INSTITUTIONAL INVESTMENTS IN FARMLAND: A SOURCE OF EXTERNAL EQUITY FOR THE FARM SECTOR

By

JOHN E. THOMASON

Bachelor of Science

Oklahoma State University

Stillwater, Oklahoma

1985

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
May, 1987

INSTITUTIONAL INVESTMENTS IN FARMLAND:

A SOURCE OF EXTERNAL EQUITY FOR

THE FARM SECTOR

Thesis Approved:

James D. Clayton
Thesis Adviser

Marcia S. Tilley

Ted R. Nelson

Norman N. Durham
Dean of the Graduate College

PREFACE

The feasibility of institutional and/or individual investments in farmland was determined by using the Capital Asset Pricing Model to compare the expected return from farmland, based on historical trends, to the required rate of return for investors with a diversified portfolio. The risk-return characteristics of farmland appear to be favorable for investors with a diversified portfolio but the unique characteristics of farmland violate the Capital Asset Pricing Model's assumptions and prevent a definite conclusion.

Multiperiod linear progamming models show that increased availability of rental land resulting from increased farmland ownership by non-farmers could significantly increase farmers' earnings and farm firm growth.

I wish to thank the faculty, staff, and graduate students in the Department of Agricultural Economics for sharing their time, knowledge, and friendship. I am particularly thankful to my major advisor, Dr. James Plaxico for always asking the right questions, and my other committee members, Dr. Marcia Tilley and Dr. Ted Nelson, for their help and guidance. I especially appreciate the encouragement and support of my family.

TABLE OF CONTENTS

APPENDIXES Page

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Farming has become increasingly capital intensive due to pressures to adopt new technology and the various incentives to expand the size of farms. Capital can be obtained from retained earnings and operator investment (internal equity), borrowing (debt), from outside investors (external equity), or by leasing.

Internal equity financing allows operators to exercise complete management control of assets but the availability of equity capital may severely limit capital accumulation, firm growth, and earnings.

Debt financing imposes some limitations on management control and increases financial risk to the operator's equity. The operator may be required to limit risk with insurance, hedging, financial constraints, or other means. With the creation of the Farm Credit System, Farmers Home Administration, and access to funds from private individuals, commercial banks and insurance companies, debt financing has been readily available to credit-worthy farmers (1). Debt capital limitations depend upon the operator's financial condition, the characteristics of the operation, and lender policy.

Limitations on management control may vary widely when external equity is used to provide capital. Sources of external equity may range from informal investments by relatives to selling stock in a corporation. The amount of external equity which can be raised is limited by the operator's ability to find willing investors.

Leasing is a means of controlling assets owned and financed by outside equity and/or debt. Since the operator is obligated to make rent payments, long term leases may create financial leverage and risk considerations similar to borrowing. The operator's control of leased assets is limited by the terms of the lease contract. Leasing a significant portion of total assets may impose management limitations on the entire operation. The limitations to leasing are the terms and availability of the lease asset and the ability of the operator to make lease payments. Leasing an asset frees the operator from the risk of unexpected depreciation or obsolescence, but precludes windfall gains from appreciation.

Problem Setting

Farmers have met their increasing capital needs primarily with their own equity, leasing, and debt. Very little outside equity is used. The availability of outside equity is limited by the earning potential of the operation and the high costs of formal arrangements needed to attract equity from beyond the realm of friends and family. In addition,

outside investments in the operation may be incompatible with the operator's objectives.

Leasing has provided an important source of control for land, and to a lesser extent, equipment and livestock. Leasing can be beneficial for both parties due to ownership advantages arising from differences in opportunity costs of capital and taxes.

Debt has been a widely used method of increasing returns to the operator's equity but the financial leverage created by debt can also rapidly decrease the operator's equity under adverse conditions. Twenty percent of Oklahoma farmers have debt-to-asset ratios (D/A) over 0.4 and over 30 percent of farmers in Iowa, Kansas, Nebraska and North Dakota have D/A ratios over 0.4 (2). Farmers with D/A ratios over 0.4 are commonly considered to be subject to at least moderate financial stress. However, the level of debt a farmer can service varies depending on the amount of off-farm income and the operation's characteristics.

The high proportion of farmers with D/A ratios over 0.4 coupled with declining asset values and low commodity prices indicates that many farmers may need to adjust their capital structure to reduce debt. With limited, and in many cases decreasing, operator equity and limited sources of outside equity, the only alternative available to some farmers is to sell assets and lease assets back in order to maintain or increase the size of the operation.

Farmland constitutes about 75 percent of farmers' assets and may be a suitable asset to sell and replace by leasing. Purchases of farmland by individuals and/or institutional investors such as insurance companies, agribusinesses, investment firms, or other large outside investors would provide equity to the farm sector and reduce farmers' equity capital needs.

The ownership and operation of farms by corporations has been an emotional issue and by January 1983, 15 states restricted ownership and operation by corporations (3). The scope of land ownership restrictions vary among states as does the list of exceptions. Common exceptions exclude entities such as family farm corporations, corporations engaged in research, or other specially authorized corporations, such as cattle feeding operations, from the general restrictions.

In Oklahoma, corporations may acquire real estate by mortgage foreclosure or in collection of a debt but it must be disposed of within seven years of acquisition (4). Corporations are only allowed to own land which is necessary for their normal business operations (4). The type of restrictions imposed and the exceptions allowed by Oklahoma are fairly common. Oklahoma law pertaining to the ownership of farmland is included in appendix A.

Objectives and Methodology

The possibility of individual and/or institutional investments in farmland providing substantial sources of equity capital to the farm sector is dependent on the risk-return characteristics of farmland relative to alternative investments. If individual or institutional ownership is feasible, an increase in non-farmer owned land could result in increased availability of rental land. Increased availability of rental land may result in significantly increased farm earnings. The objectives of this study are:

1) Determine if farmland is a feasible investment, in a diversified portfolio, for individual and/or institutional investors.

2) Evaluate the effect increased availability of rental land may have on a farmer's earnings.

The risk characteristics of an investment as well as the rate of return are important considerations to investors. Investors require a higher rate of return for investments as risk increases. The Capital Asset Pricing Model (CAPM) provides a framework to compare the risk-return characteristics of farmland to the risk-return characteristics of other assets to determine if farmland is a favorable investment. Some fundamental principles, underlying assumptions,

and empirical tests of the CAPM are reviewed and the model is applied to analyze investments in farmland.

Multiperiod linear programing models are used to determine how much rented and owned land is required to maximize the present value of a farmer's earnings. The optimal solutions are compared to solutions in which the availability of rental land is restricted. The differences in objective function values show the benefit of greater access to rental land. The unrestricted solutions also provide an expansion path of the farmer's land base and indicate the optimal composition of rented and owned land.

CHAPTER II

CRITERIA FOR INVESTMENT ANALYSIS

Investors desire a high expected rate of return but the risk associated with an investment is also important. The risk of an asset is reflected in the variation of its expected returns. The riskier the investment the more the expected returns vary, therefore one measure of risk is the variance or standard deviation of expected returns. An investor faced with two investments having the same expected return would choose the investment with the lowest variance. Similarly, if the investor were to choose between two investments having the same variance, the investment with the highest expected return would be chosen. This mean-variance criteria is illustrated in figure 1.

Asset A is preferred to asset B since the same expected returns can be obtained with more certainty. Asset D is preferred to asset C since both assets have similar variance but asset D has higher expected returns. The decision between A and D depends on the investor's attitudes towards risk. The investor may choose to invest in a combination of assets.

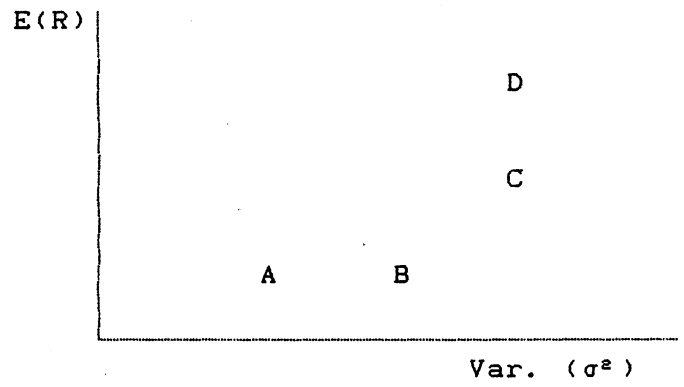

Figure 1. Mean-Variance Criteria

The expected income for a given level of variability can be increased by investing in a combination of assets as long as their returns are not perfectly correlated. To show this principle, developed by Markowitz (5), the following example will be used :

	Expected Rate of Return E(R)	Standard Deviation (σ)	Correlation of Returns ($\Gamma_{i,s}$)
Stocks	.15	20	
Land	.21	40	
			.3

Assuming equal investments in both assets, the expected return from the combination of investments is a weighted average of returns:

$$E(R_p) = [A_i * E(R_i)] + [(1-A_i) * E(R_s)]$$

where,

$E(R_p)$ = Expected rate of return to the portfolio

A_l = Percent of portfolio consisting of land

$E(R_l)$ = Expected rate of return to land

$E(R_s)$ = Expected rate of return to stocks

If 50 percent of the portfolio is land, then:

$$E(R_p) = (.5*.21)+(.5*.15) = .18$$

The income variance of the portfolio is:

$$\sigma_p^2 = (A_l*\sigma_l)^2+[(1-A_l)*\sigma_s]^2+2[A_l*(1-A_l)*\Gamma_{ls}*\sigma_l*\sigma_s]$$

where,

σ_p^2 = variance of the portfolio

A_l = percent of portfolio consisting of land

σ_l = standard deviation of land returns

σ_s = standard deviation of stock returns

Γ_{ls} = correlation coefficient

so that,

$$\sigma_p^2 = (.5*40)^2+(.5*20)^2+2(.5*.5*.3*40*20) = 6.2\ \%$$

The portfolio's variance is a weighted average of the individual variances only if the correlation coefficient equals one; otherwise, averaging the two income streams reduces relative variability. If the correlation

coefficient equals negative one, a combination of assets could be purchased so that the variance equaled zero.

Risk can be classified as systematic and non-systematic. Systematic risk is market related and cannot be eliminated by diversification. Non-systematic risk is unique to the investment and can be eliminated by diversification. The relevant risk-return trade-off faced by the investor is depicted by the efficiency frontier shown in figure 2.

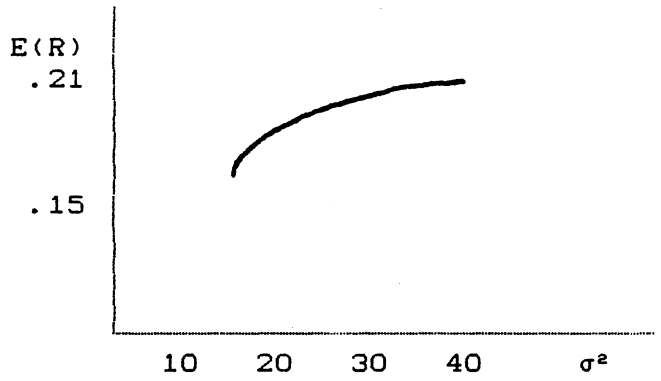

Figure 2. Efficiency Frontier

An efficiency frontier showing the risk-return trade-off of all investments available to the investor is known as the market efficiency frontier.

The expected return of a portfolio is the weighted average of the expected returns of each investment in the portfolio. The variance of returns for a portfolio with several investments is:

$$\sigma^2_p = \Sigma_{i=1} \Sigma_{j=1} A_i A_j \sigma_{ij}$$

where,

σ^2_p = variance of the portfolio

A_i = proportion of stock i in the portfolio

A_j = proportion of stock j in the portfolio

σ_{ij} = covariance between stocks i and j

In the mid-1960's Sharpe (6) and Lintner (7) showed that by including a risk-free investment such as Treasury bills, all investors would select a particular combination of risky assets for their portfolios regardless of personal risk-return preferences.

The investor would pick portfolio M (the market portfolio) to maximize utility regardless of the point where the investor's indifference curve is tangent to the efficiency frontier. Based on the separation theorem, the investor would hold portfolio M and either lend or borrow in the capital market. Investor A whose indifference curve is I_a would reach a higher indifference curve by investing in a combination of risk-free assets and portfolio M than by investing in portfolio G. Investor B whose indifference curve is depicted by I_b would reach a higher indifference curve by investing in portfolio M and borrowing money to purchase additional units of M, than investing in portfolio L. Investor C would invest in portfolio M and neither lend nor borrow.

