership, but is wealthier as a result of inflation.

In this section, the effect of a 2 percentage point increase in inflation is examined for the representative farm. All inflation rates were increased 2 percentage points above the values shown in Table 1, with the exception of inflation for land, which was increased 3 percentage points. In the base scenario, the capital gain rate for land was 50 percent greater than other inflation rates. The capital gain rate in this sensitivity analysis, therefore, was also 50 percent greater than the increase in other inflation rates. To enable examination of inflation's impacts exogenous of price impacts, it was assumed the higher inflation rates would have no effect on crop prices. To further understand the negative effects of inflation on the representative farm, a second scenario was implemented in which the 2 percentage point increase in inflation did not affect crop prices nor the value of farm land, buildings, equipment already owned, and off-farm invest-

ments. Only the negative effects of inflation (i.e., higher production costs and living expenses) were felt in the second scenario.

Results for both scenarios are presented in Table 35. The overall effect of inflation on the representative farm, when only crop prices were not affected by higher inflation rates, was negative for all four strategies. Particularly hard hit by the effects of inflation were the 1/7 strategies. Because landowners pay part of the costs under a 1/2 share arrangement, the tenant using the 1/2 share arrangement is less vulnerable to the effects of production cost inflation than when using the 1/7 share arrangement. The SSR strategies were not affected as severely as the SR strategies because the average per acre cost of production across all crops was lower under the SSR rotation.

In the second scenario, negative effects of inflation can be seen more clearly in the results. The small increase in inflation of production costs and family living expenses had a strongly negative effect on the farm operation. In comparing the two scenarios, however, one can see that inflation of land and machinery values resulted in definite positive benefits in the first scenario. Differences in average after-tax NPV between scenarios ranged from about $45,000 for the

SR 1/7 strategy to $67,000 for the SSR 1/7 strategy. A comparison between mean net cash farm incomes, however, shows little difference between the two scenarios, since all positive benefits of inflation are gained through increasing the value of assets. The results indicate inflation does have substantial positive effects on a farm operation. Had the farm manager owned a large part of the farm, the overall effect of inflation (ignoring crop price effects) probably would have been positive. In addition, favorable impacts of inflation on crop prices may outweigh any negative effects, even if the inflation impacts on asset values are ignored.

A Repeat of 1978-81 Macroeconomic Policy

The previous two sections have provided a partial analysis of changes in interest and inflation rates for the representative farm. In both cases, however, crop prices were held constant. In this section, effects of changes in interest and inflation rates, including their effects on prices, are examined by reenacting 1978-81 macroeconomic policy.

During most of the 1960's and 1970's, the Federal Reserve used monetary policy to stimulate the economy during recessionary periods and restrict the economy during over-expansionary periods. During 1975-77, in particular, the Federal Reserve had expanded the money supply at a very rapid rate to aid in the economy's recovery from the 1974-75 recession and to stabilize interest rates at low levels. By 1978, effects of the expanded money supply were showing in the rate of inflation. In 1978, the inflation rate was 7.7 percent; in 1979, 11.3 percent; and in 1980, 13.5 percent (U.S. Department of Commerce 1984).

With a change in 1978 of the Federal Reserve Board chairmanship, the Board moved from a policy of regulating interest rates to stabilizing the growth of the monetary base (*The Wall Street Journal* 1984). The discount rate used by the Federal Reserve began moving upward to 7.5 percent in 1978, 10.3 percent in 1979, 11.8 percent in 1980, and 13.4 percent in 1981. Despite the high nominal interest rates, however, real interest remained low until 1982. During this period, the dollar was weak relative to other currencies and exports of farm products reached all-time highs. In short, the 1978-81 period was characterized by high inflation, real interest rates, and high overseas demand for U.S. agricultural products.

In this scenario, a repeat of 1978-81 macroeconomic policy was implemented for the 1985-88 study period. Assumptions for 1984 were not changed from the base scenario. A model developed by Chambers and Just (1982) was used to predict standard drawing rights, or exchange rates for the period. The exchange, interest, and inflation rates were then used in the Grant, Beach, and Lin (1984) model to predict rice prices for 1985-88. Soybean prices were assumed to move in the same proportion as rice prices. The government programs were held constant through 1988 at 1984 levels.

Although the exchange rate started in a stronger position in 1985 than in 1978, by 1988 it had weakened to about the 1979 level. The result of the weakened dollar and higher inflation rate on rice price was startling. Expected U.S. rice price, as predicted by the Grant, Beach, and Lin (1984) model, rose to $10.49/cwt in 1985, $11.47/cwt in 1986, $12.28/cwt in 1987, and $15.82/cwt in 1988.[33] The 1988 figure seems particularly large, but in the late 1970's, rice price also increased substantially above earlier levels. Both private and public projected rice carryover declined substantially in the 1985-88 period, with total carryover fall-

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[33]Because the farm program provisions were frozen at 1984 levels, the rise in expected price for rice and soybeans resulted in the program being much less lucrative to farm operations. Participation in the program by farmers, therefore, was assumed to drop to 50 percent by 1988. Sensitivity analyses revealed that a 20 percent versus 50 percent rate of participation had very little effect on price.

ing from 51 million hundredweights in 1984 to 36 million hundredweights in 1988. The frozen government programs, combined with rapid inflation, moved the rice industry into essentially a free-market position by 1988. Rice acreage fell over time as a result of the higher inflation rate and fixed target price.

The effects of higher prices, inflation, and interest rates on the representative farm are summarized in Table 36. All four strategies fared much better under this scenario than under the base scenario. The 1/2 share strategies, in particular, realized large increases in probabilities of success and survival. The large gains in mean ending equity ratios were equally impressive, indicating a substantial strengthening in the financial position of all strategies. Government payments decreased as expected, reflecting the move toward a free market situation. Despite the large change in absolute results, stochastic dominance rankings for the four strategies did not change from the base scenario. Thus, the representative farm would benefit from a repeat of the 1978-81 macroeconomic policy.

Farm Program Sensitivity Scenarios

Several sensitivity scenarios dealing with potential farm program options are examined in this section. In general, the policy scenarios represent potential programs for rice that could be incorporated into the 1985 or subsequent farm bills. Scenarios were also designed to examine impacts of nonparticipation in the farm program, strict enforcement of the $50,000 payment limitation, and the current premium for long-grain rice in the loan program. Effects of altering any provisions of the current government farm program as presented here are short-term (i.e., 3 to 5 years). The limited planning horizon constrains the usefulness of the results in suggesting longer-term consequences of the policy changes.

Non-Participation in Program

The current farm program for

rice is voluntary, relying on monetary and risk reduction incentives to encourage participation. In most of the study period, 20 percent of the acreage was required as set-aside acreage to qualify for the rice loan program and deficiency payments. An additional 5 percent of rice acreage was set-aside as paid acreage diversion. No acreage set-aside was required to qualify for the soybean loan. Despite the program benefits, a farm manager may consider costs of participation are too great, i.e., that he/she is better off operating outside the program. Or, the farm manager may be fundamentally opposed to any subsidization of agriculture. The effect of choosing to remain out of the farm programs for rice and soybeans is indicated in Table 37.

For all four strategies nonparticipation in the farm programs can only be described as devastating. Survivability fell below 20 percent for all strategies and was only 6 percent for the SR 1/7 strategy. Probabilities of economic success were zero for both SR strategies. NPV numbers for all strategies declined by large amounts. When the large changes in other analysis variables were examined, mean ending equity ratios for surviving iterations only declined by modest amounts. The mean ending equity ratio for all iterations, however, was well below the minimum required for survival and was actually negative for the SR 1/7 strategy. It is not surprising that the average ending equity ratios were below the 0.33 level, but the depth to which they declined suggests many iterations lost large amounts of money in the last year of operation.

The results suggest that a farm similar to the representative farm is very dependent on government farm programs for continued survival. Government payments are an essential part of the farm manager's annual cash flow. Although a similar analysis was not carried out for farms smaller than the representative farm, Smith (1982) has shown that for Southern High Plains cotton farms smaller acreage operations are more dependent on

TABLE 36. SENSITIVITY ANALYSIS FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - REPEAT OF 1978-81 MACROECONOMIC POLICY IN 1985-88 STUDY PERIOD

Analysis Variables	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	78	90	90	92
Change from Base:	+28	+8	+18	+14
Probability of Success (%):	56	82	72	80
Change from Base:	+44	+30	+52	+40
Mean NPV ($):	-1,858.	199,814.	78,927.	203,596.
Change from Base:	+205,309.	+222,987.	+211,568.	+255,862.
Mean Ending Equity Ratio (Solvent Iterations):	0.677	0.788	0.697	0.777
Change from Base:	+0.071	+0.109	+0.101	+0.118
Mean Yearly Government Payments ($):	21,236.	32,854.	30,371.	38,584.
Change from Base:	-8,584.	-14,896.	-13,632.	-18,118.

See Table 6 for definition of the analysis variables.

TABLE 37. SENSITIVITY ANALYSIS FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - NO PARTICIPATION IN GOVERNMENT FARM PROGRAM

Analysis Variables	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	10	18	12	6
Change from Base:	-40	-64	-60	-72
Probability of Success (%):	0	6	0	0
Change from Base:	-12	-46	-20	-40
Mean NPV ($):	-373,559.	-370,016.	-394,456.	-463,102.
Change from Base:	-166,392.	-346,833.	-261,815.	-410,836.
Mean Ending Equity Ratio (Solvent Iterations):	0.610	0.595	0.537	0.510
Change from Base:	-0.004	-0.084	-0.059	-0.149
Mean Ending Equity Ratio (All Iterations):	0.143	0.130	0.105	-0.043
Change from Base:	-0.238	-0.456	-0.368	-0.598

See Table 6 for definition of the analysis variables.

Analysis Variables	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	42	64	50	48
Change from Base:	-8	-18	-22	-30
Probability of Success (%):	10	38	4	22
Change from Base:	-2	-14	-16	-18
Mean NPV ($):	-237,634.	-117,176.	-222,470.	-186,758.
Change from Base:	-30,467.	-93,993.	-89,829.	-134,492.
Mean Ending Equity Ratio (Solvent Iterations):	0.584	0.643	0.567	0.625
Change from Base:	-0.022	-0.036	-0.029	-0.034
Mean Yearly Government Payments ($):	24,962.	31,449.	30,335.	36,224.
Change from Base:	-4,858.	-16,301.	-13,668.	-20,478.

See Table 6 for definition of the analysis variables.

farm programs than are large acreage operations. If this holds in general for all farms, many operations in the Liberty County area could benefit from participating in the farm program.

Enforcement of $50,000 Payment Limitation

In the base scenario, the manager was limited to $100,000/year in government payments, representing a maximum of $50,000/year to both the farmer and a partner. In theory, the government implemented the $50,000 payment limitation to reduce program costs, judging those farm operations which qualify for more than $50,000 in payments to not need the additional monies. Quite often, however, the limitation can be avoided by legal means. Part of the farm's assets, for example, can be put in the spouse's name. Since the limit is $50,000 per person, the spouse partner becomes eligible for an additional $50,000. In addition, crop-share tenure arrangements are commonly utilized to transfer some government payments to the landowner as part of the land rent, thus reducing the effective rent paid by the farm manager. Incentives to side-step the payment limitation depend, of course, on the amount of government payments lost by the producer when he/she complies with the limitation. A strict enforcement of the limitation would have an effect on strategies, since all farms exceeded the limitation in one or more base scenario iterations. In this scenario, it was assumed that the government strictly enforced the limitation, allowing the farm operation no more than $50,000/year in deficiency and diversion payments.

Effects of enforcing the government payment limitation on a per farm basis are in Table 38. The SR rotation strategies suffered more than the SSR strategies as a result of the limit, with probability of survival falling to 50 percent or less for both SR strategies. For all strategies, probabilities of success fell to as low as 4 percent and mean after-tax NPV dropped by an average of $87,000 from base scenario levels. Perhaps the most telling statistics were the changes in average government payments to the tenant, which fell by over 35 percent in some cases. Although the change in government payments was greater for the SSR 1/7 versus the SR 1/2 strategy, the changes in probabilities of survival and success were greater for the latter strategy, again demonstrating the greater need the 1/2 share strategies have for additional cash flow. A graph of all NPV numbers for the four strategies is given in Figure 7. All distributions lie to the left of their corresponding base strategies, indicating their relative inferiority. In particular, the SSR 1/7 and SR 1/7 are much farther apart and SSR 1/2 and SR 1/2 are much closer together when the payment limit is strictly enforced.

Several implications can be drawn from these results. When the payment limit is strictly enforced, both SR rotations are less desirable to the farm manager. The payment limitation can, therefore, have an impact on the choice of an optimal crop rotation, tending to discourage intensive cropping of crops eligible for deficiency payments. Removal of the payment limitation would probably cause many farm managers to push more strongly for a 1/7 share in place of a 1/2 share arrangement when negotiating the land rental arrangement, since the 1/7 share arrangement becomes more lucrative as the payment limit is raised. Lastly, the results demonstrate a substantial economic motivation for large farms to find ways to circumvent the $50,000 payment limitation.

Increasing Long-Grain Loan Premium

Prices for long-grain rice are usually above those of medium and short-grain rices, reflecting consumer preference for longer-grained varieties. The price differential is also reflected in government commodity programs (USDA 1983). As mentioned in the section on study assumptions, the Texas rice loan rate in the model was increased 7.894 percent above the $8.00/cwt national rate assumed for

1984-88. The percentage figure reflected a premium for long-grain rice and the average difference between long-grain loan rates and national loan rates for 1976-82. Throughout the 7-year period, the premium remained close to 7 percent. In 1983, however, the premium jumped to 14.475 percent. Because the higher premium occurred only in 1 year, the earlier long-grain rice loan premium was used in the base analysis. In this section, the potential importance of a higher premium, should it become permanent, is examined.

The loan rate used in the sensitivity analysis for all 5 years of the study period was $9.16/cwt, a $1.16/cwt premium above the national loan and an increase of $0.53/cwt over the loan rate in the base scenario. Rice following 1 year of soybeans and ratoon rice was again discounted $0.30/cwt and $0.60/cwt, respectively, reflecting lower rice quality. The $3.90/cwt maximum deficiency payment limit was held constant, requiring target prices to also rise by $0.53 to $13.06/cwt. Results for this analysis are in Table 39.

All four strategies examined benefitted from the higher loan rate. The two SR strategies, in particular, received a substantial boost from the premium increase, with 6 to 8 percentage point rises in probabilities of survival occurring for both strategies. Changes in mean after-tax NPV suggest the 1/7 share strategies benefitted most from the higher loan premiums.

The principal factor influencing these results is the large increase in average government payments received under each strategy and the largest increases observed among all scenarios examined in the study. These increases caused gross farm revenues to increase only 1.5 to 3 percent for each strategy. In addition, the higher loan rate reduced downside price risk, since the farm manager was now guaranteed a higher minimum price. The combined effect of the higher target price and loan rate was to guarantee the farmer a higher return for his/her crop without any increase in operating costs. The additional
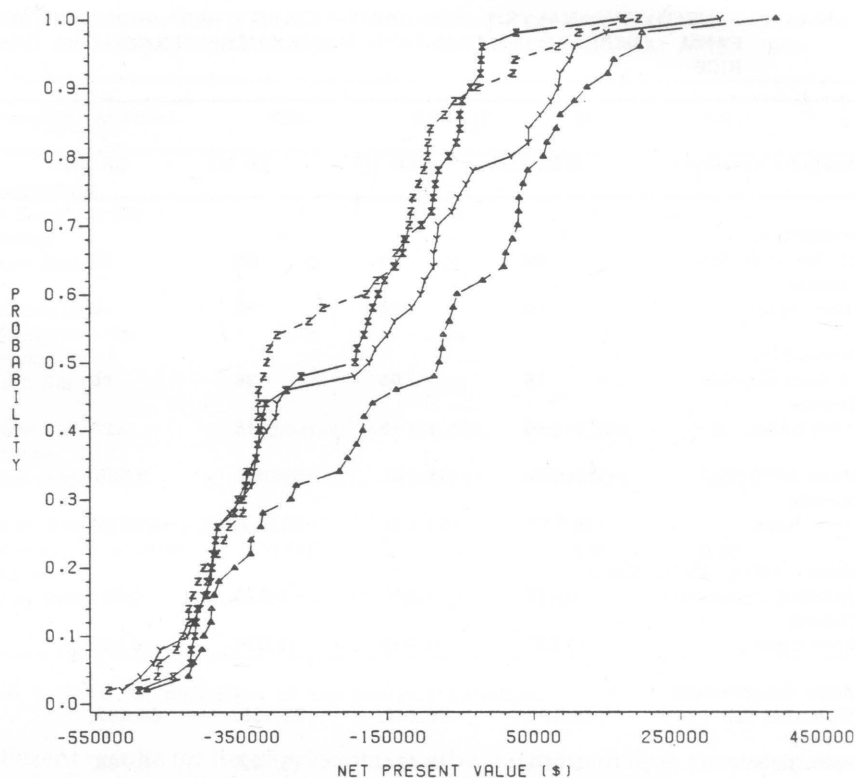
Figure 7. Net present values for each strategy when payment limitation enforced.

gross revenue caused a proportional increase in net cash farm income.

Eliminating Target Price Program

Several policy options available to lawmakers writing the 1985 farm bill for rice are considered in this and subsequent analyses. To examine the effect of the different policy options on the representative farm, it was necessary to first determine the effects of the respective policy alternatives on the entire U.S. rice industry. In particular, effects of policy on U.S. farm prices are essential in evaluating the policy impacts at the farm level. Because macro- and micro-economic aspects of policy are important to policy makers, both perspectives are reported in the subsequent scenarios. The Grant, Beach, and Lin (1984) model was used to simulate the macro aspects of the rice industry.

The primary purpose of target prices are to stabilize farm income. The target price program has been

increasingly criticized as costly to the government and overstimulative to agricultural production. Some involved in the rice industry feel that "as a concept, target price may be very difficult to maintain in the 1985 farm bill" (Adams 1984). In this scenario, the target price program for rice was eliminated, leaving the non-recourse loan as the only farm program in operation.

Elimination of the target price, with no accompanying changes in other facets of the farm program, was assumed to substantially reduce incentives for farm managers to participate in the farm program. As a result, it was assumed only 50 percent of the U.S. rice producers participated in the farm program after 1985. Reduced participation resulted in fewer managers complying with the 20 percent set-aside and 5 percent paid diversion provisions of the program. Because of the lower realized price for rice, however, some farm managers were assumed to quit producing

TABLE 39. SENSITIVITY ANALYSIS FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - INCREASE IN LOAN RATE PREMIUM FOR TEXAS LONG GRAIN RICE

Analysis Variables	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	54	88	80	84
Change from Base:	+4	+6	+8	+6
Probability of Success (%):	18	60	36	60
Change from Base:	+6	+8	+16	+20
Mean NPV ($):	-180,650.	31,010.	-82,084.	9,555.
Change from Base:	+26,517.	+54,193.	+50,557.	+61,821.
Mean Ending Equity Ratio (Solvent Iterations):	0.629	0.697	0.620	0.701
Change from Base:	+0.023	+0.018	+0.024	+0.042
Mean Government Payments ($):	35,871.	56,244.	52,105.	65,497.
Change from Base:	+6,051.	+8,494.	+8,102.	+8,795.

See Table 6 for definition of the analysis variables.

TABLE 40. U.S. RICE PRICES USED FOR BASE ANALYSIS AND POLICY SCENARIOS ($/CWT)

Scenario	Year		
	1986	1987	1988
Base:	10.11	10.52	10.96
No Target Price Program:	10.21	10.66	11.10
Change from Base:	+0.10	+0.14	+0.14
No Set-Aside:	9.74	9.89	10.15
Change from Base:	-0.37	-0.63	-0.81
10% Reduction of Target Price and Loan Rate:	9.92	10.40	10.90
Change from Base:	-0.19	-0.12	-0.06
Allotment Program:	10.26	10.78	11.29
Change from Base:	+0.15	+0.26	+0.33
Free Market:	9.21	9.30	10.34
Change from Base:	-0.90	-1.22	-0.62

Note: 1984 and 1985 rice prices were the same in these scenarios as in the base analysis.

rice. The total acreage taken out of production was assumed to be equal to 75 percent of the set-aside acreage held by those participating in the program. This acreage voluntarily taken out of production represented 9.4 percent (i.e., $0.5 \times 0.25 \times 0.75$) of all base rice acreage. National farm prices generated under the scenario, as well as prices used in the base and subsequent policy scenarios, are presented in Table 40. This and all subsequent policy scenarios address potential policies adopted after the 1985 crop year. The 1984 and 1985 U.S. rice prices were the same for all policy scenarios.

With the elimination of the target price program, the Grant, Beach, and Lin (1984) model predicted rice prices would change very little from the base scenario. Reduced production caused by lower expected rice price more or less offset the increased acreage caused by the lower farmer participation level. A long-term upward trend in price was predicted, however, as carryover stocks level off between 1986-88. The expected results of eliminating the target price program, then, are slightly higher farm prices, a large reduction in government payments to farmers (with no deficiency payments), and stabilization in production and stock levels.

The representative farm in RICESIM was assumed to participate in the farm program because of the loan program and paid diversion. Results for the four strategies are found in Table 41. Elimination of the target price program had a significantly negative impact on the representative farm. Probability of survival fell 20 percentage points below base levels for three of four strategies, with none of the strategies offering more than a 62 percent probability of survival. Probability of success and average after-tax NPV also fell by substantial amounts, particularly the 1/7 share strategies. One item of interest was the larger negative effect of the target price elimination on the SSR 1/7 strategy versus the SR 1/7 strategy, a surprising result since the SR 1/7 strategy received more

income from the government than the SSR 1/7 strategy. On a per acre basis, however, the SR 1/7 sometimes received less government payments, because of the payment limitation. From the results, one can conclude that elimination of the target price program would hurt farm managers of the type modelled by the representative farm. The large amounts of carryover stocks by the end of 1985 prevented prices from rising enough to offset the loss of government payments.

Eliminating Set-Aside

One extreme possibility in new policy formulation involves the elimination of a set-aside requirement for government program participation eligibility. Advocates of this policy alternative support it on the basis of its "maximum income protection" for producers. The potential budget exposure to the federal government is large, however, especially when likelihood of expanding carryover stocks as a result of no production cutbacks is incorporated into the analysis.

If the set-aside requirement was eliminated, the Grant, Beach, and Lin (1984) model predicted rice prices would fall below the base scenario levels by $0.37/cwt in 1986, $0.63/cwt in 1987, and $0.81/cwt in 1988. The increasingly wide differential between prices under this scenario and base level prices was the result of continued rice overproduction. Public and private carryovers were predicted to increase over time, exceeding 60 million hundredweight in 1988. The increasing size of carryover stocks indicates overproduction would become a more severe problem, depressing price and increasing government deficiency payment and storage costs. Net government payments may decrease, however, as the elimination of diversion payments is greater than the increase in deficiency payments.

RICESIM results for the representative farm are given in Table 42. Eliminating set-aside generated

TABLE 41. SENSITIVITY ANALYSIS FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - ELIMINATION OF TARGET PRICE PROGRAM AFTER 1985

Analysis Variables	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	38	62	52	58
Change from Base:	-12	-20	-20	-20
Probability of Success (%):	8	34	10	28
Change from Base:	-4	-18	-10	-12
Mean NPV ($):	-255,684.	-125,940.	-217,366.	-146,027.
Change from Base:	-48,517.	-102,757.	-84,725.	-93,761.
Mean Ending Equity Ratio (Solvent Iterations):	0.565	0.650	0.556	0.637
Change from Base:	-0.041	-0.029	-0.040	-0.022

See Table 6 for definition of the analysis variables.

different results for the representative farm, depending on the particular strategy followed by the manager. The 1/2 share strategies largely gained because of the policy change, with after-tax NPV values rising nearly $15,000 for both strategies. The 1/7 share strategies were worse off as a result of the set-aside elimination. The SR 1/7 strategy, in particular, realized a drop in after-tax NPV of almost $75,000 and a 24 percentage point decline in probability of survival.

Several factors were responsible for the varied results of this scenario. An increase in government deficiency payments largely offset the effect of lower rice prices for most strategies. The major exception was the SR 1/7 strategy, which sometimes reached the payment limitation in the base analysis. When prices fell, the payment limitation was more of a factor, resulting in a decrease in per acre revenues for rice. The payment limitation also had an effect on the SSR 1/7 strategy, but of equal importance was the loss of the paid diversion acreage. This loss was the major reason for the decline in average government payments to the representative farm. For the 1/2 share strategies the payment limitation was no problem, resulting in

the farm manager receiving the same per hundredweight price for rice as in the base scenario. In addition, acreage brought back into production increased total returns to the farm manager, sufficient in the case of the SSR 1/2 strategy to increase the probability of survival.

In summary, elimination of the set-aside requirement for participation in the farm program was beneficial if the farm manager was seldom reaching the payment limitation. When the payment limitation was a factor in limiting deficiency payments, elimination of the set-aside hurt the farm operation. Since the target price program and payment limitation policy is designed to help smaller farm operations while minimizing government costs, one can conclude that small farm managers would be against the set-aside requirement, while farmers with large operations would favor the requirement. From the government's perspective, eliminating the acreage diversion payments would more than offset increased deficiency payments, with an expected net reduction in government payments. Overproduction of rice would become more a problem, however, with the increase in rice acreage.

Analysis Variables	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	52	72	70	54
Change from Base:	+2	-10	-2	-24
Probability of Success (%):	14	50	24	32
Change from Base:	+2	-2	+4	-8
Mean NPV ($):	-192,770.	-63,110.	-116,966.	-127,060.
Change from Base:	+14,397.	-39,927.	+15,675.	-74,797.
Mean Ending Equity Ratio (Solvent Iterations):	0.603	0.673	0.610	0.663
Change from Base:	-0.012	-0.006	-0.014	+0.004
Mean Government Payments ($):	28,155.	45,947.	42,103.	56,168.
Change from Base:	-1,665.	-1,803.	-1,900.	-534.

See Table 6 for definition of the analysis variables.

TABLE 43. SENSITIVITY ANALYSIS FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - 10% REDUCTION IN TARGET PRICE AND LOAN RATE

Analysis Variables	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	44	78	68	70
Change from Base:	-6	-4	-4	-8
Probability of Success (%):	12	44	18	38
Change from Base:	0	-8	-2	-2
Mean NPV ($):	-228,784.	-63,098.	-158,000.	-84,173.
Change from Base:	-21,617.	-39,915.	-25,359.	-31,907.
Mean Ending Equity Ratio (Solvent Iterations):	0.595	0.663	0.599	0.666
Change from Base:	-0.011	-0.016	+0.003	+0.007
Mean Yearly Government Payments ($):	27,481.	42,937.	39,723.	52,586.
Change from Base:	-2,339.	-4,813.	-4,280.	-4,116.

See Table 6 for definition of the analysis variables.

Reduction of Target Price and Loan Rate

An alternative to eliminating the target price program would be to reduce target prices and loan rates. Implementation of this policy could have several advantages. First, reduction of the target price would reduce some of the incentive to overproduce that is currently plaguing most crops covered in the farm program. Second, reduction of the loan would reduce the probability of farmers forfeiting their crops in the CCC loan to the government, since the lower loan would increase the probability of world market clearing price being above the loan. Lower CCC stocks would reduce government costs associated with storage of these stocks. Third, reduction of the loan and target would also reduce government exposure to deficiency payment obligations, thereby reducing farm program costs.

In this scenario, it was assumed the federal government chose to reduce the loan rate by 10 percent ($0.80/cwt) in 1986, holding the rate at that level through 1988. The $3.90/cwt maximum deficiency payment limitation was not changed, causing target price in 1986-88 to also fall by $0.80 to $10.71/cwt. The set-aside and paid diversion portions of the program were assumed not to change, as was farmer participation rate.