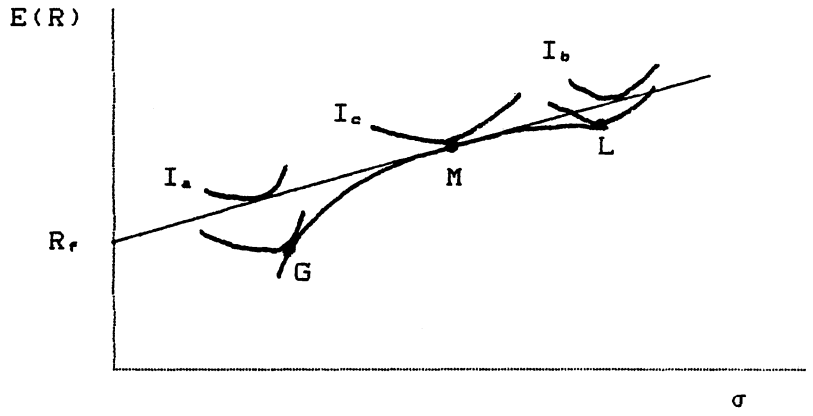

Figure 3. Portfolio Selection with Risk-Free Investment

The line passing through the risk-free investment and tangent to the efficiency frontier is the Capital Market Line. All efficient portfolios will be on the Capital Market Line (CML). The equation of the CML is:

$$E(R_p) = R_f + [(E(R_m)-R_f)/\sigma_m]\sigma(R_p)$$

where,

$E(R_p)$ = expected return for portfolios along the CML

R_f = risk-free borrowing and lending rate

$E(R_m)$ = expected return on the market portfolio

σ_m = standard deviation of returns on market portfolio

$\sigma(R_p)$ = standard deviation of returns for portfolios along the CML

Since an investor would not accept a return less than the expected return and any returns above the expected return would be windfall gains, the required rate of return for an investment is its expected rate of return. The market price of risk for a portfolio is expressed by the term $[E(R_m)-R_f]/\sigma_m$.

Application of the CAPM

The previously described framework for determining the optimum portfolio is known as the Capital Asset Pricing Model (CAPM). The CAPM also provides a basis for valuing individual risky assets.

Since diversifiable (non-systematic) risk can be eliminated, the investor is only concerned with nondiversifiable risk. The amount of nondiversifiable (systematic) risk the asset has relative to the market is known as beta. The market portfolio has a beta of one. Beta is calculated as :

$$\beta_i = Cov(R_i, R_m)/\sigma^2_m$$

where,

β_i = beta value of asset i

$Cov(R_i, R_m)$ = the covariance of returns to asset i and the market

σ^2_m = the variance of the market portfolio

Beta can be calculated by using the least squares regression equation :

$$E(R_i) - R_f = \alpha + \beta * [E(R_m) - R_f] + e$$

where,

$E(R_i)$ = expected returns to land

R_f = returns to the risk-free asset

$E(R_m)$ = expected returns to the market portfolio

α = intercept

β = beta

e = error term

The intercept term has an expected value of zero. A positive alpha value would indicate that the returns are in excess of that required for the degree of risk the asset has. Negative alpha values indicate that the returns are inadequate to compensate for the risk of the asset.

The Capital Market Line can be used to determine the required rate of return for efficient portfolios but it cannot be used to evaluate an individual risky asset since the non-diversifiable risk of the asset determines its required rate of return, not the standard deviation of the asset. In order to determine the required rate of return for an individual risky asset the CML must be expressed in terms of beta.

CML: $$E(R_p) = R_f + [(E(R_m)-R_f)/\sigma_m]\sigma(R_p)$$

The CML expressed in terms of individual assets rather than portfolios is:

$$E(R_j) = R_f + [(E(R_m)-R_f)/\sigma_m]\sigma_j$$

Since all points along the CML are perfectly correlated with the market portfolio ($\Gamma_{jm} = 1$), the standard deviation of returns to asset j can be multiplied by Γ_{jm} without changing results:

$$E(R_j) = R_f + [(E(R_m)-R_f)/\sigma_m]\Gamma_{jm}\sigma_j$$

Further manipulation of the equation yields the desired formula giving the expected return of the risky asset in equilibrium as a function of beta:

$$E(R_j) = R_f + [(E(R_m)-R_f)/\sigma_m] * (\Gamma_{jm}\sigma_j\sigma_m)/\sigma_m$$

$$E(R_j) = R_f + [E(R_m)-R_f] * (\Gamma_{jm}\sigma_j\sigma_m)/\sigma^2_m$$

$$E(R_j) = R_f + [E(R_m)-R_f] * Cov(R_j,R_m)/\sigma^2_m$$

$$E(R_j) = R_f + [E(R_m)-R_f] * \beta_j$$

This equation is the Security Market Line (SML). The SML can be used to determine the expected rate of return for individual risky assets. The relationship of the Capital

Market Line and the Security Market Line is shown in figures 4a and 4b.

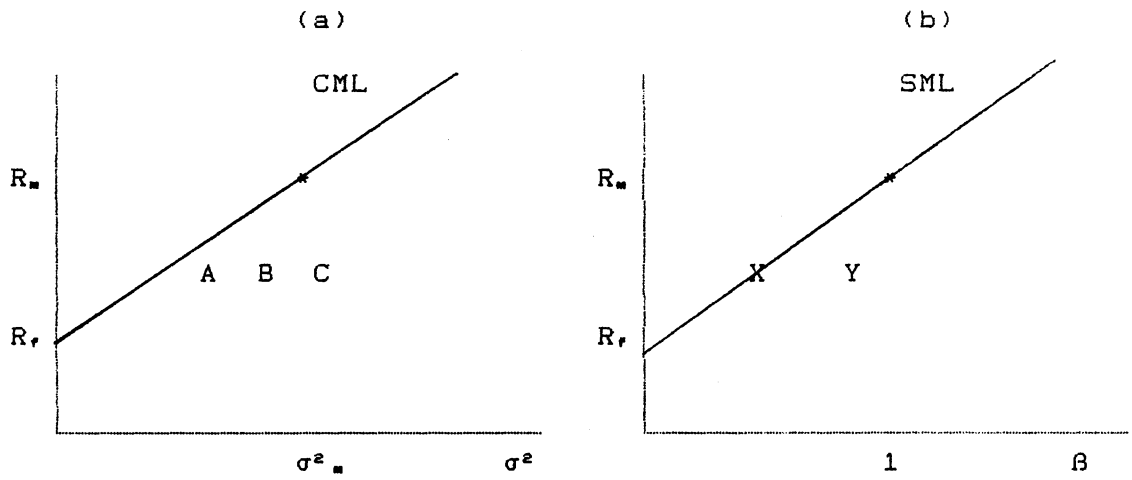

Figure 4. The Capital Market Line and Security Market Line

Assets A and B in figure 4a both have the same expected return but the total variance of the individual assets are different. Although total variance of each asset is different, their nondiversifiable variance is the same and both assets would fall on the Securities Market Line (4b) at point X. Asset C has the same expected return but has higher nondiversifiable risk than A and B. Asset C would be below the Security Market Line at a point represented by Y in figure 4b. Since asset C earns a lower than required rate of return, the price will drop, increasing the rate of return. In equilibrium, all assets will be along the

Security Market Line. The required rate of return for an asset can be found using the Securities Market Line formula:

$$r_i = R_f + \beta_i * (R_m - R_f)$$

where,

r_i = required rate of return on asset i

R_f = risk-free rate of return

β_i = beta of asset i

R_m = expected rate of return on the market portfolio

Limitations of the CAPM

The validity of the CAPM relies on the following six assumptions described by Weston and Copeland (8):

1. Investors are risk-averse individuals who maximize the expected utility of their end-of-period wealth.
2. Investors are price takers and have homogeneous expectations about asset returns which have a joint normal distribution.
3. There exists a risk-free asset such that investors may borrow or lend unlimited amounts at the risk-free rate.
4. The quantities of all risky assets are fixed. Also, all assets are marketable and perfectly divisible.
5. Asset markets are frictionless and information is costless and simultaneously available to all investors.
6. There are no market imperfections such as taxes, transaction costs, regulations, or restrictions on short-selling.

Weston and Copeland note that most of these assumptions can be relaxed without changing the important properties of the CAPM. Brealey and Myers (9) contend that the assumptions underlying the CAPM are not crucial and that it is possible to modify the model to handle them.

Empirical tests show that there may be problems with the CAPM formulation. Factors such as price-earnings ratio, size of firm, and high dividend yields explain a portion of returns not explained by beta (8). An empirically estimated market line has an intercept higher than the risk-free rate of return and the slope is less than the slope of the theoretically derived Security Market Line (8). The empirical results indicate that low-beta assets earn more than the CAPM predicts and high-beta assets earn less than the CAPM predicts.

The CAPM is difficult to test empirically since it is based on expected returns but can only be tested by actual returns. Another problem encountered in testing the CAPM is that the market portfolio consists of all risky assets, such a portfolio is difficult to construct or simulate for testing purposes (8).

Tests by Fama and MacBeth (10) show that actual returns do plot roughly along the Security Market Line with some time periods yielding much more impressive results than others.

Despite the imperfections of the CAPM it can be a beneficial tool for practical application as long as results are analyzed with the possible biases of the model in mind.

CHAPTER III

THE CAPM APPLIED TO FARMLAND

The Capital Asset Pricing Model has been applied to farmland and agricultural assets in previous studies. Barry (11) used the CAPM to evaluate investments in farmland for ten production regions and the United States using data from 1950 through 1977. Barry used 9 to 12 month U.S. government securities as the risk-free asset and an index consisting of stocks, bonds, and farm real estate as a proxy of the market portfolio. Returns to farmland were estimated by adding the change in the farm real estate price index to returns to land from farm production. Returns to land from farm production were derived by estimating net income from farm production and subtracting returns to labor, management, and non-real estate assets.

Barry's results indicated that farm real estate has lower variation relative to mean returns than the market index. Low beta values and high alpha values imply that investments in farm real estate earned more relative to risk than the market index and most individual assets during the period from 1950 to 1977. Barry noted that the confidence intervals for sample betas were relatively wide but beta values appeared to be between 0 and .5 which is

similar to betas on long-term bonds and lower than most common stocks which tend to be between .5 and 1.5 .

Rather than using the CAPM as a benchmark for comparison, Moss, Featherstone, and Baker (12) investigated the desirability of farm assets in the market portfolio based on expected earnings-variance criteria. An efficiency frontier was developed with investment opportunities available in common stocks, small capitalization stocks, long-term corporate bonds, long-term U.S. Government bonds, U.S. Treasury bills, and farm assets. The study is based on data from 1926 through 1984. Returns to farm assets were obtained from Melichar's Agricultural Finance Databook (13). Farm assets were determined to be part of a well-diversified portfolio.

A portfolio model developed by Feldstein (14) shows an important relationship between reproducible capital (business capital) and land. Due to the effects of taxes, inflation causes the real price of land to increase and the real price of reproducible capital goods to decrease. This relationship indicates that inflation would tend to cause the beta for farmland to be low and unstable as inflation rates change.

Investments in farmland will be evaluated using the CAPM to establish the appropriate discount rate for farmland based on farmland's beta. If the expected rate of return is equal to or greater than the required rate of return,

farmland can be considered a good investment for investors holding a diversified portfolio.

Farmland earnings used in the study are the earnings from Oklahoma farmland from 1945 through 1985 as reported in Farm Real Estate Market Developments (15). Earnings are calculated as the price increase plus rental payments less property taxes. Prices, taxes, and earnings for Oklahoma farmland are shown in table I.

The risk-free asset is a 10 year Treasury bond. Standard and Poor's composite of 500 common stocks is used as a proxy for the market portfolio (16). Returns to the risk-free asset and the market portfolio are shown in table II. Returns to the risk-free asset, the market portfolio, and land are plotted in figure 5. The beta value for Oklahoma farmland is found by the least squares regression model:

$$R_i - R_f = \alpha + \beta_i * (R_m - R_f) + e$$

The results are as follows:

$$E(R_i - R_f) = 5.30 - .123 * (R_m - R_f)$$

The beta value of -.123 indicates that land returns increase (decrease) when the market return decreases (increases). Assets with negative betas allow investors to substantially diversify their portfolios. The alpha value

TABLE I

RETURNS FROM OKLAHOMA FARMLAND

YEAR	GROSS RENT	LAND VALUE	PROPERTY TAXES	NET RETURN	PERCENT RETURN	% CURRENT RETURN
1945	2.86	40.00	0.62	7.61	19.03	6.53
1946	2.91	45.00	0.58	8.65	19.22	5.89
1947	3.42	51.00	0.68	8.07	15.83	6.03
1948	3.69	56.00	0.64	7.33	13.09	5.95
1949	3.80	60.00	0.68	1.39	2.32	5.65
1950	3.71	58.00	0.69	10.31	17.78	5.71
1951	4.06	65.00	0.58	14.68	22.59	5.67
1952	4.02	76.00	0.55	2.60	3.42	4.74
1953	4.38	75.00	0.59	-0.06	-0.08	5.25
1954	4.27	71.00	0.61	9.84	13.85	5.40
1955	4.34	77.00	0.59	6.89	8.94	5.05
1956	4.51	80.00	0.59	9.04	11.30	5.05
1957	4.80	85.00	0.61	5.28	6.21	5.04
1958	4.72	86.00	0.60	14.20	16.52	4.89
1959	5.47	96.00	0.58	9.91	10.33	5.12
1960	5.32	101.00	0.58	6.73	6.67	4.69
1961	5.56	103.00	0.68	13.86	13.46	4.72
1962	5.70	112.00	0.64	18.98	16.95	4.45
1963	6.13	126.00	0.59	16.39	13.01	4.28
1964	6.23	137.00	0.56	20.46	14.94	3.99
1965	7.14	152.00	0.56	18.29	12.03	4.14
1966	7.75	164.00	0.58	8.80	5.37	4.15
1967	7.36	166.00	0.57	29.41	17.72	3.86
1968	8.05	189.00	0.58	8.95	4.74	3.68
1969	8.40	191.00	0.56	28.33	14.83	3.84
1970	9.29	212.00	0.54	23.15	10.92	3.84
1971	9.82	227.00	0.53	-2.38	-1.05	3.80
1972	9.86	216.00	0.63	31.50	14.58	3.93
1973	10.75	239.00	0.56	69.41	29.04	3.94
1974	12.96	299.00	0.48	59.52	19.91	3.85
1975	14.36	347.00	0.42	64.90	18.70	3.72
1976	15.99	399.00	0.37	46.51	11.66	3.64
1977	17.09	431.00	0.34	31.62	7.34	3.63
1978	16.50	447.00	0.31	78.11	17.48	3.38
1979	19.50	510.00	0.29	105.02	20.59	3.53
1980	18.90	597.00	0.26	40.35	6.76	2.91
1981	20.40	620.00	0.24	94.91	15.31	3.05
1982	21.18	696.00	0.24	-15.49	-2.23	2.80
1983	19.83	661.00	0.26	18.11	2.74	2.74
1984	17.847	661.00	0.26	-110.87	-16.77	2.44
1985	19.758	534.00	0.29	-61.79	-11.57	3.41
1986		454.00				

Source: U.S.D.A. "Farm Real Estate Market Developments" Washington, D.C., ECRS, various issues.

TABLE II

RETURNS FROM THE MARKET PORTFOLIO
AND RISK-FREE ASSET

	S&P 500			CONSUMER	TEN YEAR
YEAR	INDEX	DIVIDEND	STOCK EARNINGS	PRICE INDEX	TREASURY BONDS
1945	15.16	4.17	12.66	53.9	2.370
1946	17.08	3.85	-11.18	58.5	2.190
1947	15.17	4.93	2.37	66.9	2.250
1948	15.53	5.54	-1.93	72.1	2.440
1949	15.23	6.59	20.81	71.4	2.310
1950	18.40	6.57	21.41	72.1	2.320
1951	22.34	6.13	9.67	77.8	2.570
1952	24.50	5.80	8.94	79.5	2.680
1953	24.73	5.80	20.06	80.1	2.850
1954	29.69	4.95	36.38	80.5	2.400
1955	40.49	4.08	15.14	80.2	2.820
1956	46.62	4.09	-4.80	81.4	3.180
1957	44.38	4.35	4.19	84.3	3.650
1958	46.24	3.97	24.09	86.6	3.320
1959	57.38	3.23	-2.67	87.3	4.330
1960	55.85	3.47	18.66	88.7	4.120
1961	66.27	2.98	-5.87	89.6	3.880
1962	62.38	3.37	12.01	90.6	3.950
1963	69.87	3.17	16.46	91.7	4.000
1964	81.37	3.01	8.36	92.9	4.190
1965	88.17	3.00	-3.30	94.5	4.280
1966	85.26	3.40	7.82	97.2	4.920
1967	91.93	3.20	7.36	100.0	5.070
1968	98.70	3.07	-0.87	104.2	5.650
1969	97.84	3.24	-14.94	109.8	6.670
1970	83.22	3.83	18.11	116.3	7.350
1971	98.29	3.14	11.10	121.3	6.160
1972	109.20	2.84	-1.62	125.3	6.210
1973	107.43	3.06	-22.88	133.1	6.840
1974	82.85	4.47	4.00	147.7	7.560
1975	86.16	4.31	18.40	161.2	7.990
1976	102.01	3.77	-3.73	170.5	7.610
1977	98.20	4.62	-2.22	181.5	7.420
1978	96.02	5.28	7.28	195.4	8.410
1979	103.01	5.47	15.31	217.4	9.440
1980	118.78	5.26	7.80	246.8	11.460
1981	128.05	5.20	-6.51	272.4	13.910
1982	119.71	5.81	34.00	289.1	13.000
1983	160.41	4.40	0.03	298.4	11.100
1984	160.46	4.64	16.44	310.7	12.440
1985	186.84	4.25	27.37	322.2	10.62
1986	237.97				

Source: Federal Reserve Board, "Federal Reserve Bulletin," Washington, D.C., various issues.

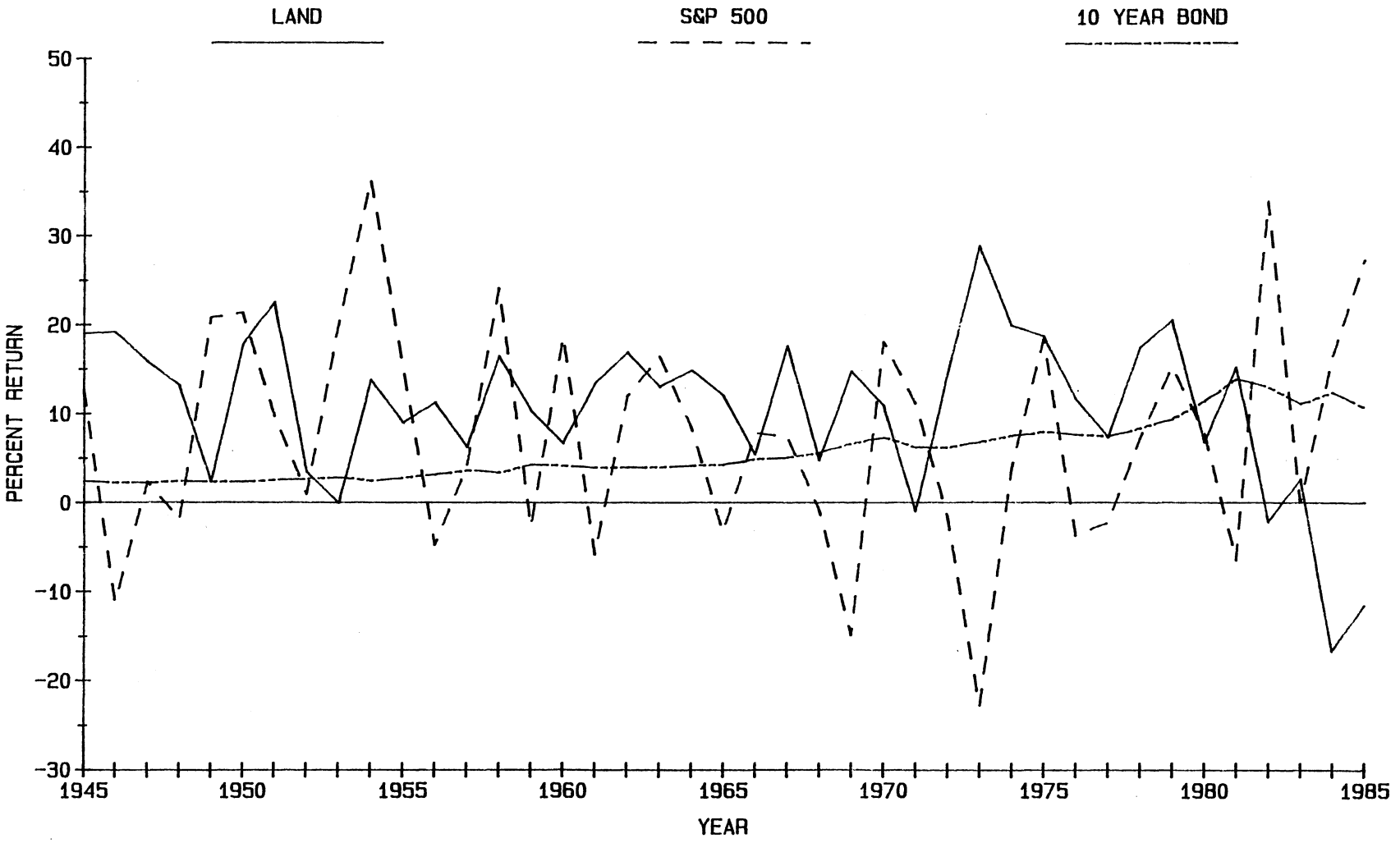

Figure 5. Returns to Farmland, the Market Portfolio, and the Risk-Free Asset

of 5.30 indicates that farmland has earned premium returns as compared to the market portfolio.

The standard error of the beta estimate is .1268, the standard error of the alpha estimate is 1.804, and the standard error of the excess returns $(R_i - R_f)$ is 10.56 . The 95 percent confidence intervals for beta, alpha, and $E(R_i - R_f)$ are:

$$-.379 \leq \beta \leq .133$$

$$2.181 \leq \alpha \leq 9.474$$

$$-10.51 \leq E(R_i - R_f) \leq 32.15$$

Accepting the estimated beta of -.123 , and using the 1945 to 1985 average return to 10 year treasury bonds as a proxy for the risk-free asset and 1945 to 1985 returns to the S&P 500 index as a proxy for the market portfolio's returns, the required rate of return can be found using the Securities Market Line formula:

$$r_i = R_f + \beta * (R_m - R_f)$$

$$r_i = 5.75 - .123 * (7.70 - 5.75)$$

$$r_i = 5.75 - .123 * 1.95$$

$$r_i = 5.510$$

Since the expected rate of return to farmland is 10.82 percent and the required rate of return is only 5.51 percent, farmland appears to be a very attractive

investment. Unfortunately the analysis has not accounted for two important factors. The data period may overestimate the returns to land. The time period from 1945 through 1985 includes the rapid price increases which occurred in 1973 to 1982 but the opposing price decreases of the cycle may not be fully represented since farmland prices are currently decreasing.

The beta value estimated from the 1945 through 1985 data may also be affected. If Feldstein's hypothesis that inflation causes the real price of land to increase and the real price of reproducible capital to decrease is correct, then a beta estimate from 1945 through 1972 data would be larger than the estimate from the 1945 through 1985 data. Although the beta estimate from 1945 through 1972 data may seem more appropriate since it reflects the returns relationship under more normal circumstances, the beta estimate from 1945 through 1985 is important since it reflects the relationship of returns during high inflation. One of the objectives of diversification is to gain protection from unfavorable extremes. The returns to land, the market, and the risk-free asset during selected time periods are:

Time	R_l	R_f	R_m
1945-85	10.82	5.75	7.70
1945-72	11.59	3.86	7.87
1973-85	9.15	9.83	7.33

Results of the estimation model for the period 1945 through 1972 are:

$$E(R_i - R_f) = 7.73 + .0015 * (R_m - R_f)$$

The standard error of β_{45-72} is .105 and the 90 percent confidence interval is from -.1806 to .1776 . The estimation model for the period 1973 to 1985 is:

$$E(R_i - R_f) = -2.029 - .538 * (R_m - R_f)$$

The standard error of β_{73-85} is .2666 and the 90 percent confidence interval is from -1.0168 to -.059 . We can conclude with 95 percent certainty that the two betas are significantly different.