The Grant, Beach, and Lin (1984) model projected government carryovers would be reduced under the new policy, with 1988 carryover 10 percent below the base level. Public carryovers were also reduced about 9 percent from the 1988 base, largely because of a 3.5 percent reduction in U.S. rice production. Production fell because of the target price reduction. Despite the favorable effects of reduced production and lower carryover, farm price fell below base levels by 6 to 19 ¢/cwt in 1986-88. The loan rate reduction was primarily responsible for the lower prices, the loan acting as a floor for domestic rice prices. A 10 percent decline in the floor price caused farm price to fall by 2 percent or less primarily because of the positive price effects

of lower production.

RICESIM results for the four strategies examined under this scenario are in Table 43. The change in policy had a moderate impact on most analysis variables. Probabilities of survival fell by as much as 8 percentage points below base results for the four strategies analyzed. Average ending equity ratios for solvent iterations changed little, suggesting the policy only hurt the farm operation when it was already in a weak position. Government payments and mean after-tax NPV also declined, but the change suggests the new policy would not have nearly the adverse effect on the farm operation as would other policies examined in this study.

Three factors were responsible for this result. The target prices and loan rates assumed in the base, combined with rising mean rice prices over time, resulted in the farm manager being less dependent on income supports during the last 3 years of the 5-year study period. Changing the program for the last 3 years, then, had less impact on the manager than it would have had if the policy change occurred in 1984. Secondly, in some of the base scenario iterations, the farm manager was constrained by the payment limitation from obtaining all the deficiency payment he/she had qualified for. Reducing the loan rate and target price by 10 percent, therefore, did not cause a 10 percent reduction in the deficiency payments received by the farm manager. Third, the deficiency payment rate was maintained so the level of income was largely unchanged. The effect of the new farm policy, therefore, was moderate.

Allotment Program

Until 1974, a combined acreage allotment and marketing quota were used to stabilize rice prices at high levels. Many managers who farmed both during the era of market controls and since 1974, when a freer market has prevailed, have expressed support for a return to production controls. Supporters believe market controls would

TABLE 44. SENSITIVITY ANALYSIS FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - IMPLEMENTATION OF ACREAGE ALLOTMENT PROGRAM

Analysis Variables	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	26	56	38	54
Change from Base:	-24	-26	-34	-24
Probability of Success (%):	6	20	10	20
Change from Base:	-6	-32	-10	-20
Mean NPV ($):	-304,963.	-170,183.	-260,408.	-194,111.
Change from Base:	-97,796.	-147,000.	-127,767.	-141,845.
Mean Ending Equity Ratio (Solvent Iterations):	0.557	0.639	0.577	0.603
Change from Base:	-0.049	-0.040	-0.019	-0.056
Mean Yearly Government Payments ($):	25,577.	37,156.	35,094.	48,375.
Change from Base:	-4,243.	-10,594.	-8,909.	-8,327.

See Table 6 for definition of the analysis variables.

eliminate many of the overproduction problems plaguing the rice industry, reduce price uncertainty, increase expected price, and reduce government expenditures.

In this scenario, an acreage allotment program for rice was adopted after 1985. All farm managers were required to participate in the program and to set-aside 35 percent of base acreage. The acreage set-aside allowed planting to other crops. The allotment was assumed to reduce price variability to pre-1974 levels, i.e., 21 percent of base variance levels (Grant et al. 1984).

Based on results from the Grant, Beach, and Lin (1984) model, implementing an allotment on rice acreage did have some moderately positive effects. Production was reduced by 6 percent from 1988 base levels and carryover in 1988 was 3 percent below base levels. The small decline in production had some effect on prices, causing prices to rise by $0.15/cwt, $0.26/cwt, and $0.33/cwt above 1986, 1987, and 1988 base levels, respectively.

RICESIM results for the representative farm are given in Table 44.

The effect of the allotment on the representative farm was strongly negative. Probabilities of survival fell by 24 to 34 percentage points below base levels. Average after-tax NPV fell by $100,000 or more for all strategies. Government payments fell by about 15 percent, a large change considering the figure includes government payments during 2 years when the allotment program was not in effect.

Again, several factors are responsible for this result. The allotment program offered only modest increases in expected rice price. The farm manager gave up the paid acreage diversion program, however, when the allotment program was adopted. Although soybeans were planted on the formerly diverted acreage, returns were lower and more variable than those associated with the paid diversion program. More importantly, reducing rice price variance had a negative impact on the farm operation. In the base analysis, the high rice price variance made possible the occasional observation prices above the target price. The loan and target price programs pro-

TABLE 45. SENSITIVITY ANALYSIS FOR LIBERTY COUNTY RICE AND SOYBEAN FARM - RETURN TO FREE MARKET AFTER 1985

Analysis Variables	SSR 1/2	SSR 1/7	SR 1/2	SR 1/7
Probability of Survival (%):	22	42	34	26
Change from Base:	-28	-40	-38	-52
Probability of Success (%):	4	12	4	8
Change from Base:	-8	-40	-16	-32
Mean NPV ($):	-310,945.	-255,036.	-304,785.	-362,022.
Change from Base:	-103,778.	-231,853.	-172,144.	-309,756.
Mean Ending Equity Ratio (Solvent Iterations):	0.568	0.595	0.525	0.573
Change from Base:	-0.038	-0.084	-0.071	-0.086
Mean Ending Equity Ratio (All Iterations):	0.239	0.285	0.238	0.106
Change from Base:	-0.142	-0.301	-0.235	-0.449

See Table 6 for definition of the analysis variables.

vided price and income protection from low prices in the base analysis. When variance was reduced, the probability of observing a price above the target level was reduced to near zero. Without the occasional higher prices to provide an occasional boost to the farm's financial situation, the farm was worse off than in the base scenario. The allotment program, then, does provide a beginning for solving many macro level problems with rice farm policy, but it does so at considerable cost to the farm manager examined in this analysis.

Return to Free Market

Another alternative advocated by some in agriculture is a market-oriented farm policy. At the extreme, this type of a policy could be implemented by completely eliminating farm programs, including target price, government CCC loan, and paid acreage diversion. Government would not interfere in any way with the marketplace, allowing world supply and demand situations to determine the market price. A free market policy would be a substantial departure from

past policy for rice, the crop having been subject to an allotment program or target price program since 1954 (Holder and Grant 1979).

In this scenario, the free market policy after 1985 was adopted for rice only; the loan provisions of the soybean program were in place to examine the effect of the new rice policy. Because the Grant, Beach, and Lin (1984) model was developed using data from a non-free market period, its limitation in this scenario should be recognized. The structural relationships could be altered should agriculture take on a free market orientation for all crops. The model, however, does account for many of the non-policy influences on the rice market and so was used to predict rice prices in a free market.

Carryover stocks held by the government at the end of 1985 were projected at 24 million hundredweight. With termination of the farm program, the government was assumed to rid itself of excess stocks as rapidly as possible. As a result, rice price was projected to fall below the base scenario price by $0.90/cwt in 1986 and $1.22/cwt

in 1987. Contributing to the depressed price situation was an increase in rice acreage, caused by eliminating the set-aside requirement. By 1988, the government no longer held rice stocks and production began to fall in response to low rice prices, causing prices to rise over $1/cwt above 1987 levels. Public holdings of rice stocks increased dramatically, however, as government stocks were eliminated. By 1988, public stocks were projected at 55 million hundredweight, a level close to the 1988 stocks in the base scenario for government and private stockholders.

RICESIM results for the representative farm are given in Table 45. The effect of the free market policy was a large reduction in all analysis variables. Probabilities of survival fell by as much as 52 percentage points and mean NPV by over $300,000. Probabilities that the representative farm would be solvent in 1989 ranged from only 22 percent for the SSR 1/2 strategy to 42 percent for the SSR 1/7 strategy. In general, the SSR 1/7 strategy continued to be predominant among the four strategies. The SR strategies performed more poorly, a not-too-surprising result since the free market scenario was implemented only for rice.

In summary, the move to a free market policy had an adverse negative effect in the short run on the viability and financial position of a typical rice and soybean farmer in the Upper Gulf Coast. Prices fell sharply and production was slow to react to the adverse situation. Much of the carryover stocks held in the past by the government were, in essence, shifted to the private sector. Government payments were virtually eliminated. At the micro level, the representative farm was negatively affected by the free market policy.

CONCLUSIONS AND RECOMMENDATIONS

Many conclusions and recommendations can be made from the study results. The results are limited by the examination of only one farm, rather than examination of

many different types of farms. Yet, because many scenarios were examined, insight can be gained into commercial farms currently operating in the Upper Gulf Coast area that are similar to the farm studied. As mentioned before, the absolute numbers given in the different scenarios are not as useful as the general pattern they illustrate. The conclusions and recommendations are separated into categories directed at (a) farm managers, (b) policymakers, (c) researchers, and (d) other groups.

Farm Managers

The principal objective of the study was to identify the preferred crop rotation and tenure arrangement among those currently used by Liberty County farmers. Of the two principal tenure arrangements examined, a strategy utilizing a 1/7 share arrangement was predominant in every case. The 1/2 share arrangement offered some significant benefits, including protection from high water costs, a lower risk level for the farm, and a method to sidestep the payment limitation. The price to the farmer for these benefits, nevertheless, was too high. With the large share (1/2) of the crop going to the landowner, the farmer was left with insufficient cash flow to meet farm operation needs. The results suggest that farm managers similar to the study farmer would benefit from the 1/7 share arrangement. Because benefits to the landowner are so lucrative under a 1/2 share arrangement, the farm manager may find it difficult to obtain a 1/7 share arrangement from his/her landowner. Cash rent of less that $30/A and land ownership with low debt are alternatives that may be preferred by the farmer over the 1/7 share arrangement.

Recommendations as to an optimal crop rotation are not as clear. The SR rotation is somewhat less risky than the SSR rotation, but may generate a smaller return to the farmer. Despite the higher risk level, the SSR rotation can be recommended as the preferred rotation with several qualifications attached to the recommendation:

(1) Government deficiency and diversion payments must be limited to less than $100,000 for the farmer, with more restrictive limits causing the SSR to be even more preferred, (2) red rice must be less of a problem in the SSR than SR rotation, (3) a 1/7 share land rental arrangement must be followed, and (4) soybeans must be at least as profitable as assumed in the base analysis. Of course, the presence of so many qualifications makes the choice of a rotation highly dependent on the particular farm situation. If the farm manager is required to rent land under a 1/2 share arrangement, for example, he/she would benefit by following a SR rotation.

Variable production costs were highly influential in determining the continued viability of the representative farm. A 10 percent change in variable costs was shown to have a major impact on all analysis variables. The importance to farmers of cost containment in their operations cannot be overemphasized. As an example, consider the scenario in which water costs were reduced by $26 to $40/A. Both 1/7 share strategies realized substantial benefits from this lower water cost. Yet any combined reduction in all costs of $26/A, while maintaining yield and quality factors, would generate the same results (for those using the 1/7 share strategies).

One of the best ways to reduce production costs is through adoption of new technology. The Lemont rice variety, for example, had a positive impact on the representative farm. In part, this positive impact was the result of a reduction in per unit production costs when using the new variety. The assumed rapid adoption of Lemont also was a positive factor for the farm manager. By quickly adopting Lemont (or any other new technology), he/she was able to obtain the benefits inherent with the new variety much sooner, thereby increasing profits earlier. In addition, the manager enjoyed the benefits (higher yields) before the negative effects (lower prices) had had an opportunity to occur. The Lemont

results suggest any new technology, whether it be a new crop variety, a new small business computer, or a more fuel-efficient tractor, may give the farm manager the competitive edge needed to stay in business. The results for irrigated soybeans suggest that some potentially profitable new technologies may not yet be in general use. More economic research is needed, however, to quantify the potential benefits and costs of the new technologies.

Ratoon acreage had little positive impact and sometimes had a negative effect on the representative farm. The small profit margin and high yield variability were partly responsible for the unimportance of ratoon rice. More important was the small share ratoon rice constituted of total farm income. Given current technology, Upper Gulf Coast farmers should carefully consider the decision to produce ratoon rice. Ratoon rice production is more favorable under a 1/2 crop share arrangement or when the farm manager has not reached the deficiency payment limitation.

Off-farm income is important, even to a farm operation of the size modelled in this study. This income reduces variability of cash flows to the farm manager and provides a source of cash during bad years. Off-farm income is especially important to a farmer utilizing a 1/2 crop share arrangement because cash flow is more of a problem under this tenure arrangement.

The use of leverage in financial management is sometimes referred to as a "double-edged sword." Farmers experienced the positive edge of the leverage sword in the 1970's, with large increases in asset (particularly land) values occurring almost every year. Now farmers are learning about the other side of the leverage sword. Based on results in this study, some Upper Gulf Coast farmers are going to continue to suffer because of too much debt. For farm managers in a high to intermediate debt position (i.e., those holding less than 60 percent equity in their operations) the results sound a clear signal; take on no more debt than is neces-

sary to survive. In fact, it may be better to liquidate the farm operation if debt is at intermediate to high levels, since the probability of losing remaining equity is high. For farm managers with little or no debt, however, expansion through debt financing may not be harmful in the short run and may be profitable in the long run. The farm manager who owns all his/her land free of any debt should be able to borrow 20 percent of the farm's asset value and use the money to purchase additional land without seriously risking farm insolvency.

Upper Gulf Coast farmers should participate in the government program as much as possible. To refrain from participating is the equivalent of financial suicide. Several farm program alternatives suggested for the 1985 farm bill were analyzed. All the alternatives examined left the farm manager worse off than continuing the current program through 1988. Of the alternative programs suggested, the least detrimental program to the representative farm was the 10 percent reduction in target price and loan rate.

Policy Makers

The farm debt problem has become a much discussed topic among government policy makers. The results from the study offer several insights into the proposals that may be enacted by the government. First, any proposed debt relief program should be targeted to those in need. Farm managers in a low debt position simply do not need financial assistance from the government. Second, if the macroeconomic scenario assumed in the study becomes a reality, nothing short of a massive buy down of debt or large increases in capital gain rates on land will save farm managers in a high debt situation from insolvency. Any debt buydown program will be extremely expensive to taxpayers. Third, because declines in land value are partly responsible for the current debt crisis, policies aimed at halting or reversing this decline may prove as effective as current proposals in dealing with the debt

crisis. As demonstrated in the scenario reenacting 1978-81 macroeconomic policy, increases in asset values and improved prices may more than compensate for the negative effects of inflation. An inflationary policy may well be the best debt relief program the federal government could devise.

A continuation of the current rice farm policy was predicted to cause increases in stocks held by private individuals and by the government. In addition, an extension of the current program would likely continue to be very expensive to taxpayers. By contrast, all proposed alternatives for rice farm policy left the representative farm manager worse off, but generated some positive benefits for society as a whole. Elimination of the target price program, reduction of the target price and loan rate levels, an allotment program, and return to a free market all reduced accumulation of CCC stocks and government payments.

The decline in exports and high interest rates has caused farmers to become more dependent than ever on government farm programs. The President, Secretary of Agriculture, and many members of Congress are advocating return to a free market situation in agriculture (USDA 1985; Stenholm 1985; Helms 1985). Given this scenario, a reasonable alternative could be to hold changes in target price and loan rates to something less than 100 percent of changes in costs. If costs of production increased 5 percent in 1 year, for example, target price and loan rate could increase by 90 percent of that amount, or 4.5 percent. By use of such a mechanism, government programs would slowly become ineffective and agriculture would return to a free market orientation.

Research Scientists

Several of the results have important implications to agronomists. Development of new technology in agriculture is looked upon by many agronomists as making all farmers better off. This is not always true. The scenarios involving Lemont provide a case in point.

The farm manager was better off with Lemont than without it, because the negative price effects were minimized by the government farm program. Consider, though, the farmer who does not or cannot adopt Lemont. He/she is not better off and may well be worse off because of Lemont. Technology, though beneficial to society as a whole, may well be harmful to some segments of society. Physical scientists should carefully consider the benefits and costs of a potential technology before commiting resources towards its development.

When appraising the impact of a new technology, researchers should consider examining more than the expected return of the new technology. Variance and higher statistical moments may also be important. In addition, evaluations of new technology would be more useful if made in context of the situation that may result from the new technology. When a new technology is expected to reduce prices, for example, technology should be evaluated using the lower price. To do otherwise results in biased results and a recommendation of technology development that may not be justified.

The results also provide important information about the behavior of simulation models. The type of distributional form used to generate random variables has a large impact on the results. Researchers using simulation models should make every attempt to learn about past and expected future behavior of random variables. Historical data and subjective expectations of farmers and physical scientists merit careful consideration when deciding on the type of distribution utilized.

Correlation of random variables is also important in a Monte Carlo simulation analysis. As demonstrated in this study, even the use of the same correlation matrix may have a different effect on one crop rotation - tenure arrangement strategy than on another. Correlation commonly occurs between crop yields and between crop prices. Contrary to assumptions made in other studies (Skees and

Reid 1984), correlation may also occur between price and yields and so should not be automatically dismissed.

The RICESIM model performed satisfactorily in attaining the objectives of the study. A major advantage in using RICESIM was the freedom allowed in parameterization of the model. Few assumptions made in the study were imposed within the framework of RICESIM. In addition, underlying reason or cause for the results was almost always discernable, although at times the results were initially counterintuitive.

RICESIM is a complex simulation model. Because of its complexity and large data requirements, errors were identified in both the data set and the model itself. Solutions for the base scenario, for example, were obtained perhaps a dozen times. Sensitivity analyses were very helpful in identifying errors. In addition, the sensitivity analyses provided additional insights into the base and other scenarios. For these reasons, researchers using RICESIM should undertake some sensitivity analyses before accepting and publishing results.

Despite the satisfactory use of RICESIM in the study, several improvements could be made in the model and data set used for analysis. Correlation of random variables using farm level data would be more appropriate than using county data, as was used in this study. Also correlating variables between years would more fully account for interaction that may occur in the real world. Price, and perhaps yield, distributions should widen over time (i.e., variance should increase), reflecting the greater uncertainty one faces when attempting to predict what these parameters will be in the future.

Other Groups

The financial results provide several items of interest to lending institutions. A lender's credit policy has a significant impact on survivability of some farm operations. Most farm operations, however, will survive or fail regardless of the credit policy imposed by a financial institution. A credit policy leverage ratio of 1.0 is too restrictive for farm managers at intermediate debt levels, because it probably will prematurely force farm operations into insolvency. A credit policy of 4.0, on the other hand, is probably too lax because it allows farm managers in a high debt position to continue farming, even though there is little chance they can achieve an acceptable equity position. The 2.0 leverage ratio appears to offer lenders a reasonable credit policy alternative; liquidating farm operations with little hope of recovery but permitting sufficient credit to allow recovery from bad years. The results indicate that farming in the Upper Gulf Coast region can be profitable in certain situations. Despite recent events in the agriculture economy, lenders should not categorically refuse credit to all farmers. An above-average farm manager who maintains a low debt level on his farm operation will survive in agriculture.

Landowners should take note of the crop rotation being followed by the farm manager. When farming under a crop-share tenure arrangement, the farm manager's choice of a crop rotation may or may not be in the best interest of the landowner. Landowners should be aware of production costs and attempt to contain cost increases where possible, but still allow the farm manager to operate in a profit-maximizing manner. Marten (1985) suggests farm managers renegotiate cash leases down as a means of "thriving" in the current year. Results in this study suggest the need to renegotiate crop share leases may also be necessary to reflect the current high cost-low return farming situation. The 1/2 crop share arrangement, in particular, appears to give the landowner a higher return than is justified under current conditions. As an alternative, a 40 percent crop share (and cost share) arrangement may be more appropriate and will improve the probability of the farm manager surviving the next 5 years.

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APPENDICES
Appendix A

Stochastic dominance allows uncertain prospects to be ordered, providing a set of rules are satisfied. Three major stochastic dominance approaches are used in this study. These approaches are (1) first degree stochastic dominance (FSD), (2) second degree stochastic dominance (SSD), and (3) stochastic dominance with respect to a function (SDRF).

Assume two different cumulative density functions, F and G.

According to Hadar and Russell (1969), FSD exists between the two distributions if and only if

$$G(x_i) \leq F(x_i) \text{ for all } x_i \in X.$$

That is, at each probability level, a corresponding value in the F distribution is greater than the value at the same probability level in the G distribution. An example can be found in Figure 3 where FSD exists between the SSR 1/7 strategy and the SSR 1/2 strategy. At every level

of probability, the SSR 1/7 strategy offers a higher NPV of returns than does the SSR 1/2 strategy, i.e., the cumulative distribution of the first strategy lies completely to the right of the latter strategy. All rational decisionmakers would choose the SSR 1/7 strategy over the SR 1/7 strategy. The SSR 1/7 strategy dominates the SSR 1/2 strategy in the first degree.

SSD exists between F and G if and only if

$$\int_{-\infty}^{X_1} [G(x) - F(x)]\, dx \geqslant 0.$$
for all $X_i \in X$

That is, the cumulative area between F and G must be positive. An example of SSD can be found in Figure 7, between the SSR 1/2 strategy and the SR 1/2 strategy. The SR 1/2 strategy almost dominates the SSR 1/2 strategy under FSD criteria, but does not because the two distributions cross. Under SSD, however, the SR 1/2 strategy is preferred, since the cumulative area between the two is positive for this strategy. SSD implicitly assumes individual aversion to risk, meaning that risk averse decisionmakers would choose the strategy that is preferred in the second degree. A FSD strategy also dominates in the second degree, since the SSD criteria are met by any function that is also dominated in the first degree.

Stochastic dominance with respect to a function is a technique developed by Meyer (1977a). Though similar to SSD, SDRF differs in that the distributions are ordered based on the expected utility or satisfaction derived from each observation. Each monetary value is transformed into its equivalent utility value using an utility function. The utility function assumed in the study is of the form

$$U(x) = -e^{-rx}$$

where r is the level of aversion to risk assumed for the decisionmaker. As r increases, the decisionmaker becomes more averse to risk, giving more utility to minimizing losses rather than maximizing gains. An r equal to zero indicates risk neutrality, meaning the decisionmaker does not consider risk when deciding which strategy to follow. A negative r

value indicates the decisionmaker is a risk taker. The r values used in this study ranged from $-.0001$ (strongly risk taking) to $+.0001$ (strongly risk averse). Under SDRF, distribution F is preferred to distribution G if and only if

$$\int_{r_2}^{r_1} [G(x) - F(x)]\, u'(x) dx \geqslant 0.$$

subject to the constraint

$$r_1 \leqslant r \leqslant r_2$$

where $u'(x)$ is the derivative of the utility function and r_1 and r_2 constitute the range over which the equation holds. The greater the difference between r_1 and r_2 the more general the recommendation of distributional preference can be made. For example, when r_1 and r_2 are $-\infty$ and ∞ respectively, the equation criteria is equivalent to FSD. When r_1 and r_2 are 0 and ∞, respectively, SSD is approximated.

Appendix B.
Data Sets and Base Results

F L I P S I M   V

A GENERAL FIRM LEVEL POLICY SIMULATION MODEL

DEVELOPED AND IMPLEMENTED BY

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SUMMARY OF PROGRAM OPTIONS SELECTED BY THE USER
     RESULTS FROM SSR ROTATION, LIBERTY COUNTY.   FINAL ANALYSES.
     MULTIVARIATE EMPIRICAL DISTRIBUTIONS USED FOR PRICES
     AND YIELDS.   WHOLLY LEASED FARM ACREAGE, 50% LONG TERM AND 40%
     INTERMEDIATE DEBT.   SUPERIOR MANAGEMENT.   CROP INSURANCE, 50 G PAYMENT LIMIT.
     1/7 CROP SHARE ON SOYBEANS, 1/2 ON RICE.   STOCHASTIC RUN, 5 YRS, 50 ITERATIONS.

SIMULATE THE REPRESENTATIVE FARM FOR 5 YEARS
FIRST YEAR TO BE SIMULATED IS 1984.
THE SIMULATION WILL BE DETERMINISTIC
PRINT ALL INPUT DATA AND ALL OUTPUT TABLES
THE REPRESENTATIVE FARM HAS 4 CROPS AND 0 LIVESTOCK ENTERPRISES
PAYOFF OUTSTANDING LOANS USING SURPLUS CASH
NO SPECIAL FINANCIAL BAILOUT PROGRAM IS IN EFFECT
ADJUST INCOME TAX SCHEDULE AFTER 1984 FOR CHANGES IN THE CPI
FIXED PORTION OF CROPS SOLD IN T AND CCC LOAN USED FOR THE REMAINDER
NO MAXIMUM ON ANNUAL INTEREST DEDUCTIONS IS IN PLACE
THE CROP MIX WILL BE CONSTANT OVER TIME
DEPRECIATION ON OLD MACHINERY WILL BE CALCULATED BY THE DECLINING BALANCE METHOD
USE THE FEDERAL INCOME TAX PROVISIONS FOR 1982
MACHINERY PURCHASED AFTER 1980 WILL BE RECOVERED USING AN ACCELERATED SCHEDULE
THE USER HAS ELECTED TO REDUCE BASIS FOR INVESTMENT TAX CREDIT
THE FARM HAS ELECTED NOT TO TAKE FIRST YEAR EXPENSING ON PURCHASES OF MACHINERY
THERE ARE 37 PIECES OF OWNED FARM MACHINERY TO BE DEPRECIATED
OLD FARM MACHINERY WILL BE TRADED IN RATHER THAN BE SOLD
USER HAS SPECIFIED THE FAMILY CONSUMPTION FUNCTION FOR REGION   6
THE FARM MAY NOT SELL CROPLAND TO AVOID INSOLVENCY
CROPLAND WILL BE LEASED USING A CROP SHARE SCHEME SPECIFIED BY THE USER
ANNUAL INFLATION RATES FOR FARMLAND ARE PROVIDED BY THE USER
THE FARM WILL NOT BE ALLOWED TO GROW OVER TIME
INFORMATION FOR   0 ALTERNATIVE FARMS IS PROVIDED BY THE USER
AN UNLIMITED NONRECOURSE LOAN (PRICE SUPPORT PROGRAM WILL BE IN EFFECT
DO NOT PAY INTEREST ON NONREDEEMED NONRECOURSE CCC LOANS
LOAN RATES ARE FIXED BY THE ANALYST IN ALL YEARS
INTEREST ON FOR LOANS WILL BE CHARGED ANNUALLY FOR 1 YEARS
A TARGET PRICE PROGRAM WILL BE IN EFFECT AND TARGET PRICES ARE FIXED
AN ALL-RISK CROP INSURANCE PROGRAM IS IN EFFECT
A MANDATORY SET-ASIDE OR VOLUNTARY DIVERSION PROGRAM WILL BE IN EFFECT
PAYMENT LIMITATIONS ARE IN EFFECT FOR DEFICIENCY PAYMENTS, DIVERSION PAYMENTS & DISASTER PAYMENTS
ALL FARMS ARE ELIGIBLE FOR ALL FARM PROGRAM BENEFITS

RESULTS FROM SSR ROTATION, LIBERTY COUNTY. FINAL ANALYSES.
MULTIVARIATE EMPIRICAL DISTRIBUTIONS USED FOR PRICES
AND YIELDS. WHOLLY LEASED FARM ACREAGE, 50% LONG TERM AND 40%
INTERMEDIATE DEBT. SUPERIOR MANAGEMENT. CROP INSURANCE, 50 G PAYMENT LIMIT.
1/7 CROP SHARE ON SOYBEANS, 1/2 ON RICE. STOCHASTIC RUN, 5 YRS, 50 ITERATIONS.