Beta is unstable but clearly low relative to mean returns. The upper bound for any beta estimated is .1776 (1945 to 1972). Assuming R_f equals 5.75 and R_m equals 7.70 , the required rate of return for an asset with a beta of .1776 is:

$$r_i = 5.75 + .1776 * 1.95$$

$$r_i = 6.10$$

Given that the highest required rate of return for any expected value of beta is 6.10 percent and the lowest mean

return from any period is 9.15 percent, farmland still seems to be a favorable addition to the portfolio.

The assumption that all assets are marketable and perfectly divisible is violated by farmland when owned in the conventional way. The farmland market lacks liquidity; the normal volume of sales is 4 to 5 percent of all farms per year. The assumption that asset markets are frictionless and information is costless and simultaneously available to all investors is also violated. The search and transaction costs of farmland transfers are higher than those for the assets included in the market portfolio.

Earnings on farmland, like those on the market portfolio, are composed of current returns and capital gains. Since the CAPM assumes a perfect market, capital gains can be easily realized and thus are additive to current returns. This assumption is not inhibiting to the market portfolio since the stocks it is composed of are publicly traded in a well-functioning market. Capital gains from farmland must be realized by selling the asset in a market that is not liquid and that has high search and transaction costs. Search and transaction costs and the uncertainty of the net realized price upon completion of the sale of land would cause the investor to discount the expected capital gains by some factor, π so that the expected value of earnings are:

$$E(V_i) = E(CR_i) + [\pi * E(CG_i)]$$

where,

$E(V_1)$ = expected value of land earnings

$E(CR_1)$ = expected current returns to land

$E(CG_1)$ = expected capital gains on land

π = unknown value from zero to one

Current returns and capital gains can be analyzed separately by determining the beta for current returns. The expected current return to land is 4.35 and the beta for current returns is .0783 . Figure 6 shows both current and total returns plotted against the Security Market Line.

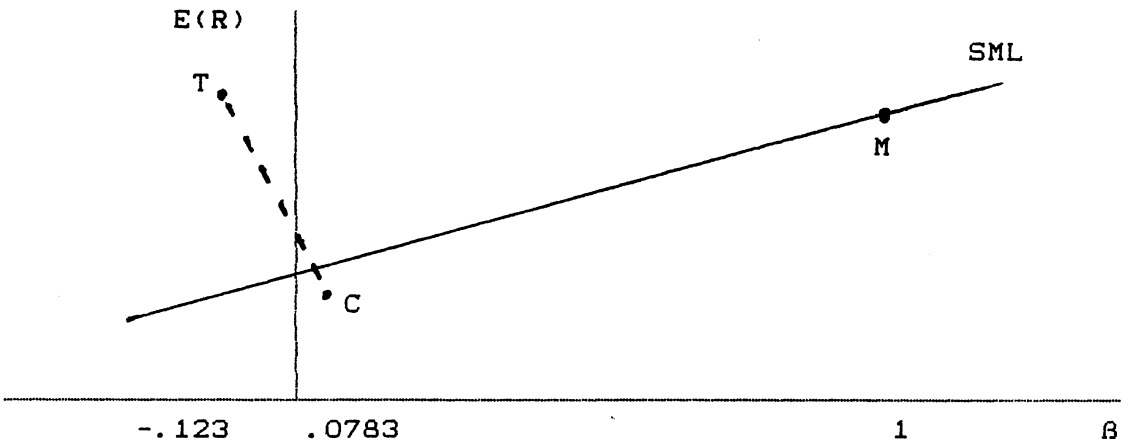

Figure 6. Current and Total Farmland Returns

Any value of π would result in an $E(V_1)$ along the line TC. The value of π at which $E(V_1)$ is equal to the required rate of return can be found by: determining the equation of

the $E(V_i)$ line as a function of beta, solving for the value of beta at which the $E(V_i)$ line and the Security Market Line intersect, finding the required rate of return for the specified beta, and then solving the equation of the land return line for π so that $E(V_i)$ equals the required rate of return.

The equation of the land returns line can be found by determining the slope then using the point-slope formula to solve for the equation. The equation is:

$$E(V_i) = 6.867 - 32.141 * \beta$$

The value of β at which the lines intersect is .03 . The required rate of return for an asset with a beta value of .03 is 5.8085 . The relationship of returns for land is:

$$E(V_i) = 4.35 + (\pi * 6.47)$$

so that,

$$5.8085 = E(V_i) = 4.35 + (\pi * 6.47)$$

$$\pi = .2254$$

Any value of π greater than 22.5 percent would result in an expected value of returns greater than the required return. Although the specific value of π cannot be found, a review of the factors determining π may lead to an idea of its magnitude. π is the percentage of the capital gains earned by land that are comparable in value to the

current returns to land and stocks or to the capital gains of stocks in the market portfolio.

π accounts for the abnormally high search and transaction cost of selling land as compared to stocks and the risk of the price declining before the land can be sold. Total variation of the land price is a major factor in determining π. The size of π also depends on the planned ownership period. The shorter the planned holding period, the smaller π will be. If the normal volume of land market transactions is 4 to 5 percent of all farms per year then the average holding period is from 20 to 25 years. The discount for transferring the asset every 20 to 25 years may be small but the liquidity of a declining land market coupled with the volatility of land prices may make π small.

The presence of taxes violates the assumption that there are no taxes, regulations, or restrictions on short selling. Since capital gains have been taxed differently than current returns, an asset with the same total returns but with a differing portion of those returns consisting of capital gains would have had a different before-tax discount rate which would affect the investment preference. Earnings on the market portfolio consist of 55.84 percent current returns and the earnings on farmland consist of 40.20 percent current returns. The different ratios of current returns to capital gains is not a significant factor.

The assumption that investors can borrow and lend at the risk-free rate is violated since the borrowing rate is greater than the lending rate. If the borrowing rate is greater than the lending rate the Security Market Line will have less slope when beta is greater than one. Since the relevant beta range is well below one this violation has no effect on the farmland analysis. The assumptions that investors are risk-averse, price takers and have homogeneous expectations about asset returns which have a joint normal distribution are not violated by any unique characteristics of this analysis.

Farmland appears to be a good addition to a well-diversified portfolio based on historical trends. The beta value for farm-land may be unstable but it is low relative to expected earnings. Uncertainty about the value of π prevents a definite conclusion.

CHAPTER IV

CRITERIA FOR ANALYZING THE EFFECTS OF INCREASED INDIVIDUAL OR INSTITUTIONAL OWNERSHIP OF FARMLAND

The effects of increased individual and/or institutional ownership of farmland depend on the tenancy arrangements of farms prior to being purchased by the non-farmer investor. If farmland is purchased from an individual who rents the land to farmers, the availability of rental land is unchanged. However, if farmland is purchased from current operators, the availability of rental land will increase. The liquidity of the farmland market could be increased if the holding period of farmland investors became shorter, or if a more efficient market structure were to emerge. It is assumed that some farmland would be purchased from current operators and the supply of rental land would increase. The liquidity of the farmland market is assumed to be unchanged.

The increased supply of rental land must be analyzed with respect to how it will affect farmers' objectives. Farmers may have various objectives which include:

1. Maximize Earnings (Before or After-Tax)
2. Maximize Wealth
3. Maximize Gross Income
4. Maximize Farm Size
5. Maximize the Amount of Owned Land
6. Maximize Family Consumption
7. Maximize Leisure Time
8. Minimize Borrowing
9. Minimize Risk
10. Provide Community Services
11. Maintain a Neat, Well-kept Farmstead

Identifying one specific objective is often difficult. Several factors may be important and objectives may change with financial conditions or age of the operator. Some objectives may not be compatible with long term business survival in a competitive environment without limiting constraints. The objective function to be used for this analysis is to maximize the present value of before-tax earnings subject to a minimum family consumption, a maximum debt-to-asset ratio, and a maximum amount of family labor provided. Maximizing earnings also enables the firm to achieve maximum growth.

The amount of owned and rented land required to maximize earnings must be determined to study the effects of rent limitations. The analysis requires three steps which include making assumptions to develop an example farm,

constructing a single-period linear program to determine the optimum farm organization, and developing multiperiod models to analyze the effects of rent limitations under various assumptions concerning land prices.

Case Farm

The case farm is located in Blaine County Oklahoma and consists of soils in the Shellabarger-Nobscot-Pratt soil association. The Shellabarger-Nobscot-Pratt soil association covers 21 percent of Blaine County and is approximately 55 percent cropland and 45 percent pasture (17). Sixty percent of the cropland can be used to grow alfalfa, wheat, grain sorghum, and sudan. The remaining forty percent is limited to wheat, grain sorghum, and sudan. All land bought or rented has the same ratio of soils and cropping options.

The operating activities available on the farm are:

Stocker Steers

Cow-Calf Operation

Pasture (Land group 1)

Alfalfa (Land group 2)

Wheat for Grain (Land group 2 and 3)

Grain Sorghum (Land group 2 and 3)

Small Grain Graze-Out (Land group 2 and 3)

Sudan Pasture (Land group 3)

Cover Crop (Land group 3)

Enterprise budgets for each activity are included in Appendix B. There are acreage restrictions for alfalfa, grain sorghum and wheat for grain. For each acre of wheat for grain there must be .38 acres of small grain graze-out or cover crop to meet set-aside requirements for government programs. This corresponds to a 27.5 percent set-aside of base acreage. A similar set-aside requirement applies to grain sorghum. For each acre of grain sorghum, there must be .25 acres of sudan for pasture or cover crop to fulfill the requirements of a 20 percent set-aside of the base acreage. Only 71 percent of land group two may be planted to alfalfa. This is based on the assumption that an alfalfa stand will last five years then be farmed at least two years in other crops before being replanted to alfalfa.

The prices received for wheat and grain sorghum include government payments in accordance with the required set-aside for 1987; they are not market prices. Commodity prices used in the analysis are:

Beef Cows	$ 36.35 per cwt.
4-5 cwt steers	62.00 per cwt.
4-5 cwt heifers	54.50 per cwt.
5-6 cwt steers	56.00 per cwt.
6-7 cwt steers	57.00 per cwt.
Alfalfa	55.00 per ton
Wheat	4.12 per bushel
Sorghum	4.36 per cwt.

The land is farmed with the following machinery which has the listed values:

Pickup(3/4 ton)	$8000	Truck (2 ton)	$5000
Tractor (110 hp)	20000	M.B. Plow	2000
Tractor (80 hp)	12000	Tandem Disk	2000
Stock Trailer	2000	Row Cultivator	1500
Horse	800	Springtooth	2000
Offset Disk	4000	Field Cultivator	1500
Chisel	4000	Sprayer	1775
Grain Drill	4500	Hay Baler	4500
Combine	25000	Swather	10000

The amount of family labor available to the operation for each month is:

January	171 hours
February	180 hours
March	190 hours
April	200 hours
May	210 hours
June	220 hours
July	210 hours
August	200 hours
September	190 hours
October	180 hours
November	171 hours
December	161 hours

Additional labor may be hired for $5 per hour. In addition to the machinery complement, the operator owns 160 acres of land valued at $435 per acre. Total net worth is $180,175. Debt is limited to 50 percent of equity which is equivalent to limiting the debt-to-asset ratio to 33 percent. The interest rate on all types of debt is 13 percent. Additional land can be rented for $21.75 per acre, this is a weighted average of rental rates consisting of $8 per acre for pasture and $33 per acre for cropland. The operator is assumed to be capable of managing all enterprises.