CROPLAND ON INITIAL FARM
```
   TOTAL CROPLAND ACRES OWNED                       10.0000
   TOTAL CROPLAND ACRES LEASED                     2300.0000
   PASTURELAND ACRES OWNED                            0.0
   PASTURELAND ACRES LEASED                           0.0
   FRACTION CROPLAND THAT IS TILLABLE                0.9500
   FRACTION CROPLAND THAT IS IRRIGATED               0.5300
```

INITIAL BALANCE SHEET FOR THE FARM
 ASSETS
```
   MARKET VALUE OF CROPLAND & FARMSTEAD            12000.0000
   MARKET VALUE OF BUILDINGS                      155000.000
      TOTAL VALUE OF OWNED CROPLAND & BUILDINGS   167000.000
   MARKET VALUE OF OFF-FARM INVESTMENTS            20000.0000
   BEGINNING CASH RESERVE                           5000.0000
   MARKET VALUE OF OWNED PASTURELAND                   0.0
   MARKET VALUE OF ALL FARM MACHINERY             585202.000
   MARKET VALUE OF ALL LIVESTOCK                       0.0
      TOTAL VALUE OF ASSETS                       757202.000
 LIABILITIES
   TOTAL REAL ESTATE DEBT                          66800.0000
   TOTAL INTERMEDIATE-TERM DEBT                   226081.000
   INCOME TAXES DUE IN YEAR 1                          0.0
   SELF EMPLOYMENT TAXES DUE IN YEAR 1                 0.0
      TOTAL DEBT                                  292881.000

      BEGINNING NET WORTH (MARKET VALUE)          464321.000
```

INITIAL FINANCIAL RATIOS FOR THE FARM
```
   EQUITY TO ASSETS RATIO                            0.6132
   DEBT TO ASSET RATIO                               0.3868
   LEVERAGE RATIO                                    0.6308

   AVERAGE PER ACRE VALUE OF CROPLAND             1200.0000
   AVERAGE PER ACRE VALUE OF PASTURELAND             0.0
```

LIABILITIES FOR INITIAL FARM
```
   REAL ESTATE DEBT                                66800.0000
   LOAN LIFE ON DEBT                                 30.0000
   FRACTION LAND LOAN REMAINING                      0.5000
   ORIGINAL AMOUNT OF THE LOAN                    133600.000
   DEBT TO ASSET RATIO                               0.4000

   INTERMEDIATE TERM DEBT                         226081.000
   LOAN LIFE ON DEBT                                 5.0000
   FRACTION LOAN REMAINING                           0.5000
   ORIGINAL AMOUNT OF THE LOAN                    452182.000
   DEBT TO ASSET RATIO                               0.4000
```

OPERATING LOAN
```
   FRACTION OF YEAR LOAN IS USED                     0.4220
```

TERMS FOR NEW LOANS
```
   NO. YEARS FOR NEW LAND LOANS                     30.0000
   NO. YEARS FOR NEW MACH LOANS                      5.0000
```

MINIMUM EQUITY RATIOS FOR SOLVENCY
```
   MINIMUM LONG TERM EQUITY                          0.3333

   MINIMUM INTERMEDIATE TERM EQUITY                 0.3333
```

INFORMATION FOR REFINANCING DEBTS
```
   CHARGE TO REFINANCE CASH FLOW DEFICITS           0.0100
   NO. YEARS FOR A LONG-TERM LOAN                   20.0000
   NO. YEARS FOR INTERM-TERM LOAN                    5.0000
```

MINIMUM DOWNPAYMENT LEVELS
```
   MINIMUM DOWNPAYMENT FOR FARM MACHINERY            0.3000
   MINIMUM DOWNPAYMENT FOR FARMLAND                  0.3000

   AFTER-TAX DISCOUNT RATE                           0.1011
   ANNUAL RATE OF RETURN TO PROD ASSETS T-1          0.0
   CAPITAL GAIN RATE FOR LAND IN T-1                 0.0400
```

CASH RESERVE FOR THE FARM
```
   MINIMUM CASH RESERVE                            5000.0000
   BEGINNING CASH RESERVE                          5000.0000
```

CAPITAL ASSETS TO BE RECOVERED (DEPRECIATED)
 BUILDINGS PLACED INTO USE PRIOR TO 1981
```
   SALVAGE VALUE                                  10500.0000
   PURCHASE PRICE                                 105000.000
   ECONOMIC (DEPRECIATION) LIFE                      30.0000
```
 REGULAR BUILDINGS PLACED INTO USE AFTER 1980
```
   PURCHASE PRICE                                    0.0
   CALENDAR YEAR PURCHASED                           0.0
```
 SPECIAL PURPOSE BUILDINGS PLACED INTO USE AFTER 1980
```
   PURCHASE PRICE                                    0.0
   CALENDAR YEAR PURCHASED                           0.0
```

FIXED COSTS
```
   PROPERTY TAX RATE ($TAX/$VALUE)                   0.003330
   TOTAL PERSONAL PROPERTY TAX                       0.0
   OTHER TAXES                                       0.0
   ACCOUNTANT & LEGAL FEES                         3000.0000
   UNALLOCATED MAINTENANCE COSTS                     0.0
   INSURANCE ON MACHINERY                          3200.0000
   MISCELLANEOUS FIXED COSTS                       5000.0000
```

LAND LEASE COSTS
```
   CASH RENT FOR CROPLAND ($/ACRE)                   0.0
   CASH RENT FOR PASTURELAND ($/ACRE)                0.0
   ANNUAL INFLATION RATE FOR
    PER ACRE CASH LEASE COST                         0.0
   CAPITALIZATION RATE BETWEEN
    LAND VALUE & CROPLAND CASH LEASE COST            0.0
```

FAMILY CONSUMPTION AND TAX INFORMATION
```
   AGE OF OPERATOR                                  45.0000
   NO. OF TAX EXEMPTIONS CLAIMED                     5.0000
   MARGINAL TAX RATE FOR STATE                       0.0
   RATIO OF PERSONAL DEDUC TO NET INCOME             0.2000
   DESIRED TAXABLE INCOME                            0.0

   AVERAGE ANNUAL OFF-FARM INCOME                    0.0
   NON-TAXABLE OFF-FARM INCOME                    16000.0000

   ANNUAL RETURN ON OFF-FARM INVEST                  0.1100

   MINIMUM FAMILY LIVING EXPENSES                 18000.0000
   MAXIMUM FAMILY LIVING EXPENSES                 25000.0000
```

   USER'S SPECIFIED CONSUMPTION FUNCTION USED IF THE OPTION IS ELECTED

03

```
INCOME TAX PAYMENT DUE IN YEAR 1                     0.0
SELF-EMPLOYMENT TAX PAYMENT DUE IN YEAR 1            0.0
TAXABLE INCOME IN YEAR T-3                           0.0
TAXABLE INCOME IN YEAR T-2                           0.0
TAXABLE INCOME IN YEAR T-1                           0.0

MAXIMUM INTEREST DEDUCTION IF OPTION IS USED         0.0

RISK AVERSION COEFFICIENT                            0.0
```

HIRED FARM LABOR
  NO. OF FULL TIME EMPLOYEES   2.0000
  ANNUAL GROSS SALARY FOR FULL-TIME EMPLOYEE   13800.0000
  HOURLY WAGE RATE FOR PART-TIME LABOR   3.3500

ANNUAL INTEREST RATES

	1984	1985	1986	1987	1988					
OLD LONG-TERM LOANS	0.1175	0.1175	0.1175	0.1175	0.1175	0.0	0.0	0.0	0.0	0.0
OLD INTERMEDIATE-TERM LOANS	0.1500	0.1500	0.1500	0.1500	0.1500	0.0	0.0	0.0	0.0	0.0
NEW LONG-TERM LOANS	0.1310	0.1170	0.1090	0.1050	0.1050	0.0	0.0	0.0	0.0	0.0
NEW INTERMEDIATE-TERM LOANS	0.1480	0.1490	0.1410	0.1370	0.1370	0.0	0.0	0.0	0.0	0.0
REFINANCE LONG-TERM LOANS	0.1310	0.1170	0.1090	0.1050	0.1050	0.0	0.0	0.0	0.0	0.0
REFINANCE INTERM-TERM LOANS	0.1480	0.1490	0.1410	0.1370	0.1370	0.0	0.0	0.0	0.0	0.0
OPERATING LOANS	0.1520	0.1540	0.1560	0.1420	0.1420	0.0	0.0	0.0	0.0	0.0
RECEIVED FOR CASH RESERVES	0.1180	0.1193	0.1110	0.1070	0.1070	0.0	0.0	0.0	0.0	0.0

ANNUAL PERCENTAGE CHANGES IN SELECTED COSTS

NEW FARM MACHINERY	0.0	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
USED FARM MACHINERY	0.0	0.0	0.0	0.0100	0.0100	0.0	0.0	0.0	0.0	0.0
FIXED COST, INS & TAX	0.0540	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
SEED COSTS	0.0939	0.0313	-0.0640	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
FERTILIZER & LIME	0.0674	0.0727	0.0570	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
CHEMICAL COSTS	0.0720	0.0810	0.0605	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
FUEL & LUBE COSTS	0.0540	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
REPAIRS ON MACHINERY	0.0540	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
OTHER PROD COST	0.0064	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
CUSTOM COSTS	0.0540	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
HIRED LABOR COSTS	0.0540	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
OFF-FARM INVESTMENT	0.1180	0.1190	0.1110	0.1070	0.1070	0.0	0.0	0.0	0.0	0.0
PURCHASED INPUTS FOR LIVEST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FARMLAND VALUES	0.0710	0.0710	0.0710	0.0710	0.0710	0.0	0.0	0.0	0.0	0.0
BUILDING VALUES	-0.0200	-0.0200	-0.0200	-0.0200	-0.0200	0.0	0.0	0.0	0.0	0.0
OFF-FARM STORAGE COSTS	0.0	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0

OTHER ANNUAL DATA FOR THE FARM   05

	1984	1985	1986	1987	1988					
NEW CAPITAL INVESTED IN FAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CONSUMER PRICE INDEX	310.60	323.90	339.00	356.20	374.00	0.0	0.0	0.0	0.0	0.0
OTHER FARM INCOME	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SELF EMPLOYMENT TAX RATE	0.140	0.141	0.143	0.143	0.150	0.0	0.0	0.0	0.0	0.0

MAXIMUM INCOME SUBJUCT TO

SELF EMPLOYMENT TAX	37209.00	38803.00	40612.00	42672.00	44805.00	0.0	0.0	0.0	0.0	0.0

SUMMARY OF THE OWNED MACHINERY COMPLEMENT

	YEAR PURCHASED	CURRENT MARKET VALUE	ORIGINAL PURCHASE PRICE	ESTIMATED SALVAGE VALUE	DEPRECI-ATION LIFE	ECONOMIC LIFE	ACCUM. RECOVERY (DEPREC.)	MACHINERY REPLACEMENT CODE	CURRENT REPLACE. COST	COST RECOVERY PERIOD OR CLASS
TRACTOR156HP	1980.0	33474.0	39798.0	3980.0	7.0	7.0	30479.5	0.0	61700.0	5.0
TRACTOR156HP	1979.0	31769.0	33568.0	3357.0	7.0	7.0	28070.3	0.0	61700.0	5.0
TRACTOR165HP	1983.0	61700.0	61700.0	0.0	7.0	7.0	9255.0	0.0	61700.0	5.0
TRACTOR 65HP	1975.0	7717.0	10087.0	1009.0	7.0	7.0	9078.0	2.0	19900.0	5.0
TRCTR 226HP	1978.0	34945.0	52475.0	5248.0	7.0	7.0	46037.0	0.0	94800.0	5.0
TRCTR 229HP	1981.0	50897.0	74628.0	7462.8	7.0	7.0	43284.2	0.0	94800.0	5.0
COMBINE 7720	1979.0	51909.0	53886.0	5389.0	7.0	7.0	43886.7	0.0	94000.0	5.0
COMBINE 7720	1983.0	94000.0	94000.0	0.0	7.0	7.0	14100.0	0.0	94000.0	5.0
COMBINE 7720	1980.0	55882.0	61881.0	6188.0	7.0	7.0	45772.9	0.0	94000.0	5.0
PCKUP 1/2TON	1983.0	9000.0	9000.0	0.0	7.0	7.0	1350.0	0.0	9000.0	5.0
PCKUP 1/2TON	1978.0	3425.0	4538.0	454.0	7.0	7.0	3935.3	0.0	9000.0	5.0
PCKUP 1/2TON	1976.0	2375.0	3876.0	388.0	7.0	7.0	3488.0	2.0	9000.0	5.0
DSK 22' 9"	1982.0	7500.0	11500.0	0.0	7.0	7.0	4255.0	0.0	15300.0	5.0
DSK 22' 9"	1980.0	4500.0	9800.0	980.0	7.0	7.0	7249.0	0.0	15300.0	5.0
DSK 24' 4"	1981.0	5000.0	11500.0	0.0	7.0	7.0	6670.0	0.0	19300.0	5.0
DSK 24' 4"	1978.0	3500.0	9200.0	920.0	7.0	7.0	7978.1	0.0	19300.0	5.0
ROLL CULT	1982.0	2000.0	4200.0	0.0	7.0	7.0	1554.0	0.0	5200.0	5.0
ROLL CULT	1979.0	1500.0	3900.0	390.0	7.0	7.0	3174.9	0.0	5200.0	5.0
BN PLANT 8'	1976.0	4500.0	4371.0	437.0	7.0	7.0	3934.0	0.0	10250.0	5.0
BN PLANT 8'	1982.0	4500.0	7000.0	0.0	7.0	7.0	2590.0	0.0	10250.0	5.0
GRAIN CART	1981.0	3500.0	4718.0	0.0	7.0	7.0	2736.4	2.0	6800.0	5.0
GRAIN CART	1975.0	2000.0	1320.0	132.0	7.0	7.0	1188.0	2.0	6800.0	5.0
LD PL 16X60	1978.0	7376.0	7600.0	760.0	7.0	7.0	6590.6	0.0	17500.0	5.0
LD PL 16X60	1977.0	3000.0	8000.0	800.0	7.0	7.0	7200.0	0.0	17500.0	5.0
LEVEE BOXES	1982.0	6000.0	7500.0	0.0	7.0	7.0	2775.0	0.0	11250.0	5.0
LEVEE PLOW	1981.0	1547.0	1563.0	0.0	7.0	7.0	906.5	2.0	2800.0	5.0
LEVEE PUSH	1981.0	700.0	2100.0	0.0	7.0	7.0	1218.0	2.0	2500.0	5.0
LEVEE ROLLER	1978.0	350.0	350.0	35.0	7.0	7.0	303.5	2.0	650.0	5.0
FLD CUL 31'	1982.0	5500.0	7900.0	0.0	7.0	7.0	2923.0	0.0	9800.0	5.0
FLD CUL 31'	1981.0	4500.0	7100.0	0.0	7.0	7.0	4118.0	0.0	9800.0	5.0
FLD CUL 25	1978.0	2500.0	5800.0	580.0	7.0	7.0	5029.7	0.0	9800.0	5.0
BEDDER 8 ROW	1976.0	1036.0	1100.0	110.0	7.0	7.0	990.0	0.0	5400.0	5.0
BEDDER 8 ROW	1979.0	1500.0	3500.0	350.0	7.0	7.0	2849.2	0.0	5400.0	5.0
PIPE HARROW	1979.0	1000.0	1020.0	102.0	7.0	7.0	830.3	0.0	2100.0	5.0
PIPE HARROW	1980.0	1100.0	1600.0	160.0	7.0	7.0	1183.5	0.0	2100.0	5.0
DU-ALL	1978.0	3500.0	8600.0	860.0	7.0	7.0	7457.8	0.0	11500.0	5.0
MISC TRUCKS	1977.0	50000.0	80000.0	8000.0	7.0	0.0	52031.4	2.0	80000.0	5.0

SUMMARY OF CROP ENTERPRISE COSTS

	SEED	FERT-LIME	CHEMICALS	FUEL-LUBE	REPAIRS	OTHER	HARVEST COST $/YIELD UNIT
			--$/ACRE--				
1ST SOYBEANS	9.45	14.36	45.45	12.68	6.17	9.14	0.4500
2ND SOYBEANS	9.45	14.36	45.45	12.68	6.17	9.14	0.4500
FIRST RICE	33.90	51.00	67.56	18.60	6.76	79.20	1.2300
RATOON RICE	0.0	3.38	2.50	0.0	0.0	5.75	1.2300

MONTHLY LABOR REQUIREMENTS PER ACRE, BY CROP ENTERPRISE

	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1ST SOYBEANS	0.240	0.458	0.105	0.546	1.248	0.484	0.295	0.404	0.105	0.557	0.797	0.105
2ND SOYBEANS	0.240	0.458	0.105	0.546	1.248	0.484	0.295	0.404	0.105	0.557	0.797	0.105
FIRST RICE	0.275	0.387	1.380	0.515	1.730	1.191	1.273	0.977	0.294	0.111	0.156	0.222
RATOON RICE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.101	0.068	0.688	0.0	0.0

HOURS OF UNPAID FAMILY LABOR

	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
AVAILABLE EACH MONTH	400.00	400.00	600.00	800.00	750.00	900.00	900.00	800.00	800.00	800.00	800.00	400.00

HOURS WORKED EACH MONTH BY A

	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
FULL TIME EMPLOYEE	250.00	300.00	350.00	350.00	350.00	350.00	350.00	350.00	300.00	300.00	250.00	250.00

ANNUAL MEAN OR MODAL CROP YIELDS

	1984	1985	1986	1987	1988					
1ST SOYBEANS	23.69	24.17	24.67	25.17	25.68	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	22.84	23.31	23.78	24.27	24.76	0.0	0.0	0.0	0.0	0.0
FIRST RICE	50.03	56.69	60.73	61.34	61.96	0.0	0.0	0.0	0.0	0.0
RATOON RICE	1.94	1.96	1.98	2.00	2.02	0.0	0.0	0.0	0.0	0.0

ANNUAL MEAN OR MODAL CROP PRICES

	1984	1985	1986	1987	1988					
1ST SOYBEANS	6.33	7.45	7.92	8.01	8.34	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	6.33	7.45	7.92	8.01	8.34	0.0	0.0	0.0	0.0	0.0
FIRST RICE	9.54	10.05	10.40	10.83	11.29	0.0	0.0	0.0	0.0	0.0
RATOON RICE	8.88	9.34	9.68	10.07	10.50	0.0	0.0	0.0	0.0	0.0

CONSTRAINTS ON THE CROPMIX

	ACRES PLANTED YEAR 1	ACRES HARVESTED YEAR1	MINIMUM FRACTION OF MIX	MAXIMUM FRACTION OF MIX	LINKAGE TO DOUBLE CROP	NORMAL FRAC. ACRES HARVESTED
1ST SOYBEANS	731.30	694.70	0.0	0.0	0.0	0.95
2ND SOYBEANS	731.30	694.70	0.0	0.0	0.0	0.95
FIRST RICE	731.40	724.10	0.0	0.0	0.0	0.99
RATOON RICE	731.40	724.10	0.0	0.0	3.00	0.99

CROP SHARE LEASING BY CROP

		LANDLORD SHARE OF RECEIPTS & COSTS						
	CROP RECEIPTS	SEED COSTS	FERT & LIME	CHEMICAL COSTS	FUEL & LUBE	MACHINERY REPAIRS	OTHER COSTS	CUSTOM WORK
1ST SOYBEANS	0.1430	0.0	0.0	0.0	0.0	0.0	0.0	0.0790
2ND SOYBEANS	0.1430	0.0	0.0	0.0	0.0	0.0	0.0	0.0790
FIRST RICE	0.5000	1.0000	0.3630	0.5000	0.0	0.0	0.8586	0.3370
RATOON RICE	0.5000	0.0	0.3630	0.5000	0.0	0.0	0.8087	0.3370

MARKETING STRATAGIES

	BEGINNING INVENTORY	FRACTION SOLD NEXT TAX YEAR	MONTH SOLD AFTER HARVEST	MONTH SOLD IN NEXT YEAR
1ST SOYBEANS	2468.800	0.300	10.000	1.000
2ND SOYBEANS	2380.000	0.300	10.000	1.000
FIRST RICE	0.0	0.0	7.000	1.000
RATOON RICE	702.400	1.000	10.000	1.000

SEASONAL PRICE INDEX

	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1ST SOYBEANS	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2ND SOYBEANS	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
FIRST RICE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
RATOON RICE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

FACTORED MATRIX FOR CROP YIELDS & PRICES   10

	1	2	3	4	5	6	7	8
CROP YIELDS								
1ST SOYBEANS	0.0	0.503	0.515	0.395	0.0	0.300	-0.418	-0.248
2ND SOYBEANS	0.0	0.503	0.515	0.395	0.0	0.300	-0.418	-0.248
FIRST RICE	0.0	0.0	0.732	0.285	0.0	0.030	0.177	-0.592
RATOON RICE	0.0	0.0	0.0	0.533	0.0	0.031	-0.101	-0.840
CROP PRICES								
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.951	-0.190	0.242
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.951	-0.190	0.242
FIRST RICE	0.0	0.0	0.0	0.0	0.0	0.0	0.492	0.871
RATOON RICE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000

CUMMULATIVE DISTRIBUTIONS OF DEVIATES ABOUT THE MEAN (OR TREND), EXPRESSED AS A FRACTION OF MEAN

	1	2	3	4	5	6	7	8	9	10
CROP YIELDS										
1ST SOYBEANS	-0.789	-0.541	-0.378	-0.258	-0.133	-0.026	0.026	0.135	0.301	0.900
2ND SOYBEANS	-0.781	-0.530	-0.388	-0.284	-0.178	-0.085	0.032	0.152	0.310	0.970
FIRST RICE	-0.365	-0.225	-0.158	-0.116	-0.070	-0.032	0.011	0.052	0.121	0.361
RATOON RICE	-0.614	-0.317	-0.196	-0.126	-0.065	-0.023	0.024	0.085	0.166	0.792
CROP PRICES										
1ST SOYBEANS	-0.274	-0.236	-0.083	-0.052	-0.031	0.038	0.048	0.067	0.226	0.268
2ND SOYBEANS	-0.274	-0.236	-0.083	-0.052	-0.031	0.038	0.048	0.067	0.226	0.268
FIRST RICE	-0.416	-0.394	-0.222	-0.067	-0.025	0.129	0.171	0.206	0.211	0.419
RATOON RICE	-0.416	-0.394	-0.222	-0.067	-0.025	0.129	0.171	0.206	0.211	0.419

COVARIANCE MATRIX OF NET INCOMES FOR CROPS

	1	2	3	4
1ST SOYBEANS	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0

	1984	1985	1986	1987	1988
CCC LOAN RATES					
1ST SOYBEANS	5.02	5.02	5.02	5.02	5.02
2ND SOYBEANS	5.02	5.02	5.02	5.02	5.02
FIRST RICE	8.63	8.63	8.63	8.63	8.63
RATOON RICE	8.03	8.03	8.03	8.03	8.03
INTEREST RATE FOR CCC LOANS	0.12	0.12	0.12	0.12	0.12
INTEREST RATE FOR FOR LOANS	0.12	0.12	0.12	0.12	0.12
OFF-FARM STORAGE COSTS FOR CROPS UNDER LOAN					
1ST SOYBEANS	0.30	0.31	0.33	0.34	0.36
2ND SOYBEANS	0.30	0.31	0.33	0.34	0.36
FIRST RICE	0.50	0.52	0.55	0.57	0.60
RATOON RICE	0.50	0.52	0.55	0.57	0.60
TARGET PRICES, IF THEY ARE NOT TIED TO LOAN RATES					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	12.53	12.53	12.53	12.53	12.53
RATOON RICE	11.93	11.93	11.93	11.93	11.93
FLEXIBLE TARGET PRICE---FRACTION OF TARGET PRICE TO LOAN RATE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
DIRECT "FOR" ENTRY PRICE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
ACTUAL YIELDS LAST 5 YEARS FOR CALCULATING FARM PROGRAM YIELDS					
1ST SOYBEANS	30.00	32.00	17.00	10.00	6.00
2ND SOYBEANS	30.00	32.00	17.00	10.00	6.00
FIRST RICE	41.86	38.83	44.45	49.61	48.32
RATOON RICE	2.12	1.65	1.68	1.92	1.94
ACTUAL LAGGED PRICES FOR 4 YEARS USED FOR FLEXIBLE LOAN RATES					
1ST SOYBEANS	0.0	0.0	0.0	0.0	
2ND SOYBEANS	0.0	0.0	0.0	0.0	
FIRST RICE	0.0	0.0	0.0	0.0	
RATOON RICE	0.0	0.0	0.0	0.0	
PROGRAM (OR BASE) ACREAGE					
1ST SOYBEANS	731.33	731.33	731.33	731.33	731.33
2ND SOYBEANS	731.33	731.33	731.33	731.33	731.33
FIRST RICE	731.33	731.33	731.33	731.33	731.33
RATOON RICE	731.33	731.33	731.33	731.33	731.33
NATIONAL ALLOCATION FACTOR					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	1.00	1.00	1.00	1.00	1.00
RATOON RICE	1.00	1.00	1.00	1.00	1.00
ACREAGE SET ASIDE, DIVERSION OR LIMITATION (FRACTION)					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.25	0.35	0.25	0.25	0.25
RATOON RICE	0.25	0.35	0.25	0.25	0.25
SLIPPAGE RATE (FRACTION)					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.20	0.20	0.20	0.20	0.20
RATOON RICE	0.20	0.20	0.20	0.20	0.20
PAYMENT RATE FOR ACREAGE DIVERSION					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	71.19	34.52	36.48	39.07
RATOON RICE	0.0	0.0	0.0	0.0	0.0
TRIGGER PRICE FOR THE "FOR"					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
CALL PRICE FOR THE "FOR"					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
LENGTH OF FARMER OWNED RESERVE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
STORAGE PAYMENT RATE FOR THE "FOR"					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
PRODUCTION GUARANTEE FOR CROP INSURANCE					
1ST SOYBEANS	13.65	13.92	14.20	14.49	14.78
2ND SOYBEANS	13.65	13.92	14.20	14.49	14.78
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
PRICE ELECTION FOR CROP INSURANCE					
1ST SOYBEANS	6.50	7.73	8.22	8.29	8.62
2ND SOYBEANS	6.50	7.73	8.22	8.29	8.62
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
PREMIUM RATE PER ACRE FOR CROP INSURANCE					
1ST SOYBEANS	9.31	11.29	12.24	12.80	13.37
2ND SOYBEANS	9.13	11.08	12.01	12.36	13.11
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
LOAN RATE FOR PEANUTS UNDER QUOTE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
LOAN RATE FOR PEANUTS NOT UNDER QUOTA					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0

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RATOON RICE   0.0   0.0   0.0   0.0   0.0

FARM"S POUNDAGE QUOTE FOR PEANUTS
  1ST SOYBEANS   0.0   0.0   0.0   0.0   0.0
  2ND SOYBEANS   0.0   0.0   0.0   0.0   0.0
  FIRST RICE   0.0   0.0   0.0   0.0   0.0
  RATOON RICE   0.0   0.0   0.0   0.0   0.0

ACREAGE ALLOTMENT FOR RICE
  1ST SOYBEANS   0.0   0.0   0.0   0.0   0.0
  2ND SOYBEANS   0.0   0.0   0.0   0.0   0.0
  FIRST RICE   0.0   0.0   0.0   0.0   0.0
  RATOON RICE   0.0   0.0   0.0   0.0   0.0

FRACTION TARGET PRICE FOR LOW YIELD PAYMENT
  1ST SOYBEANS   0.0   0.0   0.0   0.0   0.0
  2ND SOYBEANS   0.0   0.0   0.0   0.0   0.0
  FIRST RICE   0.0   0.0   0.0   0.0   0.0
  RATOON RICE   0.0   0.0   0.0   0.0   0.0

FRACTION TARGET PRICE FOR PREVENTED PLANTING PAYMENT
  1ST SOYBEANS   0.0   0.0   0.0   0.0   0.0
  2ND SOYBEANS   0.0   0.0   0.0   0.0   0.0
  FIRST RICE   0.0   0.0   0.0   0.0   0.0
  RATOON RICE   0.0   0.0   0.0   0.0   0.0

FRACTION PROVEN YIELD FOR LOW YIELD PAYMENT
  1ST SOYBEANS   0.0   0.0   0.0   0.0   0.0
  2ND SOYBEANS   0.0   0.0   0.0   0.0   0.0
  FIRST RICE   0.0   0.0   0.0   0.0   0.0
  RATOON RICE   0.0   0.0   0.0   0.0   0.0

FRACTION PROVEN YIELD FOR PREVENTED PLANTING
  1ST SOYBEANS   0.0   0.0   0.0   0.0   0.0
  2ND SOYBEANS   0.0   0.0   0.0   0.0   0.0
  FIRST RICE   0.0   0.0   0.0   0.0   0.0
  RATOON RICE   0.0   0.0   0.0   0.0   0.0

PARITY PRICE
  1ST SOYBEANS   0.0   0.0   0.0   0.0   0.0
  2ND SOYBEANS   0.0   0.0   0.0   0.0   0.0
  FIRST RICE   0.0   0.0   0.0   0.0   0.0
  RATOON RICE   0.0   0.0   0.0   0.0   0.0

FRACTION OF CROP ELIGIBLE FOR MKTG CERTIFICATE
  1ST SOYBEANS   0.0   0.0   0.0   0.0   0.0
  2ND SOYBEANS   0.0   0.0   0.0   0.0   0.0
  FIRST RICE   0.0   0.0   0.0   0.0   0.0
  RATOON RICE   0.0   0.0   0.0   0.0   0.0

PAYMENT LIMITATION FOR
 INCOME SUPPORT PAYMENTS   100000.00 100000.00 100000.00 100000.00 100000.00
 DISASTER PAYMENTS   100000.00 100000.00 100000.00 100000.00 100000.00

MAXIMUM NONRECOURSE CCC LOAN
  1ST SOYBEANS   0.0   0.0   0.0   0.0   0.0
  2ND SOYBEANS   0.0   0.0   0.0   0.0   0.0
  FIRST RICE   0.0   0.0   0.0   0.0   0.0
  RATOON RICE   0.0   0.0   0.0   0.0   0.0

PERCENT BASE PRODUCTION ELIGIBLE FOR DEFICIENCY PAYMENT
                                    0.0   0.0   0.0   0.0   0.0

MAXIMUM VALUE OF CROP ELIGIBLE FOR DEFICIENCY PAYMENT
                                    0.0   0.0   0.0   0.0   0.0

FLEXIBLE LOAN RATE FORMULAS
                    NO. OF YEARS DROP LOW DROP HIGH FRACTION OF MEAN
  1ST SOYBEANS   0.0   0.0   0.0   0.0
  2ND SOYBEANS   0.0   0.0   0.0   0.0
  FIRST RICE   0.0   0.0   0.0   0.0
  RATOON RICE   0.0   0.0   0.0   0.0
** A 1.0 INDICATES DELETING THE LOW OR HIGH

MARKETING LOAN RATES
  1ST SOYBEANS   0.0   0.0   0.0   0.0   0.0
  2ND SOYBEANS   0.0   0.0   0.0   0.0   0.0
  FIRST RICE   0.0   0.0   0.0   0.0   0.0
  RATOON RICE   0.0   0.0   0.0   0.0   0.0

MAXIMUM MKTG LOAN BASE   0.0   0.0   0.0   0.0   0.0

SCALE FARM PROGRAM BENEFITS TO FARM SIZE

   FARMS LARGER THAN   0. ACRES ARE NOT ELIGIBLE FOR ANY FARM PROGRAM

   FARMS LARGER THAN   0. ACRES ARE ONLY ELIGIBLE FOR THE CROP INSURANCE PROGRAM

   FARMS WITH CROP SALES GREATER THAN $ 0. ARE NOT ELIGIBLE FOR ANY FARM PROGRAM BENEFITS

   FARMS WITH CROP SALES GREATER THAN $ 0. ARE ONLY ELIGIBLE FOR THE CROP INSURANCE PROGRAM

HISTORY OF FCIC PARTICIPATION

   NUMBER OF YEARS IN THE PROGRAM   3.00

   NUMBER OF LOSS YEARS IN PROGRAM   2.00

   TOTAL FCIC INSURANCE PREMIUMS PAID BY FARM 32323.50

   TOTAL FCIC INDEMNITY PAYMENTS RECEIVED 111513.00

              THE END OF ALL INPUT DATA
  1   1TOTAL DEPREC & THIS YEARS DEPREC   2662.4   2662.4
MACHINE   1   7.00 33474.00 39798.00   3980.00   9318.51   4000.00   0.0   33474.00   0.0 33141.92
                 0.0   0.0   7.00 39798.00   2662.43   0.0   0.0   1980.00   5.00   0.0
              61700.00   5.00   0.0
  1   2TOTAL DEPREC & THIS YEARS DEPREC   4233.2   1570.8
MACHINE   2   7.00 31769.00 33568.00   3357.00   5497.71   4000.00   0.0   31769.00   0.0 29641.06
                 0.0   0.0   7.00 33568.00   1570.77   0.0   0.0   1979.00   6.00   0.0
              61700.00   5.00   0.0
  1   3TOTAL DEPREC & THIS YEARS DEPREC   19217.5   14984.3
MACHINE   3   7.00 61700.00 61700.00   0.0   52445.00   0.0   0.0   61700.00   0.0 24239.28
                 0.0   0.0   7.00 61700.00 14984.29   0.0   0.0   1983.00   2.00   0.0
              61700.00   5.00   0.0
  1   4TOTAL DEPREC & THIS YEARS DEPREC   19217.5   0.0
MACHINE   4   7.00   7717.00 10087.00   1009.00   1009.00   2017.40   0.0   7717.00   0.0   9078.00
                 0.0   0.0   7.00 10087.00   0.00   2.00   0.0   1975.00   10.00   0.0
              19900.00   5.00   0.0
  1   5TOTAL DEPREC & THIS YEARS DEPREC   20407.5   1190.0
MACHINE   5   7.00 34945.00 52475.00   5248.00   8437.98   4000.00   0.0   34945.00   0.0 47227.00
                 0.0   0.0   7.00 52475.00   1189.98   0.0   0.0   1978.00   7.00   0.0
              94800.00   5.00   0.0
  1   6TOTAL DEPREC & THIS YEARS DEPREC   38831.1   8955.4
MACHINE   6   7.00 50897.00 74628.00   7462.80 31343.76   0.0   0.0   50897.00   0.0 52239.60

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SUMMARY OF PROGRAM OPTIONS SELECTED BY THE USER
        RESULTS FROM SSR ROTATION, LIBERTY COUNTY. FINAL BASE SIMULATION.
        MULTIVARIATE EMPIRICAL DISTRIBUTIONS USED FOR PRICES
        AND YIELDS. WHOLLY LEASED FARM ACREAGE, 50% LONG TERM AND 40%
        INTERMEDIATE DEBT, 33% CUT OFF POINT. CROP INSURANCE, 50 G PAYMENT LIMIT.
        1/7 CROP SHARE ON SOYBEANS AND RICE. STOCHASTIC RUN, 50 ITERATIONS.

SIMULATE THE REPRESENTATIVE FARM FOR 5 YEARS
FIRST YEAR TO BE SIMULATED IS 1984.
THE SIMULATION WILL BE DETERMINISTIC
PRINT ALL INPUT DATA AND ALL OUTPUT TABLES
THE REPRESENTATIVE FARM HAS 4 CROPS AND 0 LIVESTOCK ENTERPRISES
PAYOFF OUTSTANDING LOANS USING SURPLUS CASH
NO SPECIAL FINANCIAL BAILOUT PROGRAM IS IN EFFECT
ADJUST INCOME TAX SCHEDULE AFTER 1984 FOR CHANGES IN THE CPI
FIXED PORTION OF CROPS SOLD IN T AND CCC LOAN USED FOR THE REMAINDER
NO MAXIMUM ON ANNUAL INTEREST DEDUCTIONS IS IN PLACE
THE CROP MIX WILL BE CONSTANT OVER TIME
DEPRECIATION ON OLD MACHINERY WILL BE CALCULATED BY THE DECLINING BALANCE METHOD
USE THE FEDERAL INCOME TAX PROVISIONS FOR 1982
MACHINERY PURCHASED AFTER 1980 WILL BE RECOVERED USING AN ACCELERATED SCHEDULE
THE USER HAS ELECTED TO REDUCE BASIS FOR INVESTMENT TAX CREDIT
THE FARM HAS ELECTED NOT TO TAKE FIRST YEAR EXPENSING ON PURCHASES OF MACHINERY
THERE ARE 37 PIECES OF OWNED FARM MACHINERY TO BE DEPRECIATED
OLD FARM MACHINERY WILL BE TRADED IN RATHER THAN BE SOLD
USER HAS SPECIFIED THE FAMILY CONSUMPTION FUNCTION FOR REGION   6
THE FARM MAY NOT SELL CROPLAND TO AVOID INSOLVENCY
CROPLAND WILL BE LEASED USING A CROP SHARE SCHEME SPECIFIED BY THE USER
ANNUAL INFLATION RATES FOR FARMLAND ARE PROVIDED BY THE USER
THE FARM WILL NOT BE ALLOWED TO GROW OVER TIME
INFORMATION FOR   0 ALTERNATIVE FARMS IS PROVIDED BY THE USER
AN UNLIMITED NONRECOURSE LOAN (PRICE SUPPORT PROGRAM WILL BE IN EFFECT
DO NOT PAY INTEREST ON NONREDEEMED NONRECOURSE CCC LOANS
LOAN RATES ARE FIXED BY THE ANALYST IN ALL YEARS
INTEREST ON FOR LOANS WILL BE CHARGED ANNUALLY FOR 1 YEARS
A TARGET PRICE PROGRAM WILL BE IN EFFECT AND TARGET PRICES ARE FIXED
AN ALL-RISK CROP INSURANCE PROGRAM IS IN EFFECT
A MANDATORY SET-ASIDE OR VOLUNTARY DIVERSION PROGRAM WILL BE IN EFFECT
PAYMENT LIMITATIONS ARE IN EFFECT FOR DEFICIENCY PAYMENTS, DIVERSION PAYMENTS & DISASTER PAYMENTS
ALL FARMS ARE ELIGIBLE FOR ALL FARM PROGRAM BENEFITS

        RESULTS FROM SSR ROTATION, LIBERTY COUNTY. FINAL BASE SIMULATION.
        MULTIVARIATE EMPIRICAL DISTRIBUTIONS USED FOR PRICES
        AND YIELDS. WHOLLY LEASED FARM ACREAGE, 50% LONG TERM AND 40%
        INTERMEDIATE DEBT, 33% CUT OFF POINT. CROP INSURANCE, 50 G PAYMENT LIMIT.
        1/7 CROP SHARE ON SOYBEANS AND RICE. STOCHASTIC RUN, 50 ITERATIONS.

CROPLAND ON INITIAL FARM
  TOTAL CROPLAND ACRES OWNED   10.0000
  TOTAL CROPLAND ACRES LEASED   2300.0000
  PASTURELAND ACRES OWNED   0.0
  PASTURELAND ACRES LEASED   0.0
  FRACTION CROPLAND THAT IS TILLABLE   0.9500
  FRACTION CROPLAND THAT IS IRRIGATED   0.5300

INITIAL BALANCE SHEET FOR THE FARM
 ASSETS
  MARKET VALUE OF CROPLAND & FARMSTEAD   12000.0000
  MARKET VALUE OF BUILDINGS   155000.000
    TOTAL VALUE OF OWNED CROPLAND & BUILDINGS   167000.000
  MARKET VALUE OF OFF-FARM INVESTMENTS   20000.0000
  BEGINNING CASH RESERVE   5000.0000
  MARKET VALUE OF OWNED PASTURELAND   0.0
  MARKET VALUE OF ALL FARM MACHINERY   565202.000
  MARKET VALUE OF ALL LIVESTOCK   0.0
    TOTAL VALUE OF ASSETS   757202.000
 LIABILITIES
  TOTAL REAL ESTATE DEBT   66800.0000
  TOTAL INTERMEDIATE-TERM DEBT   226081.000
  INCOME TAXES DUE IN YEAR 1   0.0
  SELF EMPLOYMENT TAXES DUE IN YEAR 1   0.0
    TOTAL DEBT   292881.000

    BEGINNING NET WORTH (MARKET VALUE)   464321.000

INITIAL FINANCIAL RATIOS FOR THE FARM
  EQUITY TO ASSETS RATIO   0.6132
  DEBT TO ASSET RATIO   0.3868
  LEVERAGE RATIO   0.6308

  AVERAGE PER ACRE VALUE OF CROPLAND   1200.0000
  AVERAGE PER ACRE VALUE OF PASTURELAND   0.0

LIABILITIES FOR INITIAL FARM
  REAL ESTATE DEBT   66800.0000
  LOAN LIFE ON DEBT   30.0000
  FRACTION LAND LOAN REMAINING   0.5000
  ORIGINAL AMOUNT OF THE LOAN   133600.000
  DEBT TO ASSET RATIO   0.4000

  INTERMEDIATE TERM DEBT   226081.000
  LOAN LIFE ON DEBT   5.0000
  FRACTION LOAN REMAINING   0.5000
  ORIGINAL AMOUNT OF THE LOAN   452182.000
  DEBT TO ASSET RATIO   0.4000

68 OPERATING LOAN
  FRACTION OF YEAR LOAN IS USED   0.3920

TERMS FOR NEW LOANS
  NO. YEARS FOR NEW LAND LOANS   30.0000
  NO. YEARS FOR NEW MACH LOANS   5.0000

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                MINIMUM INTERMEDIATE TERM EQUITY                    0.3333

INFORMATION FOR REFINANCING DEBTS
    CHARGE TO REFINANCE CASH FLOW DEFICITS                          0.0100
    NO. YEARS FOR A LONG-TERM LOAN                                 20.0000
    NO. YEARS FOR INTERM-TERM LOAN                                  5.0000

MINIMUM DOWNPAYMENT LEVELS
    MINIMUM DOWNPAYMENT FOR FARM MACHINERY                          0.3000
    MINIMUM DOWNPAYMENT FOR FARMLAND                                0.3000

    AFTER-TAX DISCOUNT RATE                                         0.1011
    ANNUAL RATE OF RETURN TO PROD ASSETS T-1                        0.0
    CAPITAL GAIN RATE FOR LAND IN T-1                               0.0400

CASH RESERVE FOR THE FARM
    MINIMUM CASH RESERVE                                         5000.0000
    BEGINNING CASH RESERVE                                       5000.0000

CAPITAL ASSETS TO BE RECOVERED (DEPRECIATED)
  BUILDINGS PLACED INTO USE PRIOR TO 1981
    SALVAGE VALUE                                               10500.0000
    PURCHASE PRICE                                             105000.000
    ECONOMIC (DEPRECIATION) LIFE                                   30.0000
  REGULAR BUILDINGS PLACED INTO USE AFTER 1980
    PURCHASE PRICE                                                  0.0
    CALENDAR YEAR PURCHASED                                         0.0
  SPECIAL PURPOSE BUILDINGS PLACED INTO USE AFTER 1980
    PURCHASE PRICE                                                  0.0
    CALENDAR YEAR PURCHASED                                         0.0

FIXED COSTS
    PROPERTY TAX RATE ($TAX/$VALUE)                                 0.003330
    TOTAL PERSONAL PROPERTY TAX                                     0.0
    OTHER TAXES                                                     0.0
    ACCOUNTANT & LEGAL FEES                                      3000.0000
    UNALLOCATED MAINTENANCE COSTS                                   0.0
    INSURANCE ON MACHINERY                                       3200.0000
    MISCELLANEOUS FIXED COSTS                                    5000.0000

LAND LEASE COSTS
    CASH RENT FOR CROPLAND ($/ACRE)                                 0.0
    CASH RENT FOR PASTURELAND ($/ACRE)                             0.0
    ANNUAL INFLATION RATE FOR
     PER ACRE CASH LEASE COST                                      0.0
    CAPITALIZATION RATE BETWEEN
     LAND VALUE & CROPLAND CASH LEASE COST                         0.0

FAMILY CONSUMPTION AND TAX INFORMATION
    AGE OF OPERATOR                                                45.0000
    NO. OF TAX EXEMPTIONS CLAIMED                                   5.0000
    MARGINAL TAX RATE FOR STATE                                     0.0
    RATIO OF PERSONAL DEDUC TO NET INCOME                          0.2000
    DESIRED TAXABLE INCOME                                          0.0

    AVERAGE ANNUAL OFF-FARM INCOME                                 0.0
    NON-TAXABLE OFF-FARM INCOME                                18000.0000

    ANNUAL RETURN ON OFF-FARM INVEST                              0.1100

    MINIMUM FAMILY LIVING EXPENSES                             18000.0000
    MAXIMUM FAMILY LIVING EXPENSES                             25000.0000

    USER'S SPECIFIED CONSUMPTION FUNCTION USED IF THE OPTION IS ELECTED

    CONSUMPTION =     0.0  +   0.0    * (DISPOSIBLE INCOME -      0.0  )


    INCOME TAX PAYMENT DUE IN YEAR 1                                0.0
    SELF-EMPLOYMENT TAX PAYMENT DUE IN YEAR 1                       0.0
    TAXABLE INCOME IN YEAR T-3                                      0.0
    TAXABLE INCOME IN YEAR T-2                                      0.0
    TAXABLE INCOME IN YEAR T-1                                      0.0

    MAXIMUM INTEREST DEDUCTION IF OPTION IS USED                    0.0

    RISK AVERSION COEFFICIENT                                       0.0
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HIRED FARM LABOR
    NO. OF FULL TIME EMPLOYEES                                      2.0000
    ANNUAL GROSS SALARY FOR FULL-TIME EMPLOYEE                 13800.0000
    HOURLY WAGE RATE FOR PART-TIME LABOR                            3.3500
ANNUAL INTEREST RATES            1984      1985      1986      1987      1988

OLD LONG-TERM LOANS            0.1175    0.1175    0.1175    0.1175    0.1175    0.0    0.0    0.0    0.0    0.0
OLD INTERMEDIATE-TERM LOANS    0.1500    0.1500    0.1500    0.1500    0.1500    0.0    0.0    0.0    0.0    0.0
NEW LONG-TERM LOANS            0.1310    0.1170    0.1090    0.1050    0.1050    0.0    0.0    0.0    0.0    0.0
NEW INTERMEDIATE-TERM LOANS    0.1480    0.1490    0.1410    0.1370    0.1370    0.0    0.0    0.0    0.0    0.0
REFINANCE LONG-TERM LOANS      0.1310    0.1170    0.1090    0.1050    0.1050    0.0    0.0    0.0    0.0    0.0
REFINANCE INTERM-TERM LOANS    0.1480    0.1490    0.1410    0.1370    0.1370    0.0    0.0    0.0    0.0    0.0
OPERATING LOANS                0.1520    0.1540    0.1560    0.1420    0.1420    0.0    0.0    0.0    0.0    0.0
RECEIVED FOR CASH RESERVES     0.1180    0.1193    0.1110    0.1070    0.1070    0.0    0.0    0.0    0.0    0.0

ANNUAL PERCENTAGE CHANGES IN SELECTED COSTS
NEW FARM MACHINERY             0.0       0.0470    0.0450    0.0480    0.0500    0.0    0.0    0.0    0.0    0.0
USED FARM MACHINERY            0.0       0.0       0.0       0.0100    0.0100    0.0    0.0    0.0    0.0    0.0
FIXED COST, INS & TAX          0.0540    0.0470    0.0450    0.0480    0.0500    0.0    0.0    0.0    0.0    0.0
SEED COSTS                     0.0939    0.0313   -0.0640    0.0480    0.0500    0.0    0.0    0.0    0.0    0.0
FERTILIZER & LIME              0.0674    0.0727    0.0570    0.0480    0.0500    0.0    0.0    0.0    0.0    0.0
CHEMICAL COSTS                 0.0720    0.0810    0.0605    0.0480    0.0500    0.0    0.0    0.0    0.0    0.0
FUEL & LUBE COSTS              0.0540    0.0470    0.0450    0.0480    0.0500    0.0    0.0    0.0    0.0    0.0
REPAIRS ON MACHINERY           0.0540    0.0470    0.0450    0.0480    0.0500    0.0    0.0    0.0    0.0    0.0
OTHER PROD COST                0.0064    0.0470    0.0450    0.0480    0.0500    0.0    0.0    0.0    0.0    0.0
CUSTOM COSTS                   0.0540    0.0470    0.0450    0.0480    0.0500    0.0    0.0    0.0    0.0    0.0
HIRED LABOR COSTS              0.0540    0.0470    0.0450    0.0480    0.0500    0.0    0.0    0.0    0.0    0.0
OFF-FARM INVESTMENT            0.1180    0.1190    0.1110    0.1070    0.1070    0.0    0.0    0.0    0.0    0.0
PURCHASED INPUTS FOR LIVEST    0.0       0.0       0.0       0.0       0.0       0.0    0.0    0.0    0.0    0.0
FARMLAND VALUES                0.0710    0.0710    0.0710    0.0710    0.0710    0.0    0.0    0.0    0.0    0.0
BUILDING VALUES               -0.0200   -0.0200   -0.0200   -0.0200   -0.0200    0.0    0.0    0.0    0.0    0.0
OFF-FARM STORAGE COSTS         0.0       0.0470    0.0450    0.0480    0.0500    0.0    0.0    0.0    0.0    0.0
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OTHER ANNUAL DATA FOR THE FARM
                                 1984      1985      1986      1987      1988

NEW CAPITAL INVESTED IN FAR      0.0       0.0       0.0       0.0       0.0       0.0    0.0    0.0    0.0    0.0
CONSUMER PRICE INDEX           310.60    323.90    339.00    356.20    374.00     0.0    0.0    0.0    0.0    0.0
OTHER FARM INCOME                0.0       0.0       0.0       0.0       0.0       0.0    0.0    0.0    0.0    0.0

SELF EMPLOYMENT TAX RATE        0.140     0.141     0.143     0.143     0.150     0.0    0.0    0.0    0.0    0.0

MAXIMUM INCOME SUBJUCT TO
SELF EMPLOYMENT TAX          37209.00  38803.00  40612.00  42572.00  44805.00     0.0    0.0    0.0    0.0    0.0

SUMMARY OF THE OWNED MACHINERY COMPLEMENT
                    YEAR     CURRENT   ORIGINAL  ESTIMATED  DEPRECI-              ACCUM.     MACHINERY   CURRENT   COST
                             MARKET    PURCHASE  SALVAGE    ATION      ECONOMIC   RECOVERY   REPLACEMENT REPLACE.  RECOVERY
                  PURCHASED  VALUE     PRICE     VALUE      LIFE       LIFE       (DEPREC.)  CODE        COST      PERIOD OR CLASS
TRACTOR156HP       1980.0   33474.0   39798.0   3980.0     7.0        7.0        30479.5    0.0         61700.0   5.0
TRACTOR156HP       1979.0   31759.0   33568.0   3357.0     7.0        7.0        28070.3    0.0         61700.0   5.0
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TRACTOR 85HP	1975.0	7717.0	10087.0	1009.0	7.0	7.0	9078.0	2.0	19900.0	5.0
TRCTR 226HP	1978.0	34945.0	52475.0	5248.0	7.0	7.0	46037.0	0.0	94800.0	5.0
TRCTR 229HP	1981.0	50897.0	74628.0	7462.8	7.0	7.0	43284.2	0.0	94800.0	5.0
COMBINE 7720	1979.0	51909.0	53886.0	5388.0	7.0	7.0	43865.7	0.0	94000.0	5.0
COMBINE 7720	1983.0	94000.0	94000.0	0.0	7.0	7.0	14100.0	0.0	94000.0	5.0
COMBINE 7720	1980.0	55882.0	61881.0	6188.0	7.0	7.0	45772.9	0.0	94000.0	5.0
PCKUP 1/2TON	1983.0	9000.0	9000.0	0.0	7.0	7.0	1350.0	0.0	9000.0	5.0
PCKUP 1/2TON	1978.0	3425.0	4538.0	454.0	7.0	7.0	3935.3	0.0	9000.0	5.0
PCKUP 1/2TON	1976.0	2375.0	3876.0	388.0	7.0	7.0	3488.0	2.0	9000.0	5.0
DSK 22' 9"	1982.0	7500.0	11500.0	0.0	7.0	7.0	4255.0	0.0	15300.0	5.0
DSK 22' 9"	1980.0	4500.0	9800.0	980.0	7.0	7.0	7249.0	0.0	15300.0	5.0
DSK 24' 4"	1981.0	5000.0	11500.0	0.0	7.0	7.0	6670.0	0.0	19300.0	5.0
DSK 24' 4"	1978.0	3500.0	9200.0	920.0	7.0	7.0	7978.1	0.0	19300.0	5.0
ROLL CULT	1982.0	2000.0	4200.0	0.0	7.0	7.0	1554.0	0.0	5200.0	5.0
ROLL CULT	1979.0	1500.0	3900.0	390.0	7.0	7.0	3174.9	0.0	5200.0	5.0
BN PLANT 8'	1976.0	4500.0	4371.0	437.0	7.0	7.0	3934.0	0.0	10250.0	5.0
BN PLANT 8'	1982.0	4500.0	7000.0	0.0	7.0	7.0	2590.0	0.0	10250.0	5.0
GRAIN CART	1981.0	3500.0	4718.0	0.0	7.0	7.0	2736.4	2.0	6800.0	5.0
GRAIN CART	1975.0	2000.0	1320.0	132.0	7.0	7.0	1188.0	2.0	6800.0	5.0
LD PL 16X80	1978.0	7376.0	7800.0	760.0	7.0	7.0	6590.6	0.0	17500.0	5.0
LD PL 16X80	1977.0	3000.0	8000.0	800.0	7.0	7.0	7200.0	0.0	17500.0	5.0
LEVEE BOXES	1982.0	6000.0	7500.0	0.0	7.0	7.0	2775.0	0.0	11250.0	5.0
LEVEE PLOW	1981.0	1547.0	1563.0	0.0	7.0	7.0	906.5	2.0	2800.0	5.0
LEVEE PUSH	1981.0	700.0	2100.0	0.0	7.0	7.0	1218.0	2.0	2500.0	5.0
LEVEE ROLLER	1978.0	350.0	350.0	35.0	7.0	7.0	303.5	2.0	850.0	5.0
FLD CUL 31'	1982.0	5500.0	7900.0	0.0	7.0	7.0	2923.0	0.0	9800.0	5.0
FLD CUL 31'	1981.0	4500.0	7100.0	0.0	7.0	7.0	4118.0	0.0	9800.0	5.0
FLD CUL 25	1978.0	2500.0	5800.0	580.0	7.0	7.0	5029.7	0.0	9800.0	5.0
BEDDER & ROW	1976.0	1036.0	1100.0	110.0	7.0	7.0	990.0	0.0	5400.0	5.0
BEDDER & ROW	1979.0	1500.0	3500.0	350.0	7.0	7.0	2849.2	0.0	5400.0	5.0
PIPE HARROW	1979.0	1000.0	1020.0	102.0	7.0	7.0	830.3	0.0	2100.0	5.0
PIPE HARROW	1980.0	1100.0	1600.0	180.0	7.0	7.0	1183.5	0.0	2100.0	5.0
DU-ALL	1978.0	3500.0	8600.0	860.0	7.0	7.0	7457.8	0.0	11500.0	5.0
MISC TRUCKS	1977.0	50000.0	60000.0	6000.0	7.0	0.0	52031.4	2.0	90000.0	5.0