The Optimum Farm Organization

The optimum farm organization was determined by using a single period linear programing model. The optimum solution required 925 acres of rental land in addition to the 160 acres of owned land. The capital requirement for operating activities is $175,158. The return to all land, all labor, and all capital is $74,241. The optimum activity organization is:

198 head of Winter Stocker Steers

738 head of Summer Stocker Steers

488 acres of Native Grass

99 acres of Small Grain Graze-out

236 acres of Sudan Pasture

262 acres of Wheat for Grain

The operating activities on a per-acre basis are:

Native Grass	.450 acres
Small Grain Graze-out	.092 acres
Sudan Pasture	.217 acres
Wheat	.241 acres
Summer Stocker Steers	.680 head
Winter Stocker Steers	.183 head

The capital requirement for one acre of operating activity is $161.35 and the labor requirement is 2.27 hours per acre. The return to all labor, all capital, and the land for one acre of operating activity is $68.40 .

Using the capital, labor, and gross margin estimates developed by the single period model in the multiperiod models does not require that the enterprise mix remain constant, but that the enterprises which may be used in the future, as a whole, have similar capital requirements, labor requirements, and gross margin per acre. Technological or structural changes which would affect the level or ratio of capital, labor, and gross margin per acre are not incorporated into the model.

CHAPTER V

MULTIPERIOD ANALYSIS OF RENT RESTRICTIONS

Multiperiod linear programing models are used to determine how a farmer's land requirements change over the life of the farm operation and what effect various rent restrictions have on earnings and farm firm growth. Although the operation may be expected to continue for many years, extending the planning horizon beyond a certain point has little impact. The discount rate used to value future earnings is an important factor in determining the planning horizon. Increasing the discount rate quickly diminishes the importance of activities in later years.

The number of periods within the planning horizon may also vary. Increasing the number of periods in a planning horizon allows the solution to change more and increases the number of times earnings are compounded. A few long periods may be preferred if changes take place slowly in the type of operation being modeled. Decreasing the number of periods also decreases the complexity of the problem.

Specification of the Model

The planning horizon is modeled for twenty years. Within the range of relevant discount rates, activities

after twenty years have little effect on the operation. The planning horizon consists of ten 2-year periods, this prevents changes from occurring based on one year's outcome yet allows adequate flexibility.

Technical coefficients and all prices except land prices are held constant through the periods, no technological or structural changes are incorporated into the model. Rather than inflating prices and using nominal discount and interest rates, prices are held constant and real discount and interest rates are used. The real interest rate (the rate the farmer pays minus the inflation rate) is eight percent.

The discount rate used in the model is a real, before-tax, required rate of return. Theoretically, the systematic risk of an investment, the rate of return on the market portfolio, and the rate of return available on a risk-free asset determine the required rate of return. When determining a discount rate for a farm operation, tax benefits and non-monetary or indirect benefits must also be considered.

According to income estimates by Melichar, the real rate of return to assets in the farm sector from 1945 to 1984 was 4.21 percent, and the debt-to-asset ratio ranged from 9 to 22 percent. In the operation being modeled, the required rate of return must be more than 4.21 to compensate for the higher risk resulting from greater financial leverage.

Special tax laws applicable to agriculture may affect the appropriate before-tax discount rate. If the real, before-tax, discount rate is 4.8 percent under an effective tax rate of 10 percent, then the real, before-tax, discount rate would be 6.0 percent if the effective tax rate were 28 percent. The discount rate may be influenced by several factors. The appropriate discount rate for an agricultural investment may be unique for each individual. The real, before-tax, discount rate used in the multiperiod models is 6 percent.

The initial resources available to the operation include 160 acres of owned land, $110,575 of available capital, $90,087 of debt capacity, and 2,283 hours per year of family labor. Labor can be hired for $5 per hour. Land can be rented for $21.75 per acre. Land may be purchased with cash or by paying 50 percent down and borrowing the balance with an amortized loan for 30 years at 8 percent interest.

Five different assumptions concerning land prices will be used to analyze the effects of six levels of rent restrictions. Real capital gains (losses) increase (decrease) the operation's debt capacity and increase (decrease) earnings. Real capital gains are valued as cash income, this implies that the π variable, described in chapter three, equals one.

Although there is expected to be a high correlation between rental rates and land prices, there is not a strict

relationship. Real land prices are based on the land's expected future earnings which consist of real capital gains and rental income. Rental rates have historically ranged from 3 to 7.5 percent of land values. The price of land can be changed without changing the rental rate or other coefficients, but the ratio of rent to price should remain within the normal range of 3 to 7.5 percent.

The land price is initially $435 per acre in all models. In Model One, the land price is held constant at $435 per acre, rent is five percent of the land price. The land price increases two percent each year in Model Two, the land price reaches $646.39 per acre at the end of year twenty, the rent is 3.36 percent of $646.39 . In Model Three, the land price decreases two percent each year, the land price at the end of year twenty is $290.41 per acre, rent is 7.5 percent of the price at the end of the planning horizon.

In Models Four and Five, land prices decrease $60 in year one and $40 in year two then increase in subsequent years. The land price at the beginning of period two is $335, rent is 6.5 percent of the land price. The land price increases two percent each year after year two in Model Four, the price at the end of the planning horizon is $478.46, rent is 4.54 percent of the price at the end of year twenty. The land price increases four percent annually after dropping to $335 in Model Five. The price

of land at the end of year twenty is $678.65, rent is 3.2 percent of price.

Each model is run first with no rent restrictions, then rent restrictions are set at an additional 160 acres, 320 acres, 480 acres, 640 acres, and 800 acres per period for each model.

Explanation of Tableau Coefficients

A two period block of the tableau for two percent real capital gains and rent restrictions of an additional 160 acres every two years is shown in figure 7, the complete tableau is shown in Appendix C.

LAND1 is a technical restriction row that limits the use of land in period one to 160 acres plus any rented or purchased land. The operating activity (OPER1) uses one acre of land. Land buy with cash (LANDBC1), land buy with loan (LANDBL1), and land rent (LANDR1) are all activities which increase the availability of land in period one. If land is bought in period one, it is available in subsequent periods.

RENT RESTRICTION1 is an imposed restriction limiting the amount of rented land to an additional 160 acres per period. If land is rented in period one (LANDR1), that land is also available to be rented in period two in addition to the 160 acres of newly available land. If no land is rented in period one, only 160 acres are available to be rented in period two.

LP1RR1	MAXIMIZE	LIMIT	OPER1	LANDBC1	LANDBL1	LANDR1	LABHIR1	BORROW1	EARN1	MARCON1	CAPTR1	OPER2
MAXEARN		(RHS)	0	0	0	0	0	0	0.9165	0	0	0
LAND1	L	160	1	-1	-1	-1						
RENRES1	L	160				1						
LABOR1	L	2283	2.27				-1					
CAP1	L	110575	161.35	435	236.82	43.5	10	-1				
DEBT1	L	90087			217.5			1				
NETRET1	G	0	136.8		-19.32	-43.5	-10	-0.1664	-1			
FAMLIV1	L	30000							1	-1		
ACCAP1	G	30000		-435	-217.5				1	-1	-1	
LAND2	L	160		-1	-1							1
RENRES2	L	160				-1						
LABOR2	L	2283										2.27
CAP2	L	110575			38.64						-1	161.35
DEBT2	L	91492		-8.78	206.8						-0.5	
NETRET2	G	0			-38.64							136.8
FAMLIV2	L	30000										
ACCAP2	G	30000										
.	.	.										
.	.	.										
.	.	.										
LANCOUNT	G	320		-1	-1							
DEBCOUNT	L	0			137.92							
ASSCOUNT	G	317419.8		-646.39	-646.39						-1	
NETCOUNT	L	0										
CAPCOUNT	E	0		116.74	116.74							

Figure 7. Two Period Block of Tableau with Land Prices Increasing 2% and Rent Restriction set at 160 Acres.

LANDBC2	LANDBL2	LANDR2	LABHIR2	BORROW2	EARN2	MARCON2	CAPTR2	....	LANTOT	DEBTOT	ASSTOT	NWTOT	CGTOT
0	0	0	0	0	0.816	0	0	....	0	0	0	0	1
-1	-1	-1											
		1											
			-1										
453	246.57	43.5	10	-1									
	226.5			1									
	-20.07	-43.5	-10	-0.1664	-1								
					1	-1							
-453	-226.5				1	-1	-1						
-1	-1								-1				
	158.67									1			
-646.39	-646.39						-1				-1		
									-1			1	
100.64	100.64										-1	1	-1

Figure 7. Continued.

LABOR1 is a technical restriction which limits family provided labor to 2283 hours per year. Each unit of operating activity requires 2.27 hours of labor. Additional labor may be hired (LABHIR1) for $5 per hour.

CAPITAL1 is a financial restriction which limits capital to $110,575 . One unit of operating activity requires $161.35 of operating, livestock, and equipment capital. Land bought with cash requires $435 of capital and land bought with a loan requires $236.82 of capital. A down payment of $217.50 is made at the beginning of year one and a $19.32 payment is made at the beginning of year two. Land purchased with a loan requires $38.64 of capital for payments in each future period (19.32 * 2). Renting land requires $43.50 (21.75 * 2) of capital per period and hired labor requires $10 (5 * 2) per period. Borrowing money (BORROW1) provides one dollar of capital for each dollar borrowed.

DEBT1 is a financial restriction used to limit borrowing to $90,087 which is half of equity. The operator's initial equity consists of $110,575 in liquid assets plus 160 acres of land valued at $435 per acre. Total value of the land is $69,600 and total equity is $180,175. The borrowing activity uses one dollar of available debt and the land purchased using a loan requires $217.50 of debt per acre in the first period and less in future periods as principal payments are made. The debt limitations of subsequent periods are also affected by capital gains on owned land.

Two percent capital gains on $435 compounded annually for two years is $17.57; this increases debt capacity in period two by $8.78 for each acre of land owned. DEBT2 is limited to $91,492 [90,087 + (8.78 * 160)]. Each acre of land purchased using a loan in period one decreases debt capacity by the remaining principal balance of $215.58 but increases debt capacity by half of capital gains which is $8.78 . The net effect of purchasing an acre of land using a loan, is to decrease debt capacity by $206.80 .

NET RETURN1 is an accounting row used to compute the difference between returns from the operating activity and cash payments for land loans, rented land, hired labor, and borrowed money. The EARN1 activity accounts for the difference between returns and expenses.

FAMLIV1 is an accounting row used to determine marginal family consumption (MARCON1) which is calculated as earnings minus $30,000 (fixed family living expenses for two years), divided by four. The marginal propensity to consume earnings, net of the required family living expence, is .25 .

ACCAP1 is an accounting row used to determine how much of the earnings generated in period one can be transferred to future periods. The amount of capital transferred (CAPTRAN1) is calculated as earnings minus fixed family living expenses, marginal family consumption, and capital used for land purchases. Each dollar of capital

transferred to future periods also adds $.50 of debt capacity in each period.

Periods three through ten are affected by activities in period one in the same way period two is affected. Coefficients in subsequent debt rows change as principal payments are made and as capital gains from land occur. The columns pertaining to activities in period two through ten are similar to columns for period one, except for the changes resulting from different land prices.

Five accounting rows are used to compute owned land (LANCOUNT), debt (DEBCOUNT), assets (ASSCOUNT), net worth (NETCOUNT), and capital gains (CAPGAIN) at the end of the planning horizon. The LANCOUNT row counts the land purchases and adds them to the originally owned 320 acres. LANDTOT is the accounting activity which shows the total acres owned at the end of the planning horizon.

The DEBCOUNT row sums the outstanding balance of land loans at the end of the planning horizon. Total debt at the end of the planning horizon is shown by the DEBTOT activity. The ASSCOUNT row adds the value of owned land and the capital transferred at the end of the tenth period to the available capital at the beginning of the tenth period. Total assets at the end of the planning horizon are shown as the ASSTOT activity. The NETCOUNT row is used to subtract total debt from total assets. The difference is shown by the NWTOT activity. The CAPGAIN row is used to sum the discounted value of capital gains from the land

buying activities of each period. The discounted capital gains are shown as activity CGTOT.

The objective function row has discount factors in each earnings column and a one in the CGTOT column. The CGTOT column does not require a discount factor since capital gains are discounted in the CAPGAIN row.

Results of the Multiperiod Models

The availability of rental land is an important factor in determining the earning capability and firm growth of farmers. No land is purchased in any model when rental land is unrestricted. Returns on available capital are highest when land is rented and capital is used in the operating activity. Each model uses 853 acres of rented land in period one. The additional land rented in period two ranges from 243 acres to 284 acres. Requirements for rented land increase in future periods and are as high as 2124 additional acres in period twenty (Model Two). The total acres operated in period one by each model is 1013 acres, the total acres operated at the end of the planning horizon range from 9311 acres (Model Three) to 9571 acres (Model Two).