INFORMATION FOR INITIAL FARM   2310. ACRES--

SUMMARY OF CROP ENTERPRISE COSTS

	SEED	FERT-LIME	CHEMICALS	FUEL-LUBE	REPAIRS	OTHER	HARVEST COST
			--$/ACRE--				$/YIELD UNIT
1ST SOYBEANS	9.45	14.36	45.45	12.68	6.17	9.14	0.4500
2ND SOYBEANS	9.45	14.36	45.45	12.68	6.17	9.14	0.4500
FIRST RICE	33.90	51.00	67.56	18.60	6.76	79.20	1.2300
RATOON RICE	0.0	3.38	2.50	0.0	0.0	5.75	1.2300

MONTHLY LABOR REQUIREMENTS PER ACRE, BY CROP ENTERPRISE

	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1ST SOYBEANS	0.240	0.458	0.105	0.546	1.248	0.484	0.295	0.404	0.105	0.557	0.797	0.105
2ND SOYBEANS	0.240	0.458	0.105	0.546	1.248	0.484	0.295	0.404	0.105	0.557	0.797	0.105
FIRST RICE	0.275	0.387	1.380	0.516	1.730	1.191	1.273	0.977	0.294	0.111	0.156	0.222
RATOON RICE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.101	0.068	0.688	0.0	0.0

HOURS OF UNPAID FAMILY LABOR

AVAILABLE EACH MONTH	400.00	400.00	800.00	800.00	750.00	900.00	900.00	800.00	800.00	600.00	600.00	400.00

HOURS WORKED EACH MONTH BY A

FULL TIME EMPLOYEE	250.00	300.00	350.00	350.00	350.00	350.00	350.00	350.00	300.00	300.00	250.00	250.00

ANNUAL MEAN OR MODAL CROP YIELDS

	1984	1985	1986	1987	1988					
1ST SOYBEANS	23.69	24.17	24.67	25.17	25.68	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	22.84	23.31	23.78	24.27	24.76	0.0	0.0	0.0	0.0	0.0
FIRST RICE	50.03	56.69	60.73	61.34	61.96	0.0	0.0	0.0	0.0	0.0
RATOON RICE	1.94	1.96	1.98	2.00	2.02	0.0	0.0	0.0	0.0	0.0

ANNUAL MEAN OR MODAL CROP PRICES

	1984	1985	1986	1987	1988					
1ST SOYBEANS	6.33	7.45	7.92	8.01	8.34	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	6.33	7.45	7.92	8.01	8.34	0.0	0.0	0.0	0.0	0.0
FIRST RICE	9.54	10.05	10.40	10.83	11.29	0.0	0.0	0.0	0.0	0.0
RATOON RICE	8.88	9.34	9.68	10.07	10.50	0.0	0.0	0.0	0.0	0.0

CONSTRAINTS ON THE CROPMIX

	ACRES PLANTED YEAR 1	ACRES HARVESTED YEAR1	MINIMUM FRACTION OF MIX	MAXIMUM FRACTION OF MIX	LINKAGE TO DOUBLE CROP	NORMAL FRAC. ACRES HARVESTED
1ST SOYBEANS	731.30	694.70	0.0	0.0	0.0	0.95
2ND SOYBEANS	731.30	694.70	0.0	0.0	0.0	0.95
FIRST RICE	731.40	724.10	0.0	0.0	0.0	0.99
RATOON RICE	731.40	724.10	0.0	0.0	3.00	0.99

CROP SHARE LEASING BY CROP   LANDLORD SHARE OF RECEIPTS & COSTS

	CROP RECEIPTS	SEED COSTS	FERT & LIME	CHEMICAL COSTS	FUEL & LUBE	MACHINERY REPAIRS	OTHER COSTS	CUSTOM WORK
1ST SOYBEANS	0.1430	0.0	0.0	0.0	0.0	0.0	0.0	0.0790
2ND SOYBEANS	0.1430	0.0	0.0	0.0	0.0	0.0	0.0	0.0790
FIRST RICE	0.1430	0.0	0.0	0.0	0.0	0.0	0.0	0.0790
RATOON RICE	0.1430	0.0	0.0	0.0	0.0	0.0	0.0	0.0790

MARKETING STRATAGIES

	BEGINNING INVENTORY	FRACTION SOLD NEXT TAX YEAR	MONTH SOLD AFTER HARVEST	MONTH SOLD IN NEXT YEAR
1ST SOYBEANS	4231.801	0.300	10.000	1.000
2ND SOYBEANS	4080.000	0.300	10.000	1.000
FIRST RICE	0.0	0.0	7.000	1.000
RATOON RICE	1204.200	1.000	10.000	1.000

SEASONAL PRICE INDEX

	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1ST SOYBEANS	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2ND SOYBEANS	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
FIRST RICE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
RATOON RICE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

FACTORED MATRIX FOR CROP YIELDS & PRICES

	1	2	3	4	5	6	7	8
CROP YIELDS								
1ST SOYBEANS	0.0	0.503	0.515	0.395	0.0	0.300	-0.418	-0.248
2ND SOYBEANS	0.0	0.503	0.515	0.395	0.0	0.300	-0.418	-0.248
FIRST RICE	0.0	0.0	0.732	0.285	0.0	0.030	0.177	-0.592
RATOON RICE	0.0	0.0	0.0	0.533	0.0	0.031	-0.101	-0.840
CROP PRICES								
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.951	-0.190	0.242
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.951	-0.190	0.242
FIRST RICE	0.0	0.0	0.0	0.0	0.0	0.0	0.492	0.871
RATOON RICE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000

CUMMULATIVE DISTRIBUTIONS OF DEVIATES ABOUT THE MEAN (OR TREND), EXPRESSED AS A FRACTION OF MEAN

	1	2	3	4	5	6	7	8	9	10
CROP YIELDS										
1ST SOYBEANS	-0.789	-0.541	-0.378	-0.258	-0.133	-0.025	0.028	0.135	0.301	0.900
2ND SOYBEANS	-0.781	-0.530	-0.388	-0.284	-0.178	-0.085	0.032	0.152	0.310	0.970
FIRST RICE	-0.365	-0.225	-0.158	-0.116	-0.070	-0.032	0.011	0.052	0.121	0.361
RATOON RICE	-0.614	-0.317	-0.196	-0.126	-0.065	-0.023	0.024	0.085	0.168	0.792
CROP PRICES										
1ST SOYBEANS	-0.274	-0.236	-0.083	-0.052	-0.031	0.038	0.048	0.067	0.226	0.288
2ND SOYBEANS	-0.274	-0.236	-0.083	-0.052	-0.031	0.038	0.048	0.067	0.226	0.288
FIRST RICE	-0.416	-0.394	-0.222	-0.067	-0.025	0.129	0.171	0.206	0.211	0.419
RATOON RICE	-0.416	-0.394	-0.222	-0.067	-0.025	0.129	0.171	0.206	0.211	0.419

COVARIANCE MATRIX OF NET INCOMES FOR CROPS

	1	2	3	4
1ST SOYBEANS	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0

SUMMARY OF POLICY DATA, BY YEAR AND BY CROP

	1984	1985	1986	1987	1988
CCC LOAN RATES					
1ST SOYBEANS	5.02	5.02	5.02	5.02	5.02
2ND SOYBEANS	5.02	5.02	5.02	5.02	5.02
FIRST RICE	8.63	8.63	8.63	8.63	8.63
RATOON RICE	8.03	8.03	8.03	8.03	8.03
INTEREST RATE FOR CCC LOANS	0.12	0.12	0.12	0.12	0.12
INTEREST RATE FOR FOR LOANS	0.12	0.12	0.12	0.12	0.12
OFF-FARM STORAGE COSTS FOR CROPS UNDER LOAN					
1ST SOYBEANS	0.30	0.31	0.33	0.34	0.36
2ND SOYBEANS	0.30	0.31	0.33	0.34	0.36
FIRST RICE	0.50	0.52	0.55	0.57	0.60
RATOON RICE	0.50	0.52	0.55	0.57	0.60
TARGET PRICES, IF THEY ARE NOT TIED TO LOAN RATES					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	12.53	12.53	12.53	12.53	12.53
RATOON RICE	11.93	11.93	11.93	11.93	11.93
FLEXIBLE TARGET PRICE---FRACTION OF TARGET PRICE TO LOAN RATE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
DIRECT "FOR" ENTRY PRICE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
ACTUAL YIELDS LAST 5 YEARS FOR CALCULATING FARM PROGRAM YIELDS					
1ST SOYBEANS	30.00	32.00	17.00	10.00	6.00
2ND SOYBEANS	30.00	32.00	17.00	10.00	6.00
FIRST RICE	41.86	38.83	44.45	49.61	48.32
RATOON RICE	2.12	1.65	1.68	1.92	1.94
ACTUAL LAGGED PRICES FOR 4 YEARS USED FOR FLEXIBLE LOAN RATES					
1ST SOYBEANS	0.0	0.0	0.0	0.0	
2ND SOYBEANS	0.0	0.0	0.0	0.0	
FIRST RICE	0.0	0.0	0.0	0.0	
RATOON RICE	0.0	0.0	0.0	0.0	
PROGRAM (OR BASE) ACREAGE					
1ST SOYBEANS	731.33	731.33	731.33	731.33	731.33
2ND SOYBEANS	731.33	731.33	731.33	731.33	731.33
FIRST RICE	731.33	731.33	731.33	731.33	731.33
RATOON RICE	731.33	731.33	731.33	731.33	731.33
NATIONAL ALLOCATION FACTOR					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	1.00	1.00	1.00	1.00	1.00
RATOON RICE	1.00	1.00	1.00	1.00	1.00
ACREAGE SET ASIDE, DIVERSION OR LIMITATION (FRACTION)					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0

RATOON RICE	0.25	0.35	0.25	0.25	0.25

SLIPPAGE RATE (FRACTION)

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.20	0.20	0.20	0.20	0.20
RATOON RICE	0.20	0.20	0.20	0.20	0.20

PAYMENT RATE FOR ACREAGE DIVERSION

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	71.19	34.52	36.48	39.07
RATOON RICE	0.0	0.0	0.0	0.0	0.0

TRIGGER PRICE FOR THE "FOR"

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

CALL PRICE FOR THE "FOR"

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

LENGTH OF FARMER OWNED RESERVE

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

STORAGE PAYMENT RATE FOR THE "FOR"

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

PRODUCTION GUARANTEE FOR CROP INSURANCE

1ST SOYBEANS	13.65	13.92	14.20	14.49	14.78
2ND SOYBEANS	13.65	13.92	14.20	14.49	14.78
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

PRICE ELECTION FOR CROP INSURANCE

1ST SOYBEANS	6.50	7.73	8.22	8.29	8.62
2ND SOYBEANS	6.50	7.73	8.22	8.29	8.62
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

PREMIUM RATE PER ACRE FOR CROP INSURANCE

1ST SOYBEANS	9.31	11.29	12.24	12.80	13.37
2ND SOYBEANS	9.13	11.08	12.01	12.36	13.11
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

LOAN RATE FOR PEANUTS UNDER QUOTE

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

LOAN RATE FOR PEANUTS NOT UNDER QUOTA

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

FARM"S POUNDAGE QUOTE FOR PEANUTS

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

ACREAGE ALLOTMENT FOR RICE

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

FRACTION TARGET PRICE FOR LOW YIELD PAYMENT

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

FRACTION TARGET PRICE FOR PREVENTED PLANTING PAYMENT

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

FRACTION PROVEN YIELD FOR LOW YIELD PAYMENT

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

FRACTION PROVEN YIELD FOR PREVENTED PLANTING

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

PARITY PRICE

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

FRACTION OF CROP ELIGIBLE FOR MKTG CERTIFICATE

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

PAYMENT LIMITATION FOR

INCOME SUPPORT PAYMENTS	100000.00	100000.00	100000.00	100000.00	100000.00
DISASTER PAYMENTS	100000.00	100000.00	100000.00	100000.00	100000.00

MAXIMUM NONRECOURSE CCC LOAN

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

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PERCENT BASE PRODUCTION ELIGIBLE FOR DEFICIENCY PAYMENT

	0.0	0.0	0.0	0.0	0.0

MAXIMUM VALUE OF CROP ELIGIBLE FOR DEFICIENCY PAYMENT

	0.0	0.0	0.0	0.0	0.0

FLEXIBLE LOAN RATE FORMULAS

	NO. OF YEARS	DROP LOW	DROP HIGH	FRACTION OF MEAN
1ST SOYBEANS	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0

** A 1.0 INDICATES DELETING THE LOW OR HIGH

MARKETING LOAN RATES

1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

MAXIMUM MKTG LOAN BASE   0.0   0.0   0.0   0.0   0.0

SCALE FARM PROGRAM BENEFITS TO FARM SIZE

    FARMS LARGER THAN   0. ACRES ARE NOT ELIGIBLE FOR ANY FARM PROGRAM

    FARMS LARGER THAN   0. ACRES ARE ONLY ELIGIBLE FOR THE CROP INSURANCE PROGRAM

    FARMS WITH CROP SALES GREATER THAN $ 0. ARE NOT ELIGIBLE FOR ANY FARM PROGRAM BENEFITS

    FARMS WITH CROP SALES GREATER THAN $ 0. ARE ONLY ELIGIBLE FOR THE CROP INSURANCE PROGRAM

HISTORY OF FCIC PARTICIPATION

    NUMBER OF YEARS IN THE PROGRAM 3.00

    NUMBER OF LOSS YEARS IN PROGRAM   2.00

    TOTAL FCIC INSURANCE PREMIUMS PAID BY FARM 32323.50

    TOTAL FCIC INDEMNITY PAYMENTS RECEIVED 111513.00

                    THE END OF ALL INPUT DATA
  1   1TOTAL DEPREC & THIS YEARS DEPREC   2662.4   2662.4
MACHINE   1   7.00 33474.00 39798.00   3980.00   9318.51   4000.00   0.0   33474.00   0.0   33141.92
               0.0   0.0   7.00 39798.00   2662.43   0.0   0.0   1980.00   5.00   0.0
          61700.00   5.00   0.0
  1   2TOTAL DEPREC & THIS YEARS DEPREC   4233.2   1570.8
MACHINE   2   7.00 31769.00 33568.00   3357.00   5497.71   4000.00   0.0   31769.00   0.0   29641.06
               0.0   0.0   7.00 33568.00   1570.77   0.0   0.0   1979.00   6.00   0.0
          61700.00   5.00   0.0
  1   3TOTAL DEPREC & THIS YEARS DEPREC   19217.5   14984.3
MACHINE   3   7.00 61700.00 61700.00   0.0   52445.00   0.0   0.0   61700.00   0.0   24239.28
               0.0   0.0   7.00 61700.00 14984.29   0.0   0.0   1983.00   2.00   0.0
          61700.00   5.00   0.0
  1   4TOTAL DEPREC & THIS YEARS DEPREC   19217.5   0.0
MACHINE   4   7.00   7717.00 10087.00   1009.00   1009.00   2017.40   0.0   7717.00   0.0   9078.00
               0.0   0.0   7.00 10087.00   0.00   2.00   0.0   1975.00   10.00   0.0
          19900.00   5.00   0.0
  1   5TOTAL DEPREC & THIS YEARS DEPREC   20407.5   1190.0
MACHINE   5   7.00 34945.00 52475.00   5248.00   6437.98   4000.00   0.0   34945.00   0.0   47227.00
               0.0   0.0   7.00 52475.00   1189.98   0.0   0.0   1978.00   7.00   0.0
          94800.00   5.00   0.0
  1   6TOTAL DEPREC & THIS YEARS DEPREC   38631.1   8955.4
MACHINE   6   7.00 50897.00 74628.00   7462.80 31343.76   0.0   0.0   50897.00   0.0   52239.60
               0.0   0.0   7.00 74628.00   8955.36   0.0   0.0   1981.00   4.00   0.0
          94800.00   5.00   0.0

  1   7TOTAL DEPREC & THIS YEARS DEPREC   41493.7   2862.6
MACHINE   7   7.00 51909.00 53886.00   5389.00 10019.26   0.0   0.0   51909.00   0.0   46729.38
               0.0   0.0   7.00 53886.00   2862.65   0.0   0.0   1979.00   8.00   0.0
          94000.00   5.00   0.0
  1   8TOTAL DEPREC & THIS YEARS DEPREC   64322.3   22828.6
MACHINE   8   7.00 94000.00 94000.00   0.0   79900.00   0.0   0.0   94000.00   0.0   36928.56
               0.0   0.0   7.00 94000.00 22828.57   0.0   0.0   1983.00   2.00   0.0
          94000.00   5.00   0.0
  1   9TOTAL DEPREC & THIS YEARS DEPREC   68924.6   4602.3
MACHINE   9   7.00 55882.00 61881.00   6188.00 16108.13   0.0   0.0   55882.00   0.0   50375.19
               0.0   0.0   7.00 61881.00   4602.32   0.0   0.0   1980.00   5.00   0.0
          94000.00   5.00   0.0
  1 10TOTAL DEPREC & THIS YEARS DEPREC   71110.2   2185.7
MACHINE 10   7.00   9000.00   9000.00   0.0   7650.00   0.0   0.0   9000.00 *   0.0   3535.71
               0.0   0.0   7.00   9000.00   2185.71   0.0   0.0   1983.00   2.00   0.0
           9000.00   5.00   0.0
  1 11TOTAL DEPREC & THIS YEARS DEPREC   71258.9   148.7
MACHINE 11   7.00   3425.00   4538.00   454.00   802.69   0.0   0.0   3425.00   0.0   4084.00
               0.0   0.0   7.00   4538.00   148.69   0.0   0.0   1978.00   7.00   0.0
           9000.00   5.00   0.0
  1 12TOTAL DEPREC & THIS YEARS DEPREC   72116.9   0.0
MACHINE 12   7.00   2375.00   3876.00   388.00   388.00   775.20   0.0   2375.00   0.0   3488.00
               0.0   0.0   7.00   3876.00   0.00   2.00   0.0   1976.00   9.00   0.0
           9000.00   5.00   0.0
  1 13TOTAL DEPREC & THIS YEARS DEPREC   74186.9   2070.0
MACHINE 13   7.00   7500.00 11500.00   0.0   7245.00   0.0   0.0   7500.00   0.0   6325.00
               0.0   0.0   7.00 11500.00   2070.00   0.0   0.0   1982.00   3.00   0.0
          15300.00   5.00   0.0
  1 14TOTAL DEPREC & THIS YEARS DEPREC   74915.7   728.9
MACHINE 14   7.00   4500.00   9800.00   980.00   2551.02   0.0   0.0   4500.00   0.0   7977.84
               0.0   0.0   7.00   9800.00   728.86   0.0   0.0   1980.00   5.00   0.0
          15300.00   5.00   0.0
  1 15TOTAL DEPREC & THIS YEARS DEPREC   76295.7   1380.0
MACHINE 15   7.00   5000.00 11500.00   0.0   4830.00   0.0   0.0   5000.00   0.0   8050.00
               0.0   0.0   7.00 11500.00   1380.00   0.0   0.0   1981.00   4.00   0.0
          19300.00   5.00   0.0
  1 16TOTAL DEPREC & THIS YEARS DEPREC   76597.5   301.9
MACHINE 16   7.00   3500.00   9200.00   920.00   1221.86   0.0   0.0   3500.00   0.0   8280.00
               0.0   0.0   7.00   9200.00   301.86   0.0   0.0   1978.00   7.00   0.0
          19300.00   5.00   0.0
  1 17TOTAL DEPREC & THIS YEARS DEPREC   79733.7   756.0
MACHINE 17   7.00   2000.00   4200.00   0.0   2646.00   0.0   0.0   2000.00   0.0   2310.00
               0.0   0.0   7.00   4200.00   756.00   0.0   0.0   1982.00   3.00   0.0
           5200.00   5.00   0.0
  1 18TOTAL DEPREC & THIS YEARS DEPREC   79940.9   207.2
MACHINE 18   7.00   1500.00   3900.00   390.00   725.14   0.0   0.0   1500.00   0.0   3382.04
               0.0   0.0   7.00   3900.00   207.18   0.0   0.0   1979.00   6.00   0.0
           5200.00   5.00   0.0
  1 19TOTAL DEPREC & THIS YEARS DEPREC   79940.9   0.0
MACHINE 19   7.00   4500.00   4371.00   437.00   437.00   874.20   0.0   4500.00   0.0   3934.00
               0.0   0.0   7.00   4371.00   0.00   0.0   0.0   1976.00   9.00   0.0
          10250.00   5.00   0.0
  1 20TOTAL DEPREC & THIS YEARS DEPREC   82082.4   1260.0
MACHINE 20   7.00   4500.00   7000.00   0.0   4410.00   0.0   0.0   4500.00   0.0   3850.00
               0.0   0.0   7.00   7000.00   1250.00   0.0   0.0   1982.00   3.00   0.0
          10250.00   5.00   0.0
  1 21TOTAL DEPREC & THIS YEARS DEPREC   82648.6   566.2
MACHINE 21   7.00   3500.00   4718.00   0.0   1981.56   0.0   0.0   3500.00   0.0   3302.60
               0.0   0.0   7.00   4718.00   566.16   2.00   0.0   1981.00   4.00   0.0
           6800.00   5.00   0.0
  1 22TOTAL DEPREC & THIS YEARS DEPREC   82648.6   0.0
MACHINE 22   7.00   2000.00   1320.00   132.00   132.00   264.00   0.0   2000.00   0.0   1188.00
               0.0   0.0   7.00   1320.00   0.00   2.00   0.0   1975.00   10.00   0.0
           6800.00   5.00   0.0
  1 23TOTAL DEPREC & THIS YEARS DEPREC   82897.9   249.4

FLIPSIM V

A GENERAL FIRM LEVEL POLICY SIMULATION MODEL

DEVELOPED AND IMPLEMENTED BY

JAMES W. RICHARDSON

AND

CLAIR J. NIXON

DEPARTMENT OF AGRICULTURAL ECONOMICS
TEXAS A&M UNIVERSITY

RELEASE DATE   9 / 30 / 85

SUMMARY OF PROGRAM OPTIONS SELECTED BY THE USER
          RESULTS FROM SR ROTATION, LIBERTY COUNTY. FINAL ANALYSIS.
          MULTIVARIATE EMPIRICAL DISTRIBUTIONS USED FOR PRICES
          AND YIELDS. WHOLLY LEASED FARM ACREAGE, 50% LONG TERM AND 40%
          INTERMEDIATE DEBT. SUPERIOR MANAGEMENT. CROP INSURANCE, 50 G PAYMENT LIMIT.
          1/7 CROP SHARE ON SOYBEANS, 1/2 ON RICE. STOCHASTIC RUN, 5 YRS, 50 ITERATIONS.

SIMULATE THE REPRESENTATIVE FARM FOR 5 YEARS
FIRST YEAR TO BE SIMULATED IS 1984.
THE SIMULATION WILL BE DETERMINISTIC
PRINT ALL INPUT DATA AND ALL OUTPUT TABLES
THE REPRESENTATIVE FARM HAS 4 CROPS AND 0 LIVESTOCK ENTERPRISES
PAYOFF OUTSTANDING LOANS USING SURPLUS CASH
NO SPECIAL FINANCIAL BAILOUT PROGRAM IS IN EFFECT
ADJUST INCOME TAX SCHEDULE AFTER 1984 FOR CHANGES IN THE CPI
FIXED PORTION OF CROPS SOLD IN T AND CCC LOAN USED FOR THE REMAINDER
NO MAXIMUM ON ANNUAL INTEREST DEDUCTIONS IS IN PLACE
THE CROP MIX WILL BE CONSTANT OVER TIME
DEPRECIATION ON OLD MACHINERY WILL BE CALCULATED BY THE DECLINING BALANCE METHOD
USE THE FEDERAL INCOME TAX PROVISIONS FOR 1982
MACHINERY PURCHASED AFTER 1980 WILL BE RECOVERED USING AN ACCELERATED SCHEDULE
THE USER HAS ELECTED TO REDUCE BASIS FOR INVESTMENT TAX CREDIT
THE FARM HAS ELECTED NOT TO TAKE FIRST YEAR EXPENSING ON PURCHASES OF MACHINERY
THERE ARE 37 PIECES OF OWNED FARM MACHINERY TO BE DEPRECIATED
OLD FARM MACHINERY WILL BE TRADED IN RATHER THAN BE SOLD
USER HAS SPECIFIED THE FAMILY CONSUMPTION FUNCTION FOR REGION 6
THE FARM MAY NOT SELL CROPLAND TO AVOID INSOLVENCY
CROPLAND WILL BE LEASED USING A CROP SHARE SCHEME SPECIFIED BY THE USER
ANNUAL INFLATION RATES FOR FARMLAND ARE PROVIDED BY THE USER
THE FARM WILL NOT BE ALLOWED TO GROW OVER TIME
INFORMATION FOR   0 ALTERNATIVE FARMS IS PROVIDED BY THE USER
AN UNLIMITED NONRECOURSE LOAN (PRICE SUPPORT PROGRAM WILL BE IN EFFECT
DO NOT PAY INTEREST ON NONREDEEMED NONRECOURSE CCC LOANS
LOAN RATES ARE FIXED BY THE ANALYST IN ALL YEARS
INTEREST ON FOR LOANS WILL BE CHARGED ANNUALLY FOR 1 YEARS
A TARGET PRICE PROGRAM WILL BE IN EFFECT AND TARGET PRICES ARE FIXED
AN ALL-RISK CROP INSURANCE PROGRAM IS IN EFFECT
A MANDATORY SET-ASIDE OR VOLUNTARY DIVERSION PROGRAM WILL BE IN EFFECT
PAYMENT LIMITATIONS ARE IN EFFECT FOR DEFICIENCY PAYMENTS, DIVERSION PAYMENTS & DISASTER PAYMENTS
ALL FARMS ARE ELIGIBLE FOR ALL FARM PROGRAM BENEFITS

RESULTS FROM SR ROTATION, LIBERTY COUNTY. FINAL ANALYSIS.
MULTIVARIATE EMPIRICAL DISTRIBUTIONS USED FOR PRICES
AND YIELDS. WHOLLY LEASED FARM ACREAGE, 50% LONG TERM AND 40%
INTERMEDIATE DEBT. SUPERIOR MANAGEMENT. CROP INSURANCE, 50 G PAYMENT LIMIT.
1/7 CROP SHARE ON SOYBEANS, 1/2 ON RICE. STOCHASTIC RUN, 5 YRS, 50 ITERATIONS.