The objective function value for Model One is $1,195,185: Model two is $1,204,658: Model Three is $1,187,178: Model Four is $1,184,751: and Model Five is $1,190,607. The objective function value and the amount of

TABLE III

OBJECTIVE FUNCTION VALUE AND LAND PURCHASE SUMMARY

Land Price Assumption	Rent Restrict.	Function Value	Land Bought
$435 and Constant (Model One)	None	1,195,185	0
	160	583,900	834
	320	813,622	931
	480	983,282	925
	640	1,064,253	834
	800	1,128,997	744
$435 and Increases 2% (Model Two)	None	1,204,658	0
	160	598,519	727
	320	824,342	798
	480	985,111	762
	640	1,067,627	691
	800	1,133,667	620
$435 and Decreases 2% (Model Three)	None	1,187,178	0
	160	497,347	0
	320	769,944	0
	480	964,572	0
	640	1,049,678	0
	800	1,115,374	0
$435 then drop to $335 and Increases 2% (Model Four)	None	1,184,751	0
	160	647,237	1,013
	320	842,076	1,015
	480	995,013	969
	640	1,067,308	860
	800	1,128,766	752
$435 then drop to $335 and Increases 4% (Model Five)	None	1,190,607	0
	160	676,825	922
	320	857,621	882
	480	1,000,566	809
	640	1,072,170	713
	800	1,133,566	619

land purchased is shown in table III for all models and each level of rent restriction.

Restricting the amount of rental land to an additional 160 acres per period decreases the objective function value by as much as 58 percent (Model Three). Shadow prices for rental land, the amount the objective function values would increase if another acre of rental land were available, are as high as $751 (Model Two). Many of the shadow prices are greater than the net return from renting an acre for one period. This is possible since the amount of available land is dependent on the amount of land rented in previous periods.

Restricting the amount of rental land to an additional 320 acres per period decreases the objective function value from 28 percent (Model Five) to 35 percent (Model Three). Shadow prices for rental land are as high as $483. Rent restrictions allowing a maximum of 480 additional acres per period decrease the objective function value from 16 percent (Models Four and Five) to 19 percent (Model Three). The highest shadow price for rental land is $301. The objective function value decreases just over 10 percent when rental land is restricted to an additional 640 acres per period. The highest shadow price is $243. With rental land restricted to an additional 800 acres per period the objective function values decrease from 4 to 6 percent. The highest shadow price for rental land is $254.

The most additional land rented in any period is 2,124 acres. Rent restrictions of 2,124 additional acres per period or more would not affect the objective function value of any model. A summary of results for all models at each level of rent restriction is shown in Appendix D.

The various assumptions used regarding real land prices depict a variety of possible land prices that may prevail at the fixed rental rate and gross margin used in the models. Rent restrictions of less than 2,066 additional acres per period decrease the objective function value under every land price assumption used in the analysis. Farm operators with more available capital would be adversely affected by rent restrictions higher than 2,066 additional acres per period and farm operators with less available capital would only be affected by rent restrictions of less than 2,124 additional acres per period.

The supply of rental land varies among locations as does the degree to which such restrictions affect individual farmers. An increased supply of rental land resulting from increased nonfarmer ownership of farmland could significantly increase farmers' earnings in some areas. An increased supply of rental land would be of the most benefit to beginning farmers and large, expanding farmers.

CHAPTER VI

CONCLUSIONS

Farmers have relied on their own equity, debt, and leasing to meet their capital needs. Results of the Oklahoma Farm Financial Survey, and similar surveys from other states, show that many farmers have debt levels which may cause moderate to severe financial stress. Some farmers must increase equity or decrease debt to alleviate the effects of being over-leveraged. With limited amounts of owner-provided and outside equity available, the only alternative for some farmers is to sell assets and replace them with leased assets in order to maintain or increase the size of the operation.

Farmland constitutes approximately 75 percent of farmers' assets and may be a suitable asset to sell and replace by leasing. Purchases of farmland by individuals and/or institutional investors would provide equity to the farm sector and reduce farmers' equity capital needs. The possibility of individual and/or institutional investments in farmland providing a substantial source of equity capital to the farm sector is dependent on the risk-return characteristics of farmland relative to alternative investments. An increase in available rental land

resulting from increased non-farmer ownership would increase farmers' earning potential.

Results of the Capital Asset Pricing Model show that, historically, farmland has had high returns relative to its systematic risk, but some assumptions of the CAPM are violated by the unique characteristics of farmland. Capital gains on farmland must be realized by selling the asset in a market that, at times, is not liquid and has high search and transaction costs. Assets in the market portfolio are traded in a liquid market and capital gains can easily be realized. The capital gains portion of farmland earnings may be discounted by some unknown factor between zero and one (π) in order to make them comparable to cash earnings or capital gains on assets in the market portfolio. If capital gains on farmland are worth at least 22.5 percent of cash earnings, farmland meets the required rate of return for inclusion in the portfolio.

Estimates of beta derived from two different time periods are significantly different. Feldstein's hypothesis, that the real price of land increases and the real price of reproducible capital goods decreases during periods of inflation, suggests that inflation may cause beta to be unstable. The upper bound of the 90 percent confidence interval for any beta estimated is .1776 (1945 to 1972). The required rate of return for an asset with a beta of .1776 is 6.10 percent, which is well below the expected return from farmland.

Farmland appears to be a suitable asset in a diversified portfolio based on historical trends. The beta value for farmland may be unstable but it is low relative to expected earnings. Uncertainty about the value of π prevents a definite conclusion.

The effect on farm operators of increased non-farmer ownership of farmland depends upon the tenancy arrangement of farms prior to being purchased by off-farm investors, current rent restrictions and farmers' objectives. If land is purchased from current operators the supply of rental land will increase. If the supply of rental land is not limiting to the farmer's objectives, an increase in the supply is little benefit. An increased supply of rental land may affect a farmer in various ways depending on the farmer's objectives. If a farmer's objective is to maximize earnings and a limited supply of rental land effectively restricts the farmer, increases in the supply of rental land can substantially increase the farmer's objective function value.

When a farmer's objective is to maximize the present value of earnings over a planning horizon, all land is rented. Limiting the supply of rental land to an additional 160 acres every two years can reduce the objective function value by as much as 58 percent when available capital is $110,575. The amount of available capital and trends in the price of land influence the effect of rent restrictions. The shadow price for an additional acre of

rental land is $751 when rental land is restricted to an additional 160 acres per year, available capital is $110,575 and the land price increases 2 percent each year from an initial price of $435 per acre. Although several factors influence the degree to which rent restrictions affect the objective function value, increasing the supply of rental land to farmers facing rent restrictions clearly increases their earning potential. The supply of rental land is particularly important to beginning farmers and large, expanding farmers.

Results of the analysis show that farmland's risk-return characteristics make it a suitable addition to a diversified portfolio. But for farmers, the rate of return to farmland is not sufficient to compensate for the capital requirements of purchasing land if an alternative exists to invest the capital in additional units of operating activities. If the rate of return to farmland were higher than the rate of return to the operating activities, land would be purchased in the unrestricted solutions. Since the operating activities are the only source of cash income, rent restrictions would still decrease the objective function value.

Implications for Further Research

The feasibility of non-farmer investments in farmland was analyzed by comparing the rate of return on farmland required by investors with a diversified portfolio, to

farmland's expected rate of return. An alternative method would be to compare the rate of return required by non-farmers to the rate of return required by farmers. Assuming farmers' portfolios are limited to agricultural assets, farmers' required rate of return could be determined using agricultural income estimates similar to those developed by Melichar. Such an analysis would also require the assumption that non-monetary and indirect benefits from land ownership are equal to non-monetary and indirect benefits from owning other agricultural assets. The investors for which the lowest value of π caused the expected value of earnings to equal their required rate of return would be the likely purchasers of farmland, if the value of π for farmers equals the value of π for non-farmers.

Uncertainty about the value of π, the instability of beta, and the possibility of inflation, total variance, or the dividend-earnings ratio influencing the appropriate discount rate for farmland are of concern. The results of farmland investment analyses based on the Capital Asset Pricing Model may be inconclusive or misleading. Due to the unique characteristics of farmland, balancing the portfolio with a factor model may be a superior approach. The objective when constructing a portfolio with a factor model is to include assets which have opposite responses to what are determined to be key variables such as interest rates, oil prices, etc. A low beta value indicates that

farmland may be a suitable asset to include in a portfolio based on a factor model.

It was assumed in the analysis that the supply of rental land increased, this required that the amount of operator-owned land decreased. A transfer of land from farmers to non-farmers may be detrimental to farmers whose objectives include land ownership. If the expected rate of return to farmland is greater than the rate of return required by non-farmer investors, resulting increases in non-farmer purchases would cause the price of land to increase. Land purchases by farmers would be less feasible, but current owners would benefit from additional capital gains. If the non-monetary or indirect benefits to operators from owning land could be measured, those benefits could be incorporated in the objective functions of the multiperiod models.

Selected References

(1) Plaxico, James S. and Glenn Knowles. "Capital For The Agriculture Of The Future." Southern Journal of Agricultural Economics, 17:1(July 1985), pp. 103-111.

(2) Plaxico, James S. and Marcia L. Tilley. "The 1986 Farm Financial Survey: Preliminary Results." Current Farm Economics, Division of Agriculture, Oklahoma State University, Stillwater, Oklahoma. 59:2 June 1986.

(3) Schian, Dale C. State Laws Relating to the Ownership of U.S. Agricultural Land by Aliens and Business Entities. United States Department of Agriculture, Economic Research Service, Staff Report No. AGES840412, May 1984.

(4) Oklahoma Const. art. 22, § 2.

(5) Markowitz, H.M. Portfolio Selection: Efficient Diversification of Investments. New York: Wiley, 1959.

(6) Sharpe, W.F. "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk." Journal of Finance, 19(September 1964), pp. 425-442.

(7) Lintner, J. "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets." Review of Economics and Statistics, 47 (February 1965), pp. 13-37.

(8) Weston, J. Fred and Thomas E. Copeland. Managerial Finance. 8th Ed. New York: CBS College Publishing, 1986.

(9) Brealy, Richard and Stewart Myers. Principles of Corporate Finance. 2nd Ed. New York: McGraw-Hill Book Co., Inc., 1984.

(10) Fama, E.F. and J.D. MacBeth. "Risk, Return and Equilibrium: Emperical Tests." Journal of Political Economy, 81 (May 1973), pp. 607-636.

(11) Barry, Peter J. "Capital Asset Pricing and Farm Real Estate." American Journal of Agricultural Economics, 62:3(August 1980), pp. 549-553.

(12) Moss, Charles B., Allen M. Featherstone and Timothy G. Baker. "Stocks, Bonds, Bills, and Farm Assets: A Portfolio Analysis," Unpublished Paper, West Lafayette, Indiana: Department of Agricultural Economics, Purdue University, 1986.

(13) Melichar, E. Agricultural Finance Databook. December 1984.

(14) Feldstein, Martin. "Inflation, Portfolio Choice, and the Prices of Land and Corporate Stock." American Journal of Agricultural Economics, 62:5(December 1980), pp. 910-916.

(15) United States Department of Agriculture. Farm Real Estate Market Developments. Washington, D.C., ESCS, various issues.

(16) Federal Reserve Board. Federal Reserve Bulletin. Washington, D.C., various issues.

(17) Fisher, Carl F. Soil Survey of Blaine County, Oklahoma. Soil Conservation Service, United States Department of Agriculture in cooperation with the Oklahoma Agricultural Experiment Station, February 1968.