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CROPLAND ON INITIAL FARM
   TOTAL CROPLAND ACRES OWNED                           10.0000
   TOTAL CROPLAND ACRES LEASED                        2300.0000
   PASTURELAND ACRES OWNED                               0.0
   PASTURELAND ACRES LEASED                              0.0
   FRACTION CROPLAND THAT IS TILLABLE                    0.9500
   FRACTION CROPLAND THAT IS IRRIGATED                   0.5300

INITIAL BALANCE SHEET FOR THE FARM
  ASSETS
   MARKET VALUE OF CROPLAND & FARMSTEAD               12000.0000
   MARKET VALUE OF BUILDINGS                         155000.000
      TOTAL VALUE OF OWNED CROPLAND & BUILDINGS      167000.000
   MARKET VALUE OF OFF-FARM INVESTMENTS               20000.0000
   BEGINNING CASH RESERVE                              5000.0000
   MARKET VALUE OF OWNED PASTURELAND                      0.0
   MARKET VALUE OF ALL FARM MACHINERY                585202.000
   MARKET VALUE OF ALL LIVESTOCK                          0.0
      TOTAL VALUE OF ASSETS                          757202.000
  LIABILITIES
   TOTAL REAL ESTATE DEBT                             66800.0000
   TOTAL INTERMEDIATE-TERM DEBT                      226081.000
   INCOME TAXES DUE IN YEAR 1                             0.0
   SELF EMPLOYMENT TAXES DUE IN YEAR 1                    0.0
      TOTAL DEBT                                     292881.000

      BEGINNING NET WORTH (MARKET VALUE)             464321.000

INITIAL FINANCIAL RATIOS FOR THE FARM
   EQUITY TO ASSETS RATIO                                0.6132
   DEBT TO ASSET RATIO                                   0.3868
   LEVERAGE RATIO                                        0.6308

   AVERAGE PER ACRE VALUE OF CROPLAND                 1200.0000
   AVERAGE PER ACRE VALUE OF PASTURELAND                 0.0

LIABILITIES FOR INITIAL FARM
   REAL ESTATE DEBT                                   66800.0000
   LOAN LIFE ON DEBT                                    30.0000
   FRACTION LAND LOAN REMAINING                          0.5000
   ORIGINAL AMOUNT OF THE LOAN                       133600.000
   DEBT TO ASSET RATIO                                   0.4000

   INTERMEDIATE TERM DEBT                            226081.000
   LOAN LIFE ON DEBT                                     5.0000
   FRACTION LOAN REMAINING                               0.5000
   ORIGINAL AMOUNT OF THE LOAN                       452162.000
   DEBT TO ASSET RATIO                                   0.4000

OPERATING LOAN
   FRACTION OF YEAR LOAN IS USED                         0.3980

TERMS FOR NEW LOANS
   NO. YEARS FOR NEW LAND LOANS                         30.0000
   NO. YEARS FOR NEW MACH LOANS                          5.0000

MINIMUM EQUITY RATIOS FOR SOLVENCY
   MINIMUM LONG TERM EQUITY                              0.3333

   MINIMUM INTERMEDIATE TERM EQUITY                      0.3333

INFORMATION FOR REFINANCING DEBTS
   CHARGE TO REFINANCE CASH FLOW DEFICITS               0.0100
   NO. YEARS FOR A LONG-TERM LOAN                       20.0000
   NO. YEARS FOR INTERM-TERM LOAN                        5.0000

MINIMUM DOWNPAYMENT LEVELS
   MINIMUM DOWNPAYMENT FOR FARM MACHINERY               0.3000
   MINIMUM DOWNPAYMENT FOR FARMLAND                     0.3000

   AFTER-TAX DISCOUNT RATE                              0.1011
   ANNUAL RATE OF RETURN TO PROD ASSETS T-1             0.0
   CAPITAL GAIN RATE FOR LAND IN T-1                    0.0400

CASH RESERVE FOR THE FARM
   MINIMUM CASH RESERVE                              5000.0000
   BEGINNING CASH RESERVE                            5000.0000

CAPITAL ASSETS TO BE RECOVERED (DEPRECIATED)
 BUILDINGS PLACED INTO USE PRIOR TO 1981
   SALVAGE VALUE                                    10500.0000
   PURCHASE PRICE                                  105000.000
   ECONOMIC (DEPRECIATION) LIFE                        30.0000
 REGULAR BUILDINGS PLACED INTO USE AFTER 1980
   PURCHASE PRICE                                       0.0
   CALENDAR YEAR PURCHASED                             0.0
 SPECIAL PURPOSE BUILDINGS PLACED INTO USE AFTER 1980
   PURCHASE PRICE                                      0.0
   CALENDAR YEAR PURCHASED                             0.0

FIXED COSTS
   PROPERTY TAX RATE (STAX/SVALUE)                     0.003330
   TOTAL PERSONAL PROPERTY TAX                         0.0
   OTHER TAXES                                         0.0
   ACCOUNTANT & LEGAL FEES                          3000.0000
   UNALLOCATED MAINTENANCE COSTS                       0.0
   INSURANCE ON MACHINERY                           3200.0000
   MISCELLANEOUS FIXED COSTS                        5000.0000

LAND LEASE COSTS
   CASH RENT FOR CROPLAND ($/ACRE)                     0.0
   CASH RENT FOR PASTURELAND ($/ACRE)                  0.0
   ANNUAL INFLATION RATE FOR
    PER ACRE CASH LEASE COST                           0.0
   CAPITALIZATION RATE BETWEEN
    LAND VALUE & CROPLAND CASH LEASE COST              0.0

FAMILY CONSUMPTION AND TAX INFORMATION
   AGE OF OPERATOR                                    45.0000
   NO. OF TAX EXEMPTIONS CLAIMED                       5.0000
   MARGINAL TAX RATE FOR STATE                         0.0
   RATIO OF PERSONAL DEDUC TO NET INCOME               0.2000
   DESIRED TAXABLE INCOME                              0.0

   AVERAGE ANNUAL OFF-FARM INCOME                      0.0
   NON-TAXABLE OFF-FARM INCOME                     16000.0000

   ANNUAL RETURN ON OFF-FARM INVEST                    0.1100

   MINIMUM FAMILY LIVING EXPENSES                  18000.0000
   MAXIMUM FAMILY LIVING EXPENSES                  25000.0000

USER"S SPECIFIED CONSUMPTION FUNCTION USED IF THE OPTION IS ELECTED
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INCOME TAX PAYMENT DUE IN YEAR 1                      0.0
SELF-EMPLOYMENT TAX PAYMENT DUE IN YEAR 1             0.0
TAXABLE INCOME IN YEAR T-3                            0.0
TAXABLE INCOME IN YEAR T-2                            0.0
TAXABLE INCOME IN YEAR T-1                            0.0

MAXIMUM INTEREST DEDUCTION IF OPTION IS USED          0.0

RISK AVERSION COEFFICIENT                             0.0


HIRED FARM LABOR
   NO. OF FULL TIME EMPLOYEES                      3.0000
   ANNUAL GROSS SALARY FOR FULL-TIME EMPLOYEE  13800.0000
   HOURLY WAGE RATE FOR PART-TIME LABOR            3.3500
ANNUAL INTEREST RATES        1984      1985      1986      1987      1988
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	1984	1985	1986	1987	1988				
OLD LONG-TERM LOANS	0.1175	0.1175	0.1175	0.1175	0.1175	0.0	0.0	0.0	0.0	0.0
OLD INTERMEDIATE-TERM LOANS	0.1500	0.1500	0.1500	0.1500	0.1500	0.0	0.0	0.0	0.0	0.0
NEW LONG-TERM LOANS	0.1310	0.1170	0.1090	0.1050	0.1050	0.0	0.0	0.0	0.0	0.0
NEW INTERMEDIATE-TERM LOANS	0.1480	0.1490	0.1410	0.1370	0.1370	0.0	0.0	0.0	0.0	0.0
REFINANCE LONG-TERM LOANS	0.1310	0.1170	0.1090	0.1050	0.1050	0.0	0.0	0.0	0.0	0.0
REFINANCE INTERM-TERM LOANS	0.1480	0.1490	0.1410	0.1370	0.1370	0.0	0.0	0.0	0.0	0.0
OPERATING LOANS	0.1520	0.1540	0.1560	0.1420	0.1420	0.0	0.0	0.0	0.0	0.0
RECEIVED FOR CASH RESERVES	0.1180	0.1193	0.1110	0.1070	0.1070	0.0	0.0	0.0	0.0	0.0

ANNUAL PERCENTAGE CHANGES IN SELECTED COSTS

NEW FARM MACHINERY	0.0	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
USED FARM MACHINERY	0.0	0.0	0.0	0.0100	0.0100	0.0	0.0	0.0	0.0	0.0
FIXED COST, INS & TAX	0.0540	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
SEED COSTS	0.1145	0.0204	-0.1201	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
FERTILIZER & LIME	0.0744	0.0859	0.0631	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
CHEMICAL COSTS	0.0813	0.0985	0.0685	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
FUEL & LUBE COSTS	0.0540	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
REPAIRS ON MACHINERY	0.0540	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
OTHER PROD COST	0.0064	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
CUSTOM COSTS	0.0540	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
HIRED LABOR COSTS	0.0540	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
OFF-FARM INVESTMENT	0.1180	0.1190	0.1110	0.1070	0.1070	0.0	0.0	0.0	0.0	0.0
PURCHASED INPUTS FOR LIVEST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FARMLAND VALUES	0.0710	0.0710	0.0710	0.0710	0.0710	0.0	0.0	0.0	0.0	0.0
BUILDING VALUES	-0.0200	-0.0200	-0.0200	-0.0200	-0.0200	0.0	0.0	0.0	0.0	0.0
OFF-FARM STORAGE COSTS	0.0	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0

OTHER ANNUAL DATA FOR THE FARM

	1984	1985	1986	1987	1988				
NEW CAPITAL INVESTED IN FAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CONSUMER PRICE INDEX	310.60	323.90	339.00	356.20	374.00	0.0	0.0	0.0	0.0	0.0
OTHER FARM INCOME	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SELF EMPLOYMENT TAX RATE	0.140	0.141	0.143	0.143	0.150	0.0	0.0	0.0	0.0	0.0

MAXIMUM INCOME SUBJUCT TO

SELF EMPLOYMENT TAX	37209.00	38803.00	40612.00	42672.00	44805.00	0.0	0.0	0.0	0.0	0.0

SUMMARY OF THE OWNED MACHINERY COMPLEMENT

	YEAR PURCHASED	CURRENT MARKET VALUE	ORIGINAL PURCHASE PRICE	ESTIMATED SALVAGE VALUE	DEPRECI-ATION LIFE '	ECONOMIC LIFE	ACCUM. RECOVERY (DEPREC.)	MACHINERY REPLACEMENT CODE	CURRENT REPLACE. COST	COST RECOVERY PERIOD OR CLASS
TRACTOR156HP	1980.0	33474.0	39798.0	3980.0	7.0	7.0	30479.5	0.0	61700.0	5.0
TRACTOR156HP	1979.0	31769.0	33568.0	3357.0	7.0	7.0	28070.3	0.0	61700.0	5.0
TRACTOR165HP	1983.0	61700.0	61700.0	0.0	7.0	7.0	9255.0	0.0	61700.0	5.0
TRACTOR 85HP	1975.0	7717.0	10087.0	1009.0	7.0	7.0	9078.0	2.0	19900.0	5.0
TRCTR 226HP	1978.0	34945.0	52475.0	5248.0	7.0	7.0	46037.0	0.0	94800.0	5.0
TRCTR 229HP	1981.0	50897.0	74628.0	7462.8	7.0	7.0	43284.2	0.0	94800.0	5.0
COMBINE 7720	1979.0	51909.0	53886.0	5389.0	7.0	7.0	43866.7	0.0	94000.0	5.0
COMBINE 7720	1983.0	94000.0	94000.0	0.0	7.0	7.0	14100.0	0.0	94000.0	5.0
COMBINE 7720	1980.0	55882.0	61881.0	6188.0	7.0	7.0	45772.9	0.0	94000.0	5.0
PCKUP 1/2TON	1983.0	9000.0	9000.0	0.0	7.0	7.0	1350.0	0.0	9000.0	5.0
PCKUP 1/2TON	1978.0	3425.0	4538.0	454.0	7.0	7.0	3935.3	0.0	9000.0	5.0
PCKUP 1/2TON	1976.0	2375.0	3875.0	388.0	7.0	7.0	3488.0	2.0	9000.0	5.0
DSK 22' 9"	1982.0	7500.0	11500.0	0.0	7.0	7.0	4255.0	0.0	15300.0	5.0
DSK 22' 9"	1980.0	4500.0	9800.0	980.0	7.0	7.0	7249.0	0.0	15300.0	5.0
DSK 24' 4"	1981.0	5000.0	11500.0	0.0	7.0	7.0	6670.0	0.0	19300.0	5.0
DSK 24' 4"	1978.0	3500.0	9200.0	920.0	7.0	7.0	7978.1	0.0	19300.0	5.0
ROLL CULT	1982.0	2000.0	4200.0	0.0	7.0	7.0	1554.0	0.0	5200.0	5.0
ROLL CULT	1979.0	1500.0	3900.0	390.0	7.0	7.0	3174.9	0.0	5200.0	5.0
BN PLANT 8'	1976.0	4500.0	4371.0	437.0	7.0	7.0	3934.0	0.0	10250.0	5.0
BN PLANT 8'	1982.0	4500.0	7000.0	0.0	7.0	7.0	2590.0	0.0	10250.0	5.0
GRAIN CART	1981.0	3500.0	4718.0	0.0	7.0	7.0	2736.4	2.0	6800.0	5.0
GRAIN CART	1975.0	2000.0	1320.0	132.0	7.0	7.0	1188.0	2.0	6800.0	5.0
LD PL 16X60	1978.0	7376.0	7600.0	760.0	7.0	7.0	6590.6	0.0	17500.0	5.0
LD PL 16X60	1977.0	3000.0	8000.0	800.0	7.0	7.0	7200.0	0.0	17500.0	5.0
LEVEE BOXES	1982.0	6000.0	7500.0	0.0	7.0	7.0	2775.0	0.0	11250.0	5.0
LEVEE PLOW	1981.0	1547.0	1563.0	0.0	7.0	7.0	906.5	2.0	2800.0	5.0
LEVEE PUSH	1981.0	700.0	2100.0	0.0	7.0	7.0	1218.0	2.0	2500.0	5.0
LEVEE ROLLER	1978.0	350.0	350.0	35.0	7.0	7.0	303.5	2.0	650.0	5.0
FLD CUL 31'	1982.0	5500.0	7900.0	0.0	7.0	7.0	2923.0	0.0	9800.0	5.0
FLD CUL 31'	1981.0	4500.0	7100.0	0.0	7.0	7.0	4118.0	0.0	9800.0	5.0
FLD CUL 25	1978.0	2500.0	5800.0	580.0	7.0	7.0	5029.7	0.0	9800.0	5.0
BEDDER & ROW	1976.0	1036.0	1100.0	110.0	7.0	7.0	990.0	0.0	5400.0	5.0
BEDDER & ROW	1979.0	1500.0	3500.0	350.0	7.0	7.0	2849.2	0.0	5400.0	5.0
PIPE HARROW	1979.0	1000.0	1020.0	102.0	7.0	7.0	830.3	0.0	2100.0	5.0
PIPE HARROW	1980.0	1100.0	1600.0	160.0	7.0	7.0	1183.5	0.0	2100.0	5.0
DU-ALL	1978.0	3500.0	8600.0	860.0	7.0	7.0	7457.8	0.0	11500.0	5.0
MISC TRUCKS	1977.0	50000.0	60000.0	6000.0	7.0	0.0	52031.4	2.0	90000.0	5.0

SUMMARY OF CROP ENTERPRISE COSTS

	SEED	FERT-LIME	CHEMICALS	FUEL-LUBE	REPAIRS	OTHER	HARVEST COST
			--$/ACRE--				$/YIELD UNIT
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	9.45	14.36	45.45	12.68	6.17	9.14	0.4500
FIRST RICE	33.90	51.00	67.56	18.60	6.76	79.20	1.2300
RATOON RICE	0.0	3.38	2.50	0.0	0.0	5.75	1.2300

MONTHLY LABOR REQUIREMENTS PER ACRE, BY CROP ENTERPRISE

	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1ST SOYBEANS	0.240	0.458	0.105	0.546	1.248	0.484	0.295	0.404	0.105	0.557	0.797	0.105
2ND SOYBEANS	0.240	0.458	0.105	0.546	1.248	0.484	0.295	0.404	0.105	0.557	0.797	0.105
FIRST RICE	0.275	0.387	1.380	0.516	1.730	1.191	1.273	0.977	0.294	0.111	0.156	0.222
RATOON RICE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.101	0.068	0.688	0.0	0.0

HOURS OF UNPAID FAMILY LABOR

AVAILABLE EACH MONTH	400.00	400.00	600.00	600.00	750.00	900.00	900.00	600.00	600.00	600.00	600.00	400.00

HOURS WORKED EACH MONTH BY A

FULL TIME EMPLOYEE	250.00	300.00	350.00	350.00	350.00	350.00	350.00	350.00	300.00	300.00	250.00	250.00

ANNUAL MEAN OR MODAL CROP YIELDS

	1984	1985	1986	1987	1988					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	23.69	24.17	24.67	25.17	25.68	0.0	0.0	0.0	0.0	0.0
FIRST RICE	46.17	52.31	56.04	56.61	57.18	0.0	0.0	0.0	0.0	0.0
RATOON RICE	1.94	1.96	1.98	2.00	2.02	0.0	0.0	0.0	0.0	0.0

ANNUAL MEAN OR MODAL CROP PRICES

	1984	1985	1986	1987	1988					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	6.33	7.45	7.92	8.01	8.34	0.0	0.0	0.0	0.0	0.0
FIRST RICE	9.25	9.78	10.14	10.56	11.02	0.0	0.0	0.0	0.0	0.0
RATOON RICE	8.62	9.10	9.43	9.82	10.25	0.0	0.0	0.0	0.0	0.0

CONSTRAINTS ON THE CROPMIX

	ACRES PLANTED YEAR 1	ACRES HARVESTED YEAR1	MINIMUM FRACTION OF MIX	MAXIMUM FRACTION OF MIX	LINKAGE TO DOUBLE CROP	NORMAL FRAC. ACRES HARVESTED
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	1097.00	1042.40	0.0	0.0	0.0	0.95
FIRST RICE	1097.00	1086.40	0.0	0.0	0.0	0.99
RATOON RICE	1097.00	1086.30	0.0	0.0	3.00	0.99

CROP SHARE LEASING BY CROP

LANDLORD SHARE OF RECEIPTS & COSTS

	CROP RECEIPTS	SEED COSTS	FERT & LIME	CHEMICAL COSTS	FUEL LUBE	MACHINERY REPAIRS	OTHER COSTS	CUSTOM WORK
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.1430	0.0	0.0	0.0	0.0	0.0	0.0	0.0790
FIRST RICE	0.5000	1.0000	0.3630	0.5000	0.0	0.0	0.8586	0.3370
RATOON RICE	0.5000	0.0	0.3630	0.5000	0.0	0.0	0.6087	0.3370

MARKETING STRATAGIES

	BEGINNING INVENTORY	FRACTION SOLD NEXT TAX YEAR	MONTH SOLD AFTER HARVEST	MONTH SOLD IN NEXT YEAR
1ST SOYBEANS	0.0	0.0	0.0	0.0
2ND SOYBEANS	3704.000	0.300	10.000	1.000
FIRST RICE	0.0	0.0	7.000	1.000
RATOON RICE	1053.500	1.000	10.000	1.000

SEASONAL PRICE INDEX

	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1ST SOYBEANS	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2ND SOYBEANS	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
FIRST RICE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
RATOON RICE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

FACTORED MATRIX FOR CROP YIELDS & PRICES

	1	2	3	4	5	6	7	8
CROP YIELDS								
1ST SOYBEANS	0.0	0.503	0.515	0.395	0.0	0.300	-0.418	-0.248
2ND SOYBEANS	0.0	0.503	0.515	0.395	0.0	0.300	-0.418	-0.248
FIRST RICE	0.0	0.0	0.732	0.285	0.0	0.030	0.177	-0.592
RATOON RICE	0.0	0.0	0.0	0.533	0.0	0.031	-0.101	-0.840
CROP PRICES								
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.951	-0.190	0.242
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.951	-0.190	0.242
FIRST RICE	0.0	0.0	0.0	0.0	0.0	0.0	0.492	0.871
RATOON RICE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000

CUMMULATIVE DISTRIBUTIONS OF DEVIATES ABOUT THE MEAN (OR TREND), EXPRESSED AS A FRACTION OF MEAN

	1	2	3	4	5	6	7	8	9	10
CROP YIELDS										
1ST SOYBEANS	-0.781	-0.530	-0.388	-0.284	-0.178	-0.085	0.032	0.152	0.310	0.970
2ND SOYBEANS	-0.789	-0.541	-0.378	-0.258	-0.133	-0.026	0.026	0.135	0.301	0.900
FIRST RICE	-0.427	-0.216	-0.160	-0.121	-0.077	-0.042	-0.004	0.034	0.121	0.368
RATOON RICE	-0.614	-0.317	-0.196	-0.126	-0.065	-0.023	0.024	0.085	0.186	0.792
CROP PRICES										
1ST SOYBEANS	-0.274	-0.236	-0.083	-0.052	-0.031	0.038	0.048	0.067	0.226	0.268
2ND SOYBEANS	-0.274	-0.236	-0.083	-0.052	-0.031	0.038	0.048	0.067	0.226	0.268
FIRST RICE	-0.416	-0.394	-0.222	-0.067	-0.025	0.129	0.171	0.206	0.211	0.419
RATOON RICE	-0.416	-0.394	-0.222	-0.067	-0.025	0.129	0.171	0.206	0.211	0.419

COVARIANCE MATRIX OF NET INCOMES FOR CROPS

	1	2	3	4
1ST SOYBEANS	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0

	1984	1985	1986	1987	1988
CCC LOAN RATES					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	5.02	5.02	5.02	5.02	5.02
FIRST RICE	8.33	8.33	8.33	8.33	8.33
RATOON RICE	8.03	8.03	8.03	8.03	8.03
INTEREST RATE FOR CCC LOANS	0.12	0.12	0.12	0.12	0.12
INTEREST RATE FOR FOR LOANS	0.12	0.12	0.12	0.12	0.12
OFF-FARM STORAGE COSTS FOR CROPS UNDER LOAN					
1ST SOYBEANS	0.30	0.31	0.33	0.34	0.36
2ND SOYBEANS	0.30	0.31	0.33	0.34	0.36
FIRST RICE	0.50	0.52	0.55	0.57	0.60
RATOON RICE	0.50	0.52	0.55	0.57	0.60
TARGET PRICES, IF THEY ARE NOT TIED TO LOAN RATES					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	12.23	12.23	12.23	12.23	12.23
RATOON RICE	11.93	11.93	11.93	11.93	11.93
FLEXIBLE TARGET PRICE---FRACTION OF TARGET PRICE TO LOAN RATE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
DIRECT "FOR" ENTRY PRICE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
ACTUAL YIELDS LAST 5 YEARS FOR CALCULATING FARM PROGRAM YIELDS					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	30.00	32.00	17.00	10.00	6.00
FIRST RICE	41.86	38.83	44.45	49.61	48.32
RATOON RICE	2.12	1.65	1.68	1.92	1.94
ACTUAL LAGGED PRICES FOR 4 YEARS USED FOR FLEXIBLE LOAN RATES					
1ST SOYBEANS	0.0	0.0	0.0	0.0	
2ND SOYBEANS	0.0	0.0	0.0	0.0	
FIRST RICE	0.0	0.0	0.0	0.0	
RATOON RICE	0.0	0.0	0.0	0.0	
PROGRAM (OR BASE) ACREAGE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	1097.00	1097.00	1097.00	1097.00	1097.00
FIRST RICE	1097.00	1097.00	1097.00	1097.00	1097.00
RATOON RICE	1097.00	1097.00	1097.00	1097.00	1097.00
NATIONAL ALLOCATION FACTOR					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	1.00	1.00	1.00	1.00	1.00
RATOON RICE	1.00	1.00	1.00	1.00	1.00
ACREAGE SET ASIDE, DIVERSION OR LIMITATION (FRACTION)					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.25	0.35	0.25	0.25	0.25
RATOON RICE	0.25	0.35	0.25	0.25	0.25
SLIPPAGE RATE (FRACTION)					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.20	0.20	0.20	0.20	0.20
RATOON RICE	0.20	0.20	0.20	0.20	0.20
PAYMENT RATE FOR ACREAGE DIVERSION					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	71.19	33.62	35.06	36.56
RATOON RICE	0.0	0.0	0.0	0.0	0.0
TRIGGER PRICE FOR THE "FOR"					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
CALL PRICE FOR THE "FOR"					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
LENGTH OF FARMER OWNED RESERVE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
STORAGE PAYMENT RATE FOR THE "FOR"					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
PRODUCTION GUARANTEE FOR CROP INSURANCE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	13.65	13.92	14.20	14.49	14.78
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
PRICE ELECTION FOR CROP INSURANCE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	6.50	7.73	8.22	8.29	8.62
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
PREMIUM RATE PER ACRE FOR CROP INSURANCE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	9.13	11.08	12.01	12.36	13.11
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
LOAN RATE FOR PEANUTS UNDER QUOTE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
LOAN RATE FOR PEANUTS NOT UNDER QUOTA					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0

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    RATOON RICE                      0.0        0.0        0.0        0.0        0.0

FARM"S POUNDAGE QUOTE FOR PEANUTS
    1ST SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    2ND SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    FIRST RICE                       0.0        0.0        0.0        0.0        0.0
    RATOON RICE                      0.0        0.0        0.0        0.0        0.0

ACREAGE ALLOTMENT FOR RICE
    1ST SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    2ND SOYBEAHS                     0.0        0.0        0.0        0.0        0.0
    FIRST RICE                       0.0        0.0        0.0        0.0        0.0
    RATOON RICE                      0.0        0.0        0.0        0.0        0.0

FRACTION TARGET PRICE FOR LOW YIELD PAYMENT
    1ST SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    2ND SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    FIRST RICE                       0.0        0.0        0.0        0.0        0.0
    RATOON RICE                      0.0        0.0        0.0        0.0        0.0

FRACTION TARGET PRICE FOR PREVENTED PLANTING PAYMENT
    1ST SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    2ND SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    FIRST RICE                       0.0        0.0        0.0        0.0        0.0
    RATOON RICE                      0.0        0.0        0.0        0.0        0.0

FRACTION PROVEN YIELD FOR LOW YIELD PAYMENT
    1ST SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    2ND SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    FIRST RICE                       0.0        0.0        0.0        0.0        0.0
    RATOON RICE                      0.0        0.0        0.0        0.0        0.0

FRACTION PROVEN YIELD FOR PREVENTED PLANTING
    1ST SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    2ND SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    FIRST RICE                       0.0        0.0        0.0        0.0        0.0
    RATOON RICE                      0.0        0.0        0.0        0.0        0.0

PARITY PRICE
    1ST SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    2ND SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    FIRST RICE                       0.0        0.0        0.0        0.0        0.0
    RATOON RICE                      0.0        0.0        0.0        0.0        0.C

FRACTION OF CROP ELIGIBLE FOR MKTG CERTIFICATE
    1ST SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    2ND SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    FIRST RICE                       0.0        0.0        0.0        0.0        0.0
    RATOON RICE                      0.0        0.0        0.0        0.0        0.0

PAYMENT LIMITATION FOR
  INCOME SUPPORT PAYMENTS      100000.00 100000.00 100000.00 100000.00 100000.00
  DISASTER PAYMENTS            100000.00 100000.00 100000.00 100000.00 100000.00

MAXIMUM NONRECOURSE CCC LOAN
    1ST SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    2ND SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    FIRST RICE                       0.0        0.0        0.0        0.0        0.0
    RATOON RICE                      0.0        0.0        0.0        0.0        0.0

PERCENT BASE PRODUCTION ELIGIBLE FOR DEFICIENCY PAYMENT
                                     0.0        0.0        0.0        0.0        0.0

MAXIMUM VALUE OF CROP ELIGIBLE FOR DEFICIENCY PAYMENT
                                     0.0        0.0        0.0        0.0        0.0


FLEXIBLE LOAN RATE FORMULAS
                      NO. OF YEARS  DROP LOW   DROP HIGH  FRACTION OF MEAN
    1ST SOYBEANS                     0.0        0.0        0.0        0.0
    2ND SOYBEANS                     0.0        0.0        0.0        0.0
    FIRST RICE                       0.0        0.0        0.0        0.0
    RATOON RICE                      0.0        0.0        0.0        0.0
** A 1.0 INDICATES DELETING THE LOW OR HIGH

MARKETING LOAN RATES
    1ST SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    2ND SOYBEANS                     0.0        0.0        0.0        0.0        0.0
    FIRST RICE                       0.0        0.0        0.0        0.0        0.0
    RATOON RICE                      0.0        0.0        0.0        0.0        0.0

MAXIMUM MKTG LOAN BASE               0.0        0.0        0.0        0.0        0.0

SCALE FARM PROGRAM BENEFITS TO FARM SIZE

    FARMS LARGER THAN      0. ACRES ARE NOT ELIGIBLE FOR ANY FARM PROGRAM

    FARMS LARGER THAN      0. ACRES ARE ONLY ELIGIBLE FOR THE CROP INSURANCE PROGRAM

    FARMS WITH CROP SALES GREATER THAN $      0. ARE NOT ELIGIBLE FOR ANY FARM PROGRAM BENEFITS

    FARMS WITH CROP SALES GREATER THAN $      0. ARE ONLY ELIGIBLE FOR THE CROP INSURANCE PROGRAM

HISTORY OF FCIC PARTICIPATION

    NUMBER OF YEARS IN THE PROGRAM   3.00

    NUMBER OF LOSS YEARS IN PROGRAM      2.00

    TOTAL FCIC INSURANCE PREMIUMS PAID BY FARM  24243.70

    TOTAL FCIC INDEMNITY PAYMENTS RECEIVED  83638.37




              THE END OF ALL INPUT DATA
   1   1TOTAL DEPREC & THIS YEARS DEPREC    2662.4     2662.4
MACHINE   1      7.00  33474.00  39798.00   3980.00    9318.51  4000.00       0.0  33474.00      0.0  33141.92
                 0.0       0.0       7.00  39798.00   2662.43       0.0       0.0   1980.00     5.00      0.0
              61700.00      5.00       0.0
   1   2TOTAL DEPREC & THIS YEARS DEPREC    4233.2     1570.8
MACHINE   2      7.00  31769.00  33568.00   3357.00    5497.71  4000.00       0.0  31769.00      0.0  29641.06
                 0.0       0.0       7.00  33568.00   1570.77       0.0       0.0   1979.00     5.00      0.0
              61700.00      5.00       0.0
   1   3TOTAL DEPREC & THIS YEARS DEPREC   19217.5    14984.3
MACHINE   3      7.00  61700.00  61700.00       0.0   52445.00       0.0       0.0  61700.00      0.0  24239.28
                 0.0       0.0       7.00  61700.00  14984.29       0.0       0.0   1983.00     2.00      0.0
              61700.00      5.00       0.0
   1   4TOTAL DEPREC & THIS YEARS DEPREC   19217.5        0.0
MACHINE   4      7.00   7717.00  10087.00   1009.00    1009.00  2017.40       0.0   7717.00      0.0   9078.00
                 0.0       0.0       7.00  10087.00      0.00       2.00       0.0   1975.00    10.00      0.0
              19900.00      5.00       0.0
   1   5TOTAL DEPREC & THIS YEARS DEPREC   20407.5     1190.0
MACHINE   5      7.00  34945.00  52475.00   5248.00    6437.98  4000.00       0.0  34945.00      0.0  47227.00
                 0.0       0.0       7.00  52475.00   1189.98       0.0       0.0   1978.00     7.00      0.0
              94800.00      5.00       0.0
   1   6TOTAL DEPREC & THIS YEARS DEPREC   38631.1     8955.4
MACHINE   6      7.00  50897.00  74628.00   7462.80   31343.76       0.0       0.0  50897.00      0.0  52239.80
                 0.0       0.0       7.00  74628.00   8955.36       0.0       0.0   1981 00     4.00
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SUMMARY OF PROGRAM OPTIONS SELECTED BY THE USER
     RESULTS FROM SR ROTATION, LIBERTY COUNTY. FINAL ANALYSIS.
     MULTIVARIATE EMPIRICAL DISTRIBUTIONS USED FOR PRICES
     AND YIELDS. WHOLLY LEASED FARM ACREAGE, 50% LONG TERM AND 40%
     INTERMEDIATE DEBT. SUPERIOR MANAGEMENT. CROP INSURANCE, 50 G PAYMENT LIMIT.
     1/7 CROP SHARE ON SOYBEANS AND RICE. STOCHASTIC RUN, 5 YRS, 50 ITERATIONS.

SIMULATE THE REPRESENTATIVE FARM FOR 5 YEARS
FIRST YEAR TO BE SIMULATED IS 1984.
THE SIMULATION WILL BE DETERMINISTIC
PRINT ALL INPUT DATA AND ALL OUTPUT TABLES
THE REPRESENTATIVE FARM HAS 4 CROPS AND 0 LIVESTOCK ENTERPRISES
PAYOFF OUTSTANDING LOANS USING SURPLUS CASH
NO SPECIAL FINANCIAL BAILOUT PROGRAM IS IN EFFECT
ADJUST INCOME TAX SCHEDULE AFTER 1984 FOR CHANGES IN THE CPI
FIXED PORTION OF CROPS SOLD IN T AND CCC LOAN USED FOR THE REMAINDER
NO MAXIMUM ON ANNUAL INTEREST DEDUCTIONS IS IN PLACE
THE CROP MIX WILL BE CONSTANT OVER TIME
DEPRECIATION ON OLD MACHINERY WILL BE CALCULATED BY THE DECLINING BALANCE METHOD
USE THE FEDERAL INCOME TAX PROVISIONS FOR 1982
MACHINERY PURCHASED AFTER 1980 WILL BE RECOVERED USING AN ACCELERATED SCHEDULE
THE USER HAS ELECTED TO REDUCE BASIS FOR INVESTMENT TAX CREDIT
THE FARM HAS ELECTED NOT TO TAKE FIRST YEAR EXPENSING ON PURCHASES OF MACHINERY
THERE ARE 37 PIECES OF OWNED FARM MACHINERY TO BE DEPRECIATED
OLD FARM MACHINERY WILL BE TRADED IN RATHER THAN BE SOLD
USER HAS SPECIFIED THE FAMILY CONSUMPTION FUNCTION FOR REGION   6
THE FARM MAY NOT SELL CROPLAND TO AVOID INSOLVENCY
CROPLAND WILL BE LEASED USING A CROP SHARE SCHEME SPECIFIED BY THE USER
ANNUAL INFLATION RATES FOR FARMLAND ARE PROVIDED BY THE USER
THE FARM WILL NOT BE ALLOWED TO GROW OVER TIME
INFORMATION FOR   0 ALTERNATIVE FARMS IS PROVIDED BY THE USER
AN UNLIMITED NONRECOURSE LOAN (PRICE SUPPORT PROGRAM WILL BE IN EFFECT
DO NOT PAY INTEREST ON NONREDEEMED NONRECOURSE CCC LOANS
LOAN RATES ARE FIXED BY THE ANALYST IN ALL YEARS
INTEREST ON FOR LOANS WILL BE CHARGED ANNUALLY FOR 1 YEARS
A TARGET PRICE PROGRAM WILL BE IN EFFECT AND TARGET PRICES ARE FIXED
AN ALL-RISK CROP INSURANCE PROGRAM IS IN EFFECT
A MANDATORY SET-ASIDE OR VOLUNTARY DIVERSION PROGRAM WILL BE IN EFFECT
PAYMENT LIMITATIONS ARE IN EFFECT FOR DEFICIENCY PAYMENTS, DIVERSION PAYMENTS & DISASTER PAYMENTS
ALL FARMS ARE ELIGIBLE FOR ALL FARM PROGRAM BENEFITS

     RESULTS FROM SR ROTATION, LIBERTY COUNTY. FINAL ANALYSIS.
     MULTIVARIATE EMPIRICAL DISTRIBUTIONS USED FOR PRICES
     AND YIELDS. WHOLLY LEASED FARM ACREAGE, 50% LONG TERM AND 40%
     INTERMEDIATE DEBT. SUPERIOR MANAGEMENT. CROP INSURANCE, 50 G PAYMENT LIMIT.
     1/7 CROP SHARE ON SOYBEANS AND RICE. STOCHASTIC RUN, 5 YRS, 50 ITERATIONS.

CROPLAND ON INITIAL FARM
   TOTAL CROPLAND ACRES OWNED   10.0000
   TOTAL CROPLAND ACRES LEASED   2300.0000
   PASTURELAND ACRES OWNED   0.0
   PASTURELAND ACRES LEASED   0.0
   FRACTION CROPLAND THAT IS TILLABLE   0.9500
   FRACTION CROPLAND THAT IS IRRIGATED   0.5300

INITIAL BALANCE SHEET FOR THE FARM
 ASSETS
   MARKET VALUE OF CROPLAND & FARMSTEAD   12000.0000
   MARKET VALUE OF BUILDINGS   155000.000
     TOTAL VALUE OF OWNED CROPLAND & BUILDINGS   167000.000
   MARKET VALUE OF OFF-FARM INVESTMENTS   20000.0000
   BEGINNING CASH RESERVE   5000.0000
   MARKET VALUE OF OWNED PASTURELAND   0.0
   MARKET VALUE OF ALL FARM MACHINERY   585202.000
   MARKET VALUE OF ALL LIVESTOCK   0.0
     TOTAL VALUE OF ASSETS   757202.000
 LIABILITIES
   TOTAL REAL ESTATE DEBT   66800.0000
   TOTAL INTERMEDIATE-TERM DEBT   226081.000
   INCOME TAXES DUE IN YEAR 1   0.0
   SELF EMPLOYMENT TAXES DUE IN YEAR 1   0.0
     TOTAL DEBT   292881.000

     BEGINNING NET WORTH (MARKET VALUE)   464321.000

INITIAL FINANCIAL RATIOS FOR THE FARM
   EQUITY TO ASSETS RATIO   0.6132
   DEBT TO ASSET RATIO   0.3868
   LEVERAGE RATIO   0.6308

   AVERAGE PER ACRE VALUE OF CROPLAND   1200.0000
   AVERAGE PER ACRE VALUE OF PASTURELAND   0.0

LIABILITIES FOR INITIAL FARM
   REAL ESTATE DEBT   66800.0000
   LOAN LIFE ON DEBT   30.0000
   FRACTION LAND LOAN REMAINING   0.5000
   ORIGINAL AMOUNT OF THE LOAN   133600.000
   DEBT TO ASSET RATIO   0.4000

   INTERMEDIATE TERM DEBT   226081.000
   LOAN LIFE ON DEBT   5.0000
   FRACTION LOAN REMAINING   0.5000
   ORIGINAL AMOUNT OF THE LOAN   452162.000
   DEBT TO ASSET RATIO   0.4000

OPERATING LOAN
   FRACTION OF YEAR LOAN IS USED   0.3890

TERMS FOR NEW LOANS
   NO. YEARS FOR NEW LAND LOANS   30.0000
   NO. YEARS FOR NEW MACH LOANS   5.0000

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MINIMUM INTERMEDIATE TERM EQUITY                           0.3333

INFORMATION FOR REFINANCING DEBTS
   CHARGE TO REFINANCE CASH FLOW DEFICITS                  0.0100
   NO  YEARS FOR A LONG-TERM LOAN                         20.0000
   NO. YEARS FOR INTERM-TERM LOAN                          5.0000

MINIMUM DOWNPAYMENT LEVELS
   MINIMUM DOWNPAYMENT FOR FARM MACHINERY                  0.3000
   MINIMUM DOWNPAYMENT FOR FARMLAND                        0.3000

   AFTER-TAX DISCOUNT RATE                                 0.1011
   ANNUAL RATE OF RETURN TO PROD ASSETS T-1                0.0
   CAPITAL GAIN RATE FOR LAND IN T-1                       0.0400

CASH R2SERVE FOR THE FARM
   MINIMUM CASH RESERVE                                 5000.0000
   BEGINNING CASH RESERVE                               5000.0000

CAPITAL ASSETS TO BE RECOVERED (DEPRECIATED)
 BUILDINGS PLACED INTO USE PRIOR TO 1981
   SALVAGE VALUE                                       10500.0000
   PURCHASE PRICE                                     105000.000
   ECONOMIC (DEPRECIATION) LIFE                           30.0000
 REGULAR BUILCINGS PLACED INTO USE AFTER 1980
   PURCHASE PRICE                                          0.0
   CALENDAR YEAR PURCHASED                                 0.0
 SPECIAL PURPOSE BUILDINGS PLACED INTO USE AFTER 1980
   PURCHASE PRICE                                          0.0
   CALENDAR YEAR PURCHASED                                 0.0

FIXED COSTS
   PROPERTY TAX RATE (STAX/SVALUE)                         0.003330
   TOTAL PERSONAL PROPERTY TAX                             0.0
   OTHER TAXES                                             0.0
   ACCOUNTANT & LEGAL FEES                              3000.0000
   UNALLOCATED MAINTENANCE COSTS                           0.0
   INSURANCE ON MACHINERY                               3200.0000
   MISCELLANEOUS FIXED COSTS                            5000.0000

LAND LEASE COSTS
   CASH RENT FOR CROPLAND (S/ACRE)                         0.0
   CASH RENT FOR PASTURELAND (S/ACRE)                      0.0
   ANNUAL INFLATION RATE FOR
    PER ACRE CASH LEASE COST                               0.0
   CAPITALIZATION RATE BETWEEN
    LAND VALUE & CROPLAND CASH LEASE COST                  0.0

FAMILY CONSUMPTION AND TAX INFORMATION
   AGE OF OPERATOR                                        45.0000
   NO. OF TAX EXEMPTIONS CLAIMED                           5.0000
   MARGINAL TAX RATE FOR STATE                             0.0
   RATIO OF PERSONAL DEDUC TO NET INCOME                   0.2000
   DESIRED TAXABLE INCOME                                  0.0

   AVERAGE ANNUAL OFF-FARM INCOME                          0.0
   NON-TAXABLE OFF-FARM INCOME                         16000.0000

   ANNUAL RETURN ON OFF-FARM INVEST                        0.1100

   MINIMUM FAMILY LIVING EXPENSES                      18000.0000
   MAXIMUM FAMILY LIVING EXPENSES                      25000.0000

   USER"S SPECIFIED CONSUMPTION FUNCTION USED IF THE OPTION IS ELECTED

   CONSUMPTION =      0.0 +   0.0   * (DISPOSIBLE INCOME -      0.0 )


   INCOME TAX PAYMENT DUE IN YEAR 1                        0.0
   SELF-EMPLOYMENT TAX PAYMENT DUE IN YEAR 1               0.0
   TAXABLE INCOME IN YEAR T-3                              0.0
   TAXABLE INCOME IN YEAR T-2                              0.0
   TAXABLE INCOME IN YEAR T-1                              0.0

   MAXIMUM INTEREST DEDUCTION IF OPTION IS USED            0.0

   RISK AVERSION COEFFICIENT                               0.0


HIRED FARM LABOR
   NO. OF FULL TIME EMPLOYEES                              3.0000
   ANNUAL GROSS SALARY FOR FULL-TIME EMPLOYEE          13800.0000
   HOURLY WAGE RATE FOR PART-TIME LABOR                    3.3500
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ANNUAL INTEREST RATES	1984	1985	1986	1987	1988					
OLD LONG-TERM LOANS	0.1175	0.1175	0.1175	0.1175	0.1175	0.0	0.0	0.0	0.0	0.0
OLD INTERMEDIATE-TERM LOANS	0.1500	0.1500	0.1500	0.1500	0.1500	0.0	0.0	0.0	0.0	0.0
NEW LONG-TERM LOANS	0.1310	0.1170	0.1090	0.1050	0.1050	0.0	0.0	0.0	0.0	0.0
NEW INTERMEDIATE-TERM LOANS	0.1480	0.1490	0.1410	0.1370	0.1370	9.0	0.0	0.0	0.0	0.0
REFINANCE LONG-TERM LOANS	0.1310	0.1170	0.1090	0.1050	0.1050	0.0	0.0	0.0	0.0	0.0
REFINANCE INTERM-TERM LOANS	0.1480	0.1490	0.1410	0.1370	0.1370	0.0	0.0	0.0	0.0	0.0
OPERATING LOANS	0.1520	0.1540	0.1560	0.1420	0.1420	0.0	0.0	0.0	0.0	0.0
RECEIVED FOR CASH RESERVES	0.1180	0.1183	0.1110	0.1070	0.1070	0.0	0.0	0.0	0.0	0.0

ANNUAL PERCENTAGE CHANGES IN SELECTED COSTS										
NEW FARM MACHINERY	0.0	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
USED FARM MACHINERY	0.0	0.0	0.0	0.0100	0.0100	0.0	0.0	0.0	0.0	0.0
FIXED COST, INS & TAX	0.0540	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
SEED COSTS	0.1145	0.0204	-0.1201	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
FERTILIZER & LIME	0.0744	0.0859	0.0631	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
CHEMICAL COSTS	0.0813	0.0985	0.0885	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
FUEL & LUBE COSTS	0.0540	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
REPAIRS ON MACHINERY	0.0540	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
OTHER PROD COST	0.0064	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
CUSTOM COSTS	0.0540	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
HIRED LABOR COSTS	0.0540	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0
OFF-FARM INVESTMENT	0.1180	0.1190	0.1110	0.1070	0.1070	0.0	0.0	0.0	0.0	0.0
PURCHASED INPUTS FOR LIVEST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FARMLAND VALUES	0.0710	0.0710	0.0710	0.0710	0.0710	0.0	0.0	0.0	0.0	0.0
BUILDING VALUES	-0.0200	-0.0200	-0.0200	-0.0200	-0.0200	0.0	0.0	0.0	0.0	0.0
OFF-FARM STORAGE COSTS	0.0	0.0470	0.0450	0.0480	0.0500	0.0	0.0	0.0	0.0	0.0

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OTHER ANNUAL DATA FOR THE FARM	1984	1985	1986	1987	1988					
NEW CAPITAL INVESTED IN FAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CONSUMER PRICE INDEX	310.60	323.90	339.00	356.20	374.00	0.0	0.0	0.0	0.0	0.0
OTHER FARM INCOME	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SELF EMPLOYMENT TAX RATE	0.140	0.141	0.143	0.143	0.150	0.0	0.0	0.0	0.0	0.0
MAXIMUM INCOME SUBJUCT TO SELF EMPLOYMENT TAX	37209.00	38803.00	40612.00	42672.00	44805.00	0.0	0.0	0.0	0.0	0.0

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SUMMARY OF THE OWNED MACHINERY COMPLEMENT
                       CURRENT   ORIGINAL  ESTIMATED DEPRECI-              ACCUM.    MACHINERY   CURRENT    COST
              YEAR     MARKET    PURCHASE  SALVAGE   ATION     ECONOMIC  RECOVERY  REPLACEMENT REPLACE.   RECOVERY
              PURCHASEC VALUE    PRICE     VALUE     LIFE      LIFE      (DEPREC.)  CODE       COST       PERIOD OR CLASS
TRACTOR156HP  1980.0   33474.0   39798.0   3980.0    7.0       7.0       30479.5    0.0        61700.0    5.0
TRACTOR156HP  1979.0   31769.0   33568.0   3357.0    7.0       7.0       28070.3    0.0        61700.0    5.0
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TRACTOR 65HP	1975.0	7717.0	10087.0	1009.0	7.0	7.0	9078.0	2.0	19900.0	5.0
TRCTR 226HP	1978.0	34945.0	52475.0	5248.0	7.0	7.0	46037.0	0.0	94800.0	5.0
TRCTR 229HP	1981.0	50897.0	74628.0	7462.8	7.0	7.0	43284.2	0.0	94800.0	5.0
COMBINE 7720	1979.0	51909.0	53886.0	5389.0	7.0	7.0	43866.7	0.0	94000.0	5.0
COMBINE 7720	1983.0	94000.0	94000.0	0.0	7.0	7.0	14100.0	0.0	94000.0	5.0
COMBINE 7720	1980.0	55882.0	61881.0	8188.0	7.0	7.0	45772.9	0.0	94000.0	5.0
PCKUP 1/2TON	1983.0	9000.0	9000.0	0.0	7.0	7.0	1350.0	0.0	9000.0	5.0
PCKUP 1/2TON	1978.0	3425.0	4538.0	454.0	7.0	7.0	3935.3	0.0	9000.0	5.0
PCKUP 1/2TON	1976.0	2375.0	3876.0	388.0	7.0	7.0	3488.0	2.0	9000.0	5.0
DSK 22' 9"	1982.0	7500.0	11500.0	0.0	7.0	7.0	4255.0	0.0	15300.0	5.0
DSK 22' 9"	1980.0	4500.0	9800.0	980.0	7.0	7.0	7249.0	0.0	15300.0	5.0
DSK 24' 4"	1981.0	5000.0	11500.0	0.0	7.0	7.0	8670.0	0.0	19300.0	5.0
DSK 24' 4"	1978.0	3500.0	9200.0	920.0	7.0	7.0	7978.1	0.0	19300.0	5.0
ROLL CULT	1982.0	2000.0	4200.0	0.0	7.0	7.0	1554.0	0.0	5200.0	5.0
ROLL CULT	1979.0	1500.0	3900.0	390.0	7.0	7.0	3174.9	0.0	5200.0	5.0
BN PLANT 8'	1975.0	4500.0	4371.0	437.0	7.0	7.0	3934.0	0.0	10250.0	5.0
BN PLANT 8'	1982.0	4500.0	7000.0	0.0	7.0	7.0	2590.0	0.0	10250.0	5.0
GRAIN CART	1981.0	3500.0	4718.0	0.0	7.0	7.0	2736.4	2.0	5800.0	5.0
GRAIN CART	1975.0	2000.0	1320.0	132.0	7.0*	7.0	1188.0	2.0	5800.0	5.0
LD PL 16X60	1978.0	7376.0	7600.0	760.0	7.0	7.0	8590.6	0.0	17500.0	5.0
LD PL 16X60	1977.0	3000.0	8000.0	800.0	7.0	7.0	7200.0	0.0	17500.0	5.0
LEVEE BOXES	1982.0	6000.0	7500.0	0.0	7.0	7.0	2775.0	0.0	11250.0	5.0
LEVEE PLOW	1981.0	1547.0	1563.0	0.0	7.0	7.0	906.5	2.0	2800.0	5.0
LEVEE PUSH	1981.0	700.0	2100.0	0.0	7.0	7.0	1218.0	2.0	2500.0	5.0
LEVEE ROLLER	1978.0	350.0	350.0	35.0	7.0	7.0	303.5	2.0	650.0	5.0
FLD CUL 31'	1982.0	5500.0	7900.0	0.0	7.0	7.0	2923.0	0.0	9800.0	5.0
FLD CUL 31'	1981.0	4500.0	7100.0	0.0	7.0	7.0	4118.0	0.0	9800.0	5.0
FLD CUL 25	1978.0	2500.0	5800.0	580.0	7.0	7.0	5029.7	0.0	9800.0	5.0
BEDDER & ROW	1978.0	1036.0	1100.0	110.0	7.0	7.0	990.0	0.0	5400.0	5.0
BEDDER & ROW	1979.0	1500.0	3500.0	350.0	7.0	7.0	2849.2	0.0	5400.0	5.0
PIPE HARROW	1979.0	1000.0	1020.0	102.0	7.0	7.0	830.3	0.0	2100.0	5.0
PIPE HARROW	1980.0	1100.0	1600.0	180.0	7.0	7.0	1183.5	0.0	2100.0	5.0
DU-ALL	1978.0	3500.0	8600.0	860.0	7.0	7.0	7457.8	0.0	11500.0	5.0
MISC TRUCKS	1977.0	50000.0	60000.0	8000.0	7.0	0.0	52031.4	2.0	90000.0	5.0

INFORMATION FOR INITIAL FARM   2310. ACRES--

SUMMARY OF CROP ENTERPRISE COSTS

	SEED	FERT-LIME	CHEMICALS	FUEL-LUBE	REPAIRS	OTHER	HARVEST COST
			--$/ACRE--				$/YIELD UNIT
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	9.45	14.36	45.45	12.68	6.17	9.14	0.4500
FIRST RICE	33.90	51.00	67.56	18.60	6.76	79.20	1.2300
RATOON RICE	0.0	3.38	2.50	0.0	0.0	5.75	1.2300

MONTHLY LABOR REQUIREMENTS PER ACRE, BY CROP ENTERPRISE

	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1ST SOYBEANS	0.240	0.458	0.105	0.546	1.248	0.484	0.295	0.404	0.105	0.557	0.797	0.105
2ND SOYBEANS	0.240	0.458	0.105	0.546	1.248	0.484	0.295	0.404	0.105	0.557	0.797	0.105
FIRST RICE	0.275	0.387	1.380	0.516	1.730	1.191	1.273	0.977	0.294	0.111	0.156	0.222
RATOON RICE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.101	0.068	0.688	0.0	0.0

HOURS OF UNPAID FAMILY LABOR

AVAILABLE EACH MONTH	400.00	400.00	600.00	800.00	750.00	900.00	900.00	800.00	600.00	600.00	600.00	400.00

HOURS WORKED EACH MONTH BY A

FULL TIME EMPLOYEE	250.00	300.00	350.00	350.00	350.00	350.00	350.00	350.00	300.00	300.00	250.00	250.00

ANNUAL MEAN OR MODAL CROP YIELDS

	1984	1985	1986	1987	1988					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	23.69	24.17	24.67	25.17	25.68	0.0	0.0	0.0	0.0	0.0
FIRST RICE	46.17	52.31	56.04	56.61	57.18	0.0	0.0	0.0	0.0	0.0
RATOON RICE	1.94	1.96	1.98	2.00	2.02	0.0	0.0	0.0	0.0	0.0

ANNUAL MEAN OR MODAL CROP PRICES

	1984	1985	1986	1987	1988					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	6.33	7.45	7.92	8.01	8.34	0.0	0.0	0.0	0.0	0.0
FIRST RICE	9.28	9.78	10.14	10.56	11.02	0.0	0.0	0.0	0.0	0.0
RATOON RICE	8.62	9.10	9.43	9.82	10.25	0.0	0.0	0.0	0.0	0.0

CONSTRAINTS ON THE CROPMIX

	ACRES PLANTED YEAR 1	ACRES HARVESTED YEAR1	MINIMUM FRACTION OF MIX	MAXIMUM FRACTION OF MIX	LINKAGE TO DOUBLE CROP	NORMAL FRAC. ACRES HARVESTED
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	1097.00	1042.40	0.0	0.0	0.0	0.95
FIRST RICE	1097.00	1086.40	0.0	0.0	0.0	0.99
RATOON RICE	1097.00	1086.30	0.0	0.0	3.00	0.99

CROP SHARE LEASING BY CROP

		LANDLORD SHARE OF RECEIPTS & COSTS						
	CROP RECEIPTS	SEED COSTS	FERT & LIME	CHEMICAL COSTS	FUEL & LUBE	MACHINERY REPAIRS	OTHER COSTS	CUSTOM WORK
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.1430	0.0	0.0	0.0	0.0	0.0	0.0	0.0790
FIRST RICE	0.1430	0.0	0.0	0.0	0.0	0.0	0.0	0.0790
RATOON RICE	0.1430	0.0	0.0	0.0	0.0	0.0	0.0	0.0790