APPENDIXES

APPENDIX A

OKLAHOMA LAW REGULATING LAND OWNERSHIP

OKLAHOMA STATUTORY TITLE 18

CHAPTER 21.-FARMING OR RANCHING

BUSINESS CORPORATIONS

§ 951. Prohibition on forming-Exceptions

A. It is hereby declared to be the public policy of this state and shall be the prohibition of this act that, notwithstanding the provisions of Section 5 of this act, no foreign corporation shall be formed or licensed under the Oklahoma General Corporation Act for the purpose of engaging in farming or ranching or for the purpose of owning or leasing any interest in land to be used in the business of farming or ranching. A domestic corporation may, however, be formed under the Oklahoma General Corporation Act to engage in such activity if the following requirements are met by that domestic corporation:

1. There shall be no shareholders other than (a) natural persons; (b) estates; (c) trustees of trusts for the benefit of natural persons, if such trustees are either (i) natural persons or (ii) banks or trust companies which either have their principal place of business in Oklahoma or are organized under the laws of the State of Oklahoma; or (d) corporations owned by no shareholders other than those described in paragraph 1 (a), (b) or (c) of this

section and meeting the requirements of paragraph 3 of this section.

2. Not more than thirty-five percent (35%) of the corporation's annual gross receipts shall be from any source other than (a) farming or ranching or both, as the case may be, or (b) allowing others to extract from the corporate lands any minerals underlying the same, including, but not limited to, oil and gas. Provided, however, in the event a corporation does not comply with the thirty-five percent (35%) annual gross receipt test, then, in that event the corporation may furnish records of its gross receipts for each of the previous five (5) years, or for each year that it has been in existence if less than five (5) years, and the average of said annual gross receipts shall be used in lieu of the corporation's annual gross receipts for purposes of complying with this section.

3. There shall not be more than ten shareholders unless said shareholders in excess of ten are related as lineal descendants or are or have been related by marriage to lineal descendants or persons related to lineal descendants by adoption or any combination of same.

4. Certificates of incorporation for domestic corporations which intend to engage in farming or ranching or owning or leasing any interest in land to be used in the business of farming or ranching shall initially be approved by the State board of Agriculture concerning the purpose prior to filing in the office of the Secretary of State.

No stated purpose is to be disapproved by the Board of Agriculture unless such stated purpose violates existing civil or criminal code.

B. The Secretary of State shall provide the State Department of Agriculture a list of corporations registering in the state that list farming or ranching or owning or leasing any interest in land to be used in the business of farming or ranching at least weekly.

§ 952. Revocation of licence-Vacation of franchise-Penalties

A. Any license issued after June 1, 1971, under the Oklahoma Business Corporation Act to a foreign corporation for the purpose of engaging in farming or ranching or for the purpose of owning or leasing any interest in land to be used in the business of farming or ranching shall be revoked within five (5) years of the effective date of this act.

B. The corporate franchise of any existing domestic corporation formed under the Oklahoma Business Corporation Act after June 1, 1971, for the purpose of engaging in farming or ranching or for the purpose of owning or leasing any interest in land to be used in the business of farming or ranching shall be vacated within five (5) years of the effective date of this act unless its articles of incorporation comply with Section 951 of this title.

C. The corporate franchise of any domestic corporation governed by the Oklahoma General Corporation Act formed for

the purposes of farming or ranching or for the purpose of owning or leasing any interest in land to be used in the business of farming or ranching and permitted to engage in such activity under this act shall be vacated promptly in the manner prescribed by Section 104 of this act, if the corporation has persistently violated the provisions of subsection A of Section 951 of this title.

D. The State Board of Agriculture shall initiate and prosecute civil or criminal actions and proceedings when deemed necessary to enforce or carry out any of the provisions of this code.

E. This act shall not require any foreign or domestic corporation to dispose of any property acquired on or before June 1, 1971.

F. Any farming or ranching corporation which violates the provisions of Section 951 of this title shall be fined an amount not to exeed Five Hundred Dollars ($500.00). Any other person, corporation or entity who knowingly violates such section shall be deemed guilty of a misdemeanor.

§ 953. Actions for divestment of interests in land held by a corporation-Exemptions-Dissolution of corporation

A. No corporation organized for a purpose other than farming or ranching shall own, lease or hold, directly or indirectly, agricultural lands in excess of that amount reasonably necessary to carry out its business purpose.

B. Any resident of the county in which the land is situated, who is of legal age, may initiate an action for the divestment of an interest in land held by a corporation in violation of the provisions of Sections 951 through 954 of this title, in the county in which the land is situated. If such action is successful all costs of the action shall be assessed against the defendant corporation and a reasonable attorney's fee shall be allowed the plaintiff, and should judgment be rendered for the defendant, such costs and a reasonable attorney's fee for the defendant shall be paid by the plaintiff.

C. In the event an action for the divestment of an interest in the land held by a corporation in violation of the provisions of Sections 951 through 954 of this title, is successful against said corporation, said corporation shall be required to dispose of said land within such reasonable period of time as may be ordered by the court, subject to the corporation's right of appeal. The provisions of Sections 951 through 954 of this title, shall not apply to corporations engaging in food canning operations, food processing or frozen food pocessing insofar as such corporations engage in the raising of food products for aforesaid purposes.

D. Upon the petition to a court of competent jurisdiction by shareholders holding twenty-five percent (25%) or more of the shares in a farming or ranching business corporation the court in its discretion, for good

cause shown, may order the corporation dissolved and the assets of such corporation divided in kind pro rata to the shareholders or liquidated and the proceeds of such liquidation divided pro rata to the shareholders all according to the procedures set out for the dissolution and liquidation of business corporations under the Oklahoma General Corporation Act.

§ 954. Research or feeding operations-Exemption

The provisions of this act shall not apply where a corporation, either domestic or foreign, engages in research and/or feeding arrangements or operations concerned with the feeding of livestock or poultry, but only to the extent of such research and/or feeding arrangements or such livestock or poultry operations, or engages in forestry as defined by Section 2, Chapter 242, O.S.L.1968 (2 O.S.Supp. § 1-4), or whose corporate purpose is charitable or eleemosynary.

§ 955. Limitations on ownership-Exceptions

A. No person, corporation, association or any other entity shall engage in farming or ranching, or own or lease any interest in land to be used in the business of farming or ranching, except the following:

1. Natural persons and the estates of such persons;

2. Trustees of trusts; provided that

a each beneficiary shall be a person or entity

enumerated in paragraphs 1 through 4 of this subsection, and

b there shall not be more than ten beneficiaries unless the beneficiaries in excess of ten are related as lineal descendants or are or have been related by marriage or adoption to lineal descendants, and

c at least sixty-five percent (65%) of the trust's annual gross receipts shall be derived from farming or ranching, or from allowing others to extract minerals underlying lands held by the trust. If the trust cannot comply with the annual gross receipt test, the trust may furnish records of its gross receipts for each of the previous five (5) years, or for each year that it has been in existence if less than five (5) years, and the average of such annual gross receipts may be used for purposes of complying with this section;

3. Corporations, as provided for in Sections 951 through 954 of Title 18 of the Oklahoma Statutes, or as otherwise permitted by law;

4. Partnerships and limited partnerships; provided that

a each partner shall be a person or entity enumerated in paragraphs 1 through 4 of this subsection, and

b there shall not be more than ten partners unless

said partners in excess of ten are related as lineal descendants or are or have been related by marriage or adoption to lineal descendants, and

c at least sixty-five percent (65%) of the partnership's annual gross receipts shall be derived from farming or ranching, or from allowing others to extract minerals underlying lands held by the partnership. If the partnership cannot comply with the annual gross receipt test, the partnership may furnish records of its gross receipts for each of the previous five (5) years, or for each year that it has been in existence if less than five (5) years, and the average of such annual gross receipts may be used for the purposes of complying with this section.

B. Any farming or ranching corporation, trust, partnership, limited partnership or other entity which violates any provisions of this section shall be fined an amount not to exceed Five Hundred Dollars ($500.00). Any other person or entity who knowingly violates this section shall be deemed guilty of a misdemeanor.

C. The provisions of this act shall not apply to interests in land acquired prior to June 1, 1978.

§ 956. Action for divestment-Cost-Attorney fees

A. Any resident of the county in which the land is situated, who is of legal age, may initiate an action in the district court in the county wherein the land is situated for the divestment of an interest in land held in violation of Section 1 of this act. If such action is successful, all costs of the action shall be assessed against the defendant and a reasonable attorney fee shall be allowed for the plaintiff, and, should judgment be rendered for the defendant, such costs and a reasonable attorney fee for the defendant shall be paid by the plaintiff.

B. In the event an action for the divestment of an interest in land held in violation of Section 1 of this act is successful, the defendant shall be required to dispose of said land within such reasonable period of time as may be ordered by the court, subject to the right of appeal of said defendant.

(Section 1020 of Title 18 specifies penalties and methods of enforcement.)

OKLAHOMA CONSTITUTION ARTICLE XXII

ALIEN AND CORPORATE OWNERSHIP OF LANDS

§ 1. Aliens-Ownership of land prohibited-Disposal of lands acquired

No alien or person who is not a citizen of the United States, shall acquire title to or own land in this state, and the Legislature shall enact laws whereby all persons not citizens of the United States, and their heirs, who may hereafter acquire real estate in this state by devise, descent, or otherwise, shall dispose of the same within five years upon condition of escheat or forfeiture to the State: Provided, This shall not apply to Indians born within the United States, nor to aliens or persons not citizens of the United States who may become bona fide residents of this State: And Provided Further, That this section shall not apply to lands now owned by aliens in this State.

§ 2. Corporations-Buying, acquiring or dealing in real estate

No corporation shall be created or licensed in this State for the purpose of buying, acquiring, trading, or dealing in real estate other than real estate located in

incorporated cities and towns and as additions thereto; nor shall any corporation doing business in this State buy, acquire, trade, or deal in real estate for any purpose except such as may be located in such towns and cities and as additions to such towns and cities, and further except such as shall be necessary and proper for carrying on the business for which it was chartered or licensed; and provided further that under limitations prescribed by the legislature, any corporation may acquire real estate for lease or sale to any other corporation, if such latter corporation could have legally acquired the same in the first instance; nor shall any corporation be created or licensed to do business in this State for the purpose of acting as agent in buying and selling or leasing land for agricultural purposes: provided, however, that corporations shall not be precluded from taking mortgages on real estate to secure loans or debts, or from acquiring title thereto upon foreclosure of such mortgages or in the collection of debts, conditioned that such corporation or corporations shall not hold such real estate for a longer period than seven (7) years after acquiring such title; and provided, further, that this Section shall not apply to trust companies taking only the naked title to real estate in this State as a trustee, to be held solely as security for indebtedness pursuant to such trust; and provided, further, that no public service corporation shall hold any land, or the title thereof, in any way whatever in this State,

except as the same shall be necessary for the transaction and operation of its business as such public service corporation.

[Amended by State Question No. 358, Referendum Petition No. 104, adopted at election held July 6, 1954.]