MARKETING STRATAGIES

	BEGINNING INVENTORY	FRACTION SOLD NEXT TAX YEAR	MONTH SOLD AFTER HARVEST	MONTH SOLD IN NEXT YEAR
1ST SOYBEANS	0.0	0.0	0.0	0.0
2ND SOYBEANS	6349.199	0.300	10.000	1.000
FIRST RICE	0.0	0.0	7.000	1.000
RATOON RICE	1806.000	1.000	10.000	1.000

SEASONAL PRICE INDEX

	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1ST SOYBEANS	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2ND SOYBEANS	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
FIRST RICE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
RATOON RICE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

FACTORED MATRIX FOR CROP YIELDS & PRICES

	1	2	3	4	5	6	7	8
CROP YIELDS								
1ST SOYBEANS	0.0	0.503	0.515	0.395	0.0	0.300	-0.418	-0.248
2ND SOYBEANS	0.0	0.503	0.515	0.395	0.0	0.300	-0.418	-0.248
FIRST RICE	0.0	0.0	0.732	0.285	0.0	0.030	0.177	-0.592
RATOON RICE	0.0	0.0	0.0	0.533	0.0	0.031	-0.101	-0.840
CROP PRICES								
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.951	-0.190	0.242
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0	0.951	-0.190	0.242
FIRST RICE	0.0	0.0	0.0	0.0	0.0	0.0	0.492	0.871
RATOON RICE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000

CUMMULATIVE DISTRIBUTIONS OF DEVIATES ABOUT THE MEAN (OR TREND), EXPRESSED AS A FRACTION OF MEAN

	1	2	3	4	5	6	7	8	9	10
CROP YIELDS										
1ST SOYBEANS	-0.781	-0.530	-0.388	-0.284	-0.178	-0.085	0.032	0.152	0.310	0.970
2ND SOYBEANS	-0.789	-0.541	-0.378	-0.258	-0.133	-0.028	0.026	0.135	0.301	0.900
FIRST RICE	-0.427	-0.216	-0.160	-0.121	-0.077	-0.042	-0.004	0.034	0.121	0.368
RATOON RICE	-0.614	-0.317	-0.198	-0.126	-0.065	-0.023	0.024	0.085	0.186	0.792
CROP PRICES										
1ST SOYBEANS	-0.274	-0.236	-0.083	-0.052	-0.031	0.038	0.048	0.067	0.226	0.288
2ND SOYBEANS	-0.274	-0.236	-0.083	-0.052	-0.031	0.038	0.048	0.067	0.226	0.288
FIRST RICE	-0.416	-0.394	-0.222	-0.067	-0.025	0.129	0.171	0.206	0.211	0.419
RATOON RICE	-0.416	-0.394	-0.222	-0.067	-0.025	0.129	0.171	0.206	0.211	0.419

COVARIANCE MATRIX OF NET INCOMES FOR CROPS

	1	2	3	4
1ST SOYBEANS	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0

SUMMARY OF POLICY DATA, BY YEAR AND BY CROP

	1984	1985	1986	1987	1988
CCC LOAN RATES					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	5.02	5.02	5.02	5.02	5.02
FIRST RICE	8.33	8.33	8.33	8.33	8.33
RATOON RICE	8.03	8.03	8.03	8.03	8.03
INTEREST RATE FOR CCC LOANS	0.12	0.12	0.12	0.12	0.12
INTEREST RATE FOR FOR LOANS	0.12	0.12	0.12	0.12	0.12
OFF-FARM STORAGE COSTS FOR CROPS UNDER LOAN					
1ST SOYBEANS	0.30	0.31	0.33	0.34	0.36
2ND SOYBEANS	0.30	0.31	0.33	0.34	0.36
FIRST RICE	0.50	0.52	0.55	0.57	0.60
RATOON RICE	0.50	0.52	0.55	0.57	0.60
TARGET PRICES, IF THEY ARE NOT TIED TO LOAN RATES					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	12.23	12.23	12.23	12.23	12.23
RATOON RICE	11.93	11.93	11.93	11.93	11.93
FLEXIBLE TARGET PRICE---FRACTION OF TARGET PRICE TO LOAN RATE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
DIRECT "FOR" ENTRY PRICE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0
ACTUAL YIELDS LAST 5 YEARS FOR CALCULATING FARM PROGRAM YIELDS					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	30.00	32.00	17.00	10.00	6.00
FIRST RICE	41.86	38.83	44.45	49.61	48.32
RATOON RICE	2.12	1.65	1.68	1.92	1.94
ACTUAL LAGGED PRICES FOR 4 YEARS USED FOR FLEXIBLE LOAN RATES					
1ST SOYBEANS	0.0	0.0	0.0	0.0	
2ND SOYBEANS	0.0	0.0	0.0	0.0	
FIRST RICE	0.0	0.0	0.0	0.0	
RATOON RICE	0.0	0.0	0.0	0.0	
PROGRAM (OR BASE) ACREAGE					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	1097.00	1097.00	1097.00	1097.00	1097.00
FIRST RICE	1097.00	1097.00	1097.00	1097.00	1097.00
RATOON RICE	1097.00	1097.00	1097.00	1097.00	1097.00
NATIONAL ALLOCATION FACTOR					
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	1.00	1.00	1.00	1.00	1.00
RATOON RICE	1.00	1.00	1.00	1.00	1.00
ACREAGE SET ASIDE, DIVERSION OR LIMITATION (FRACTION)					
1ST SOYBEANS	0.0	0.0	0.0	0.0	
2ND SOYBEANS	0.0	0.0	0.0	0.0	

RATOON RICE	0.25	0.35	0.25	0.25	0.25

SLIPPAGE RATE (FRACTION)
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.20	0.20	0.20	0.20	0.20
RATOON RICE	0.20	0.20	0.20	0.20	0.20

PAYMENT RATE FOR ACREAGE DIVERSION
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	71.19	33.62	35.05	36.56
RATOON RICE	0.0	0.0	0.0	0.0	0.0

TRIGGER PRICE FOR THE "FOR"
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

CALL PRICE FOR THE "FOR"
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

LENGTH OF FARMER OWNED RESERVE
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

STORAGE PAYMENT RATE FOR THE "FOR"
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

PRODUCTION GUARANTEE FOR CROP INSURANCE
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	13.65	13.92	14.20	14.49	14.78
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

PRICE ELECTION FOR CROP INSURANCE
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	8.50	7.73	8.22	8.29	8.62
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

PREMIUM RATE PER ACRE FOR CROP INSURANCE
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	9.13	11.08	12.01	12.36	13.11
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

LOAN RATE FOR PEANUTS UNDER QUOTE
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

LOAN RATE FOR PEANUTS NOT UNDER QUOTA
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

FARM"S POUNDAGE QUOTE FOR PEANUTS
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

ACREAGE ALLOTMENT FOR RICE
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

FRACTION TARGET PRICE FOR LOW YIELD PAYMENT
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

FRACTION TARGET PRICE FOR PREVENTED PLANTING PAYMENT
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

FRACTION PROVEN YIELD FOR LOW YIELD PAYMENT
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

FRACTION PROVEN YIELD FOR PREVENTED PLANTING
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

PARITY PRICE
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

FRACTION OF CROP ELIGIBLE FOR MKTG CERTIFICATE
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

PAYMENT LIMITATION FOR
INCOME SUPPORT PAYMENTS	100000.00	100000.00	100000.00	100000.00	100000.00
DISASTER PAYMENTS	100000.00	100000.00	100000.00	100000.00	100000.00

MAXIMUM NONRECOURSE CCC LOAN
1ST SOYBEANS	0.0	0.0	0.0	0.0	0.0
2ND SOYBEANS	0.0	0.0	0.0	0.0	0.0
FIRST RICE	0.0	0.0	0.0	0.0	0.0
RATOON RICE	0.0	0.0	0.0	0.0	0.0

PERCENT BASE PRODUCTION ELIGIBLE FOR DEFICIENCY PAYMENT
	0.0	0.0	0.0	0.0

MAXIMUM VALUE OF CROP ELIGIBLE FOR DEFICIENCY PAYMENT
	0.0	0.0	0.0	0.0

FLEXIBLE LOAN RATE FORMULAS
                        NO. OF YEARS DROP LOW DROP HIGH FRACTION OF MEAN
   1ST SOYBEANS   0.0   0.0   0.0   0.0
   2ND SOYBEANS   0.0   0.0   0.0   0.0
   FIRST RICE   0.0   0.0   0.0   0.0
   RATOON RICE   0.0   0.0   0.0   0.0
** A 1.0 INDICATES DELETING THE LOW OR HIGH

MARKETING LOAN RATES
   1ST SOYBEANS   0.0   0.0   0.0   0.0   0.0
   2ND SOYBEANS   0.0   0.0   0.0   0.0   0.0
   FIRST RICE   0.0   0.0   0.0   0.0   0.0
   RATOON RICE   0.0   0.0   0.0   0.0   0.0

MAXIMUM MKTG LOAN BASE   0.0   0.0   0.0   0.0   0.0

SCALE FARM PROGRAM BENEFITS TO FARM SIZE

   FARMS LARGER THAN   0. ACRES ARE NOT ELIGIBLE FOR ANY FARM PROGRAM

   FARMS LARGER THAN   0. ACRES ARE ONLY ELIGIBLE FOR THE CROP INSURANCE PROGRAM

   FARMS WITH CROP SALES GREATER THAN $ 0. ARE NOT ELIGIBLE FOR ANY FARM PROGRAM BENEFITS

   FARMS WITH CROP SALES GREATER THAN $ 0. ARE ONLY ELIGIBLE FOR THE CROP INSURANCE PROGRAM

HISTORY OF FCIC PARTICIPATION

   NUMBER OF YEARS IN THE PROGRAM   3.00

   NUMBER OF LOSS YEARS IN PROGRAM   2.00

   TOTAL FCIC INSURANCE PREMIUMS PAID BY FARM 24243.70

   TOTAL FCIC INDEMNITY PAYMENTS RECEIVED 83638.37

                    THE END OF ALL INPUT DATA
   1   1TOTAL DEPREC & THIS YEARS DEPREC   2662.4   2662.4
MACHINE   1   7.00 33474.00 39798.00   3980.00   9318.51   4000.00   0.0   33474.00   0.0   33141.92
                  0.0   0.0   7.00 39798.00   2862.43   0.0   0.0   1980.00   5.00   0.0
            81700.00   5.00   0.0
   1   2TOTAL DEPREC & THIS YEARS DEPREC   4233.2   1570.8
MACHINE   2   7.00 31769.00 33568.00   3357.00   5497.71   4000.00   0.0   31769.00   0.0   29641.06
                  0.0   0.0   7.00 33568.00   1570.77   0.0   0.0   1979.00   6.00   0.0
            81700.00   5.00   0.0
   1   3TOTAL DEPREC & THIS YEARS DEPREC   19217.5   14984.3
MACHINE   3   7.00 61700.00 61700.00   0.0   52445.00   0.0   0.0   61700.00   0.0   24239.28
                  0.0   0.0   7.00 61700.00   14984.29   0.0   0.0   1983.00   2.00   0.0
            81700.00   5.00   0.0
   1   4TOTAL DEPREC & THIS YEARS DEPREC   19217.5   0.0
MACHINE   4   7.00   7717.00 10087.00   1009.00   1009.00   2017.40   0.0   7717.00   0.0   9078.00
                  0.0   0.0   7.00 10087.00   0.00   2.00   0.0   1975.00   10.00   0.0
            19900.00   5.00   0.0
   1   5TOTAL DEPREC & THIS YEARS DEPREC   20407.5   1190.0
MACHINE   5   7.00 34945.00 52475.00   5248.00   6437.98   4000.00   0.0   34945.00   0.0   47227.00
                  0.0   0.0   7.00 52475.00   1189.98   0.0   0.0   1978.00   7.00   0.0
            94800.00   5.00   0.0
   1   6TOTAL DEPREC & THIS YEARS DEPREC   38631.1   8955.4
MACHINE   6   7.00 50897.00 74628.00   7462.80   31343.76   0.0   0.0   50897.00   0.0   52239.80
                  0.0   0.0   7.00 74628.00   8955.36   0.0   0.0   1981.00   4.00   0.0
            94800.00   5.00   0.0

   1   7TOTAL DEPREC & THIS YEARS DEPREC   41493.7   2862.5
MACHINE   7   7.00 51909.00 53886.00   5389.00   10019.26   0.0   0.0   51909.00   0.0   46729.38
                  0.0   0.0   7.00 53886.00   2862.85   0.0   0.0   1979.00   6.00   0.0
            94000.00   5.00   0.0
   1   8TOTAL DEPREC & THIS YEARS DEPREC   64322.3   22828.6
MACHINE   8   7.00 94000.00 94000.00   0.0   79900.00   0.0   0.0   94000.00   0.0   36928.56
                  0.0   0.0   7.00 94000.00   22828.57   0.0   0.0   1983.00   2.00   0.0
            94000.00   5.00   0.0
   1   9TOTAL DEPREC & THIS YEARS DEPREC   68924.6   4602.3
MACHINE   9   7.00 55882.00 61881.00   6188.00   16108.13   0.0   0.0   55882.00   0.0   50375.19
                  0.0   0.0   7.00 61881.00   4602.32   0.0   0.0   1980.00   5.00   0.0
            94000.00   5.00   0.0
   1   10TOTAL DEPREC & THIS YEARS DEPREC   71110.2   2185.7
MACHINE 10   7.00   9000.00   9000.00   0.0   7650.00   0.0   0.0   9000.00   0.0   3535.71
                  0.0   0.0   7.00   9000.00   2185.71   0.0   0.0   1983.00   2.00   0.0
             9000.00   5.00   0.0
   1   11TOTAL DEPREC & THIS YEARS DEPREC   71258.9   148.7
MACHINE 11   7.00   3425.00   4538.00   454.00   602.69   0.0   0.0   3425.00   0.0   4084.00
                  0.0   0.0   7.00   4538.00   148.69   0.0   0.0   1978.00   7.00   0.0
             9000.00   5.00   0.0
   1   12TOTAL DEPREC & THIS YEARS DEPREC   72116.9   0.0
MACHINE 12   7.00   2375.00   3876.00   388.00   388.00   775.20   0.0   2375.00   0.0   3488.00
                  0.0   0.0   7.00   3876.00   0.00   2.00   0.0   1976.00   9.00   0.0
             9000.00   5.00   0.0
   1   13TOTAL DEPREC & THIS YEARS DEPREC   74186.9   2070.0
MACHINE 13   7.00   7500.00 11500.00   0.0   7245.00   0.0   0.0   7500.00   0.0   6325.00
                  0.0   0.0   7.00 11500.00   2070.00   0.0   0.0   1982.00   3.00   0.0
            15300.00   5.00   0.0
   1   14TOTAL DEPREC & THIS YEARS DEPREC   74915.7   728.9
MACHINE 14   7.00   4500.00   9800.00   980.00   2551.02   0.0   0.0   4500.00   0.0   7977.84
                  0.0   0.0   7.00   9800.00   728.86   0.0   0.0   1980.00   5.00   0.0
            15300.00   5.00   0.0
   1   15TOTAL DEPREC & THIS YEARS DEPREC   76295.7   1380.0
MACHINE 15   . 7.00   5000.00 11500.00   0.0   4830.00   0.0   0.0   5000.00   0.0   8050.00
                  0.0   0.0   7.00 11500.00   1380.00   0.0   0.0   1981.00   4.00   0.0
            19300.00   5.00   0.0
   1   16TOTAL DEPREC & THIS YEARS DEPREC   76597.5   301.9
MACHINE 16   7.00   3500.00   9200.00   920.00   1221.86   0.0   0.0   3500.00   0.0   8280.00
                  0.0   0.0   7.00   9200.00   301.86   0.0   0.0   1978.00   7.00   0.0
            19300.00   5.00   0.0
   1   17TOTAL DEPREC & THIS YEARS DEPREC   79733.7   756.0
MACHINE 17   7.00   2000.00   4200.00   0.0   2646.00   0.0   0.0   2000.00   0.0   2310.00
                  0.0   0.0   7.00   4200.00   756.00   0.0   0.0   1982.00   3.00   0.0
             5200.00   5.00   0.0
   1   18TOTAL DEPREC & THIS YEARS DEPREC   79940.9   207.2
MACHINE 18   7.00   1500.00   3900.00   390.00   725.14   0.0   0.0   1500.00   0.0   3382.04
                  0.0   0.0   7.00   3900.00   207.18   0.0   0.0   1979.00   6.00   0.0
             5200.00   5.00   0.0
   1   19TOTAL DEPREC & THIS YEARS DEPREC   79940.9   0.0
MACHINE 19   7.00   4500.00   4371.00   437.00   437.00   874.20   0.0   4500.00   0.0   3934.00
                  0.0   0.0   7.00   4371.00   0.00   0.0   0.0   1976.00   9.00   0.0
            10250.00   5.00   0.0
   1   20TOTAL DEPREC & THIS YEARS DEPREC   82082.4   1260.0
MACHINE 20   7.00   4500.00   7000.00   0.0   4410.00   0.0   0.0   4500.00   0.0   3850.00
                  0.0   0.0   7.00   7000.00   1260.00   0.0   0.0   1982.00   3.00   0.0
            10250.00   5.00   0.0
   1   21TOTAL DEPREC & THIS YEARS DEPREC   82648.6   566.2
MACHINE 21   7.00   3500.00   4718.00   0.0   1981.56   0.0   0.0   3500.00   0.0   3302.60
                  0.0   0.0   7.00   4718.00   566.16   2.00   0.0   1981.00   4.00   0.0
             6800.00   5.00   0.0
   1   22TOTAL DEPREC & THIS YEARS DEPREC   82648.6   0.0
MACHINE 22   7.00   2000.00   1320.00   132.00   132.00   264.00   0.0   2000.00   0.0   1188.00
                  0.0   0.0   7.00   1320.00   0.00   2.00   0.0   1975.00   10.00   0.0
             8800.00   5.00   0.0
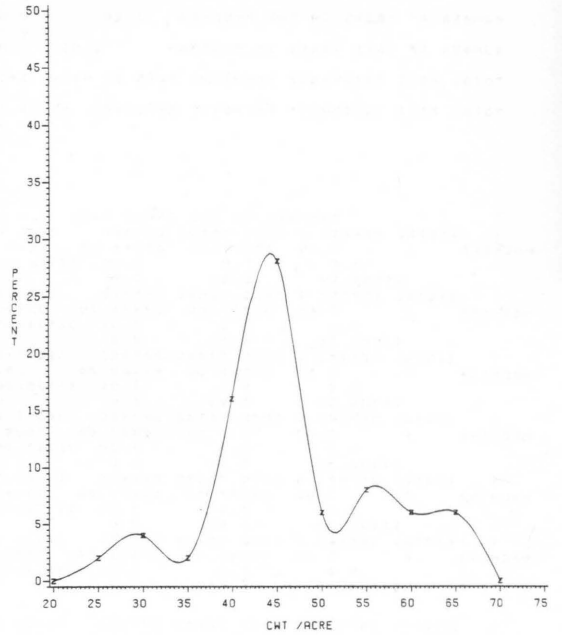   1   23TOTAL DEPREC & THIS YEARS DEPREC   82897.9   249.4

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Appendix C.
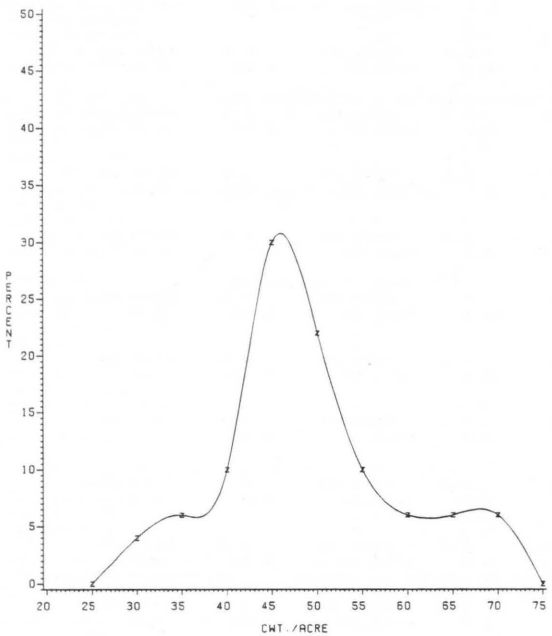## Plots of Probability Distribution Functions
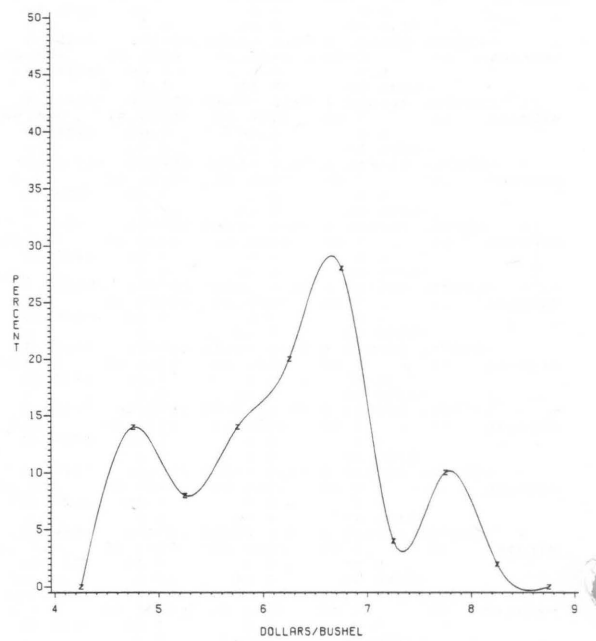
Yield distribution for ratoon rice
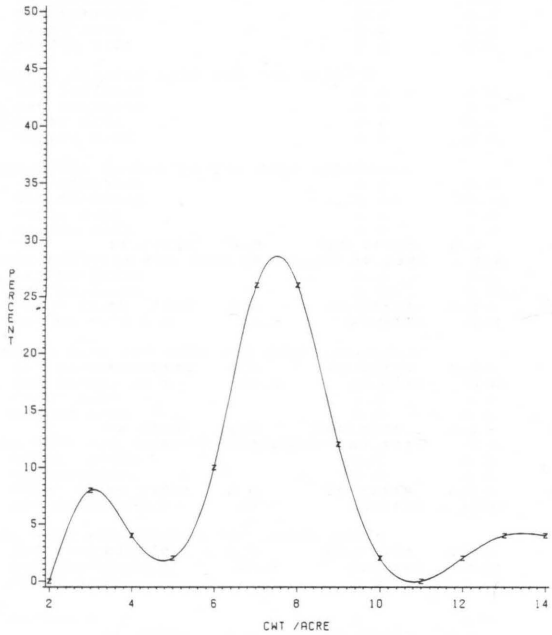
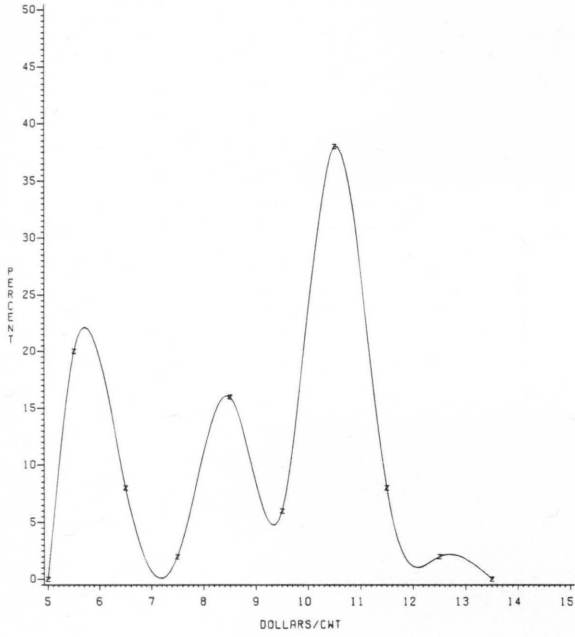Yield distribution for rice following 1 year of soybeans

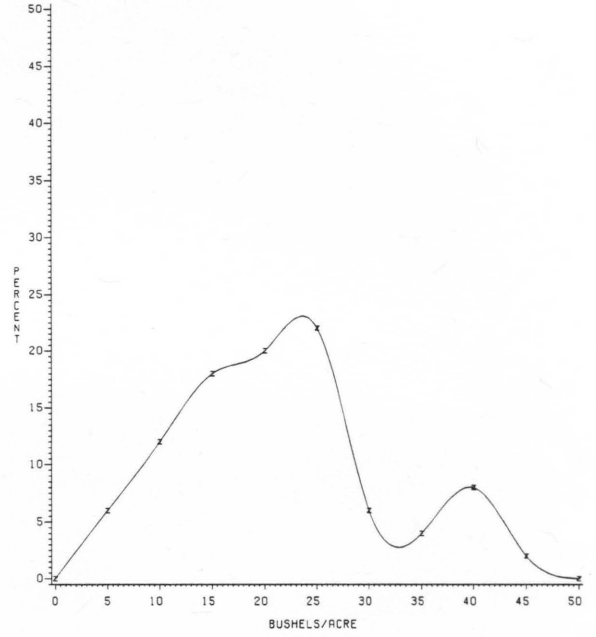Yield distribution for rice following 2 years of soybeans

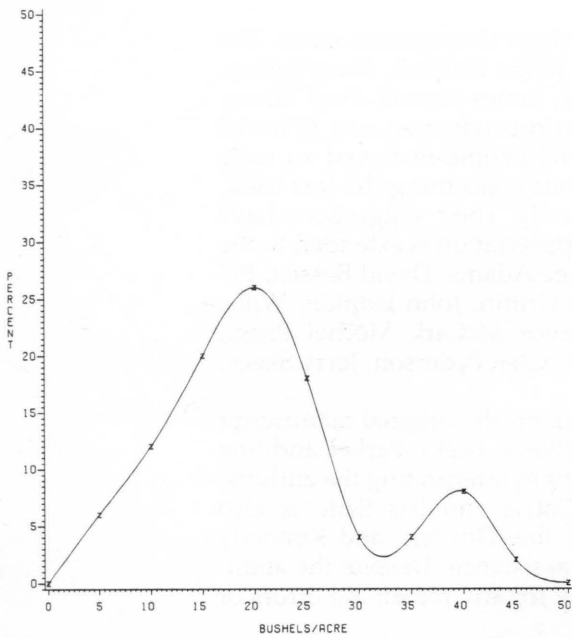Price distribution for soybeans
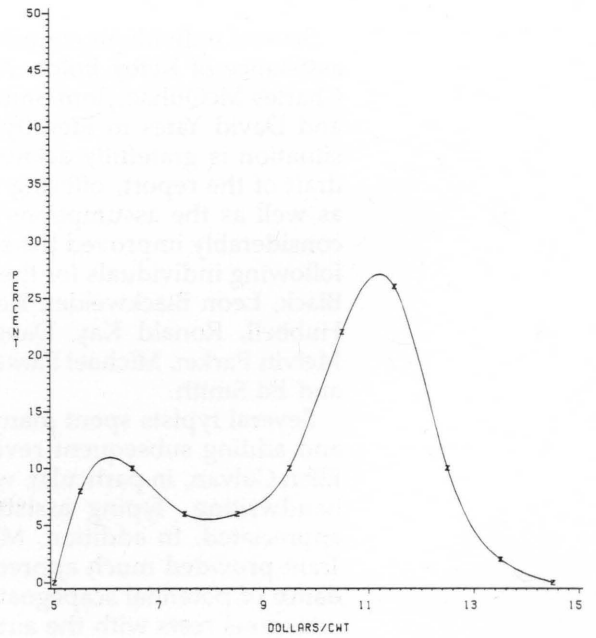
Price distribution for ratoon rice

Yield distributions for soybeans following rice

Yield distribution for soybeans following soybeans

Price distribution for first crop rice

ACKNOWLEDGEMENTS

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