APPENDIX B

ENTERPRISE BUDGETS

BUDGET CODE ID B008LV13 BUDGET NUMBER 13110325
STOCKER STEERS 13110325
BUY 500# IN MAY 1/17/86
SELL 690# IN OCTOBER NORTHWEST

PRODUCTION	UNITS	QUANTITY	WEIGHT	PRICE	VALUE/UNIT	VALUE	YOUR VALUE
STEERS (6-700#)	CWT.	0.98	6.90	57.000	393.30	385.43	----------*
TOTAL RECEIPTS						385.43	----------

OPERATING INPUTS	UNITS	RATE PER UNIT	NUMBER OF UNITS	TOTAL UNITS	PRICE	VALUE	
STEERS (5-600#)	CWT.	1.00	5.00	5.000	56.00	280.00	----------*
SALT & MIN.	LBS.	12.50	1.00	12.500	0.09	1.12	----------*
VET & MED.	HD.	1.00	1.00	1.000	3.00	3.00	----------
TRUCKING	CWT.	11.90	1.00	11.900	1.00	11.90	----------
SALES COMM.	HD.	1.00	1.00	1.000	3.50	3.50	----------
PRAIRIE HAY	TONS	0.00	0.00	0.000	42.00	0.00	----------*
MACH & FUEL & LUBE						2.98	----------
MACHINERY REPAIR COST						2.03	----------
EQUIPMENT REPAIR						0.05	----------
TOTAL OPERATING COST						304.58	----------

RETURNS TO LAND,LABOR,CAPITAL,MACHINERY,OVERHEAD,RISK AND MANAGEMENT	80.85 ----------

CAPITAL COST	PRICE	AMOUNT	VALUE	YOUR VALUE
ANNUAL OPERATING CAPITAL	0.130	126.558	16.45	----------
TRACTOR INVESTMENT	0.130	6.052	0.79	----------
EQUIPMENT INVESTMENT	0.130	1.000	0.13	----------
TOTAL INTEREST CHARGE			17.37	----------

RETURNS TO LAND,LABOR,MACHINERY,OVERHEAD,RISK,AND MANAGEMENT	63.48 ----------

OWNERSHIP COST: (DEPRECIATION, TAXES, INSURANCE)		
MACHINERY	DOL.	0.69 ----------
EQUIPMENT	DOL.	0.27 ----------
TOTAL OWNERSHIP COST		0.96 ----------

RETURNS TO LAND, LABOR, OVERHEAD, RISK AND MANAGEMENT	62.52 ----------

LABOR COSTS	PRICE	HOURS		
MACHINERY LABOR	5.000	0.900	4.50	----------
EQUIPMENT LABOR	5.000	0.040	0.20	----------
LIVESTOCK LABOR	5.000	0.883	4.42	----------
TOTAL LABOR COST		1.823	9.12	----------

RETURNS TO LAND,OVERHEAD,RISK,AND MANAGEMENT	53.40 ----------

BUDGET CODE ID B009LV13 BUDGET NUMBER 13110034
100 HEAD STOCKER BUDGET, PER HEAD 13110034
BUY OCT 15 - SELL MARCH 1: STEERS 08/01/85
400# IN - 602# OUT NORTHWEST

PRODUCTION	UNITS	QUANTITY	WEIGHT	PRICE	VALUE/UNIT	VALUE	YOUR VALUE
STEERS (5-600#)	CWT.	1.00	6.02	57.000	343.14	343.14	----------*
TOTAL RECEIPTS						343.14	----------

OPERATING INPUTS	UNITS	RATE PER UNIT	NUMBER OF UNITS	TOTAL UNITS	PRICE	VALUE	
STR CALVES(4-500	CWT.	1.02	4.00	4.080	62.00	252.96	----------*
41-45% PRO. SUP.	LBS.	50.00	1.00	50.000	0.09	4.50	----------*
SALT & MIN.	LBS.	9.00	1.00	9.000	0.09	0.81	----------*
TRUCKING	HD.	2.00	1.00	2.000	3.10	6.20	----------
SALES COMM.	HD.	1.00	1.00	1.000	4.35	4.35	----------
VET MEDICINE	HD.	1.00	1.00	1.000	7.00	7.00	----------
UTILITIES	HD.	0.15	1.00	0.150	1.00	0.15	----------
HAY	CWT.	5.50	1.00	5.500	1.09	6.01	----------
MACH & FUEL & LUBE						2.98	----------
MACHINERY REPAIR COST						2.03	----------
EQUIPMENT REPAIR						2.27	----------
TOTAL OPERATING COST						289.26	----------
RETURNS TO LAND,LABOR,CAPITAL,MACHINERY,OVERHEAD,RISK AND MANAGEMENT						53.88	----------

CAPITAL COST	PRICE	AMOUNT	VALUE	YOUR VALUE
ANNUAL OPERATING CAPITAL	0.130	103.833	13.50	----------
TRACTOR INVESTMENT	0.130	6.052	0.79	----------
EQUIPMENT INVESTMENT	0.130	45.125	5.87	----------
TOTAL INTEREST CHARGE			20.15	----------
RETURNS TO LAND,LABOR,MACHINERY,OVERHEAD,RISK,AND MANAGEMENT			33.73	----------

OWNERSHIP COST: (DEPRECIATION, TAXES, INSURANCE)			
MACHINERY	DOL.	0.69	----------
EQUIPMENT	DOL.	8.29	----------
TOTAL OWNERSHIP COST		8.98	----------
RETURNS TO LAND, LABOR, OVERHEAD, RISK AND MANAGEMENT		24.75	----------

LABOR COSTS	PRICE	HOURS		
MACHINERY LABOR	5.000	0.400	2.00	----------
EQUIPMENT LABOR	5.000	0.900	4.50	----------
LIVESTOCK LABOR	5.000	0.354	1.77	----------
TOTAL LABOR COST		1.654	8.27	----------
RETURNS TO LAND,OVERHEAD,RISK,AND MANAGEMENT			16.48	----------

NO NAME CHANGES HAVE BEEN STORED WITH THIS BUDGET

NO COMPLEMENT CHANGES HAVE BEEN STORED WITH THIS BUDGET

BUDGET CODE ID·BOO7LV13 BUDGET NUMBER 13110236
100 HEAD STOCKER BUDGET, PER HEAD 13110236
BUY OCT 15 - SELL MAY 15: STEERS 08/01/85
400# IN - 701# OUT, GRAZE-OUT - WHEAT NORTHWEST

LIVESTOCK INVESTMENT	UNITS	SIZE	NUMBER	VALUE/UNIT	VALUE	YOUR VALUE
HORSE	HD.	1.00	0.00	340.000	3.40	
TOTAL LIVESTOCK INVESTMENT					0.00	

PRODUCTION	UNITS	QUANTITY	WEIGHT	PRICE	VALUE/UNIT	VALUE	YOUR VALUE
STEERS (6-700#)	CWT.	1.00	7.01	57.000	399.57	399.57	*
TOTAL RECEIPTS						399.57	

OPERATING INPUTS	UNITS	RATE PER UNIT	NUMBER OF UNITS	TOTAL UNITS	PRICE	VALUE	
STR CALVES(4-500	CWT.	1.02	4.00	4.080	62.00	252.96	*
PRAIRIE HAY	TONS	0.15	1.00	0.150	42.00	6.30	*
21-25% PRO. SUP.	LBS.	100.00	1.00	100.000	0.07	7.20	*
SALT & MIN.	LBS.	19.00	1.00	19.000	0.09	1.71	*
TRUCKING	HD.	1.00	1.00	1.000	2.70	2.70	
SALES COMM.	HD.	1.00	1.00	1.000	5.10	5.10	
VET & MED.	HD.	1.00	1.00	1.000	3.50	3.50	
UTILITIES	HD.	0.15	1.00	0.150	1.00	0.15	
MACH & FUEL & LUBE						4.56	
MACHINERY REPAIR COST						3.11	
EQUIPMENT REPAIR						2.27	
TOTAL OPERATING COST						289.56	

RETURNS TO LAND,LABOR,CAPITAL,MACHINERY,OVERHEAD,RISK AND MANAGEMENT	110.01

CAPITAL COST	PRICE	AMOUNT	VALUE	YOUR VALUE
ANNUAL OPERATING CAPITAL	0.130	168.199	21.87	
TRACTOR INVESTMENT	0.130	9.279	1.21	
EQUIPMENT INVESTMENT	0.130	45.125	5.87	
LIVESTOCK INVESTMENT	0.130	3.400	0.44	
TOTAL INTEREST CHARGE			29.38	

RETURNS TO LAND,LABOR,MACHINERY,OVERHEAD,RISK,AND MANAGEMENT	80.63

OWNERSHIP COST: (DEPRECIATION, TAXES, INSURANCE)		
MACHINERY	DOL.	1.06
EQUIPMENT	DOL.	8.29
LIVESTOCK	DOL.	0.15
TOTAL OWNERSHIP COST		9.50

RETURNS TO LAND, LABOR, OVERHEAD, RISK AND MANAGEMENT	71.13

LABOR COSTS	PRICE	HOURS	
MACHINERY LABOR	5.000	0.800	4.00
EQUIPMENT LABOR	5.000	0.700	3.50
LIVESTOCK LABOR	5.000	1.000	5.00
TOTAL LABOR COST		2.500	12.50

RETURNS TO LAND,OVERHEAD,RISK,AND MANAGEMENT	58.63

BUDGET CODE ID BOO6LV11 BUDGET NUMBER 11111018
COW-CALF COSTS & RETURNS PER COW 11111018
100 COW UNIT SIZE, SPRING CALVING 01/17/86
NATIVE PASTURE NORTHWEST

LIVESTOCK INVESTMENT	UNITS	SIZE	NUMBER	VALUE/UNIT	VALUE	YOUR VALUE
BEEF COW	HD.	1.00	1.00	528.000	528.00	----------
BEEF BULL	HD.	1.00	0.03	1080.000	32.40	----------
BEEF HEIFER	HD.	1.00	0.12	550.000	66.00	----------
HORSE	HD.	1.00	0.01	680.000	6.80	----------
TOTAL LIVESTOCK INVESTMENT					633.20	----------

PRODUCTION	UNITS	QUANTITY	WEIGHT	PRICE	VALUE/UNIT	VALUE	YOUR VALUE
STR CALVES(4-500	CWT.	0.44	5.06	62.000	313.04	138.04	----------*
HFR CALVES(4-500	CWT.	0.32	4.78	54.500	260.78	83.45	----------*
COMMERCIAL COWS	CWT.	0.10	9.50	36.350	345.32	34.53	----------*
AGED BULLS	CWT.	0.01	16.00	45.000	720.00	7.20	----------*
TOTAL RECEIPTS						263.22	----------

OPERATING INPUTS	UNITS	RATE PER UNIT	NUMBER OF UNITS	TOTAL UNITS	PRICE	VALUE	
41-45% PRO. SUP.	LBS.	302.00	1.12	338.240	0.09	30.44	----------*
PRAIRIE HAY	TONS	0.16	1.12	0.179	42.00	7.53	----------*
SALT & MIN.	LBS.	24.00	1.12	26.880	0.09	2.42	----------*
VET & MED.	HD.	1.00	1.12	1.120	4.00	4.48	----------
HAULING & MKTG.	HD.	1.00	1.00	1.000	5.00	5.00	----------
PERSONAL TAXES	HD.	1.00	1.00	1.000	3.00	3.00	----------
MACH & FUEL & LUBE						7.94	----------
MACHINERY REPAIR COST						5.58	----------
EQUIPMENT REPAIR						4.02	----------
TOTAL OPERATING COST						70.40	----------

RETURNS TO LAND,LABOR,CAPITAL,MACHINERY,OVERHEAD,RISK AND MANAGEMENT	192.82 ----------

CAPITAL COST	PRICE	AMOUNT	VALUE	YOUR VALUE
ANNUAL OPERATING CAPITAL	0.130	26.286	3.42	----------
TRACTOR INVESTMENT	0.130	18.345	2.38	----------
EQUIPMENT INVESTMENT	0.130	170.790	22.20	----------
LIVESTOCK INVESTMENT	0.130	633.199	82.32	----------
TOTAL INTEREST CHARGE			110.32	----------

RETURNS TO LAND,LABOR,MACHINERY,OVERHEAD,RISK,AND MANAGEMENT	82.50 ----------

OWNERSHIP COST: (DEPRECIATION, TAXES, INSURANCE)			
MACHINERY	DOL.	2.07	----------
EQUIPMENT	DOL.	18.52	----------
LIVESTOCK	DOL.	8.39	----------
TOTAL OWNERSHIP COST		28.98	----------

RETURNS TO LAND, LABOR, OVERHEAD, RISK AND MANAGEMENT	53.52 ----------

LABOR COSTS	PRICE	HOURS		
MACHINERY LABOR	5.000	2.400	12.00	----------
EQUIPMENT LABOR	5.000	0.750	3.75	----------
LIVESTOCK LABOR	5.000	3.750	18.75	----------
TOTAL LABOR COST		6.900	34.50	----------

RETURNS TO LAND,OVERHEAD,RISK,AND MANAGEMENT	19.02 ----------

BUDGET CODE ID B0020281 LAND GROUP 02 BUDGET NUMBER 816*2004
ALFALFA HAY, DRYLAND 81360004
LOAM SOIL 01/17/86
OWN EQUIPMENT SOUTHWEST

CATEGORY	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
PRODUCTION:					
ALFALFA HAY	TONS	55.000	2.700	148.50	*
TOTAL RECEIPTS				148.50	
OPERATING INPUTS:					
EST. COST	ACRE	90.000	0.200	18.00	
PHOSPH (P205)	LBS.	0.150	60.000	9.00	
INSECTICIDE	ACRE	10.000	1.000	10.00	
MISCL EXPENSE	BL.	0.120	90.000	10.80	
RNTFERTSPRD/ACRE	ACRE	1.250	1.000	1.25	
TRACTOR FUEL & LUBE	ACRE			5.54	
TRACTOR REPAIR COST	ACRE			3.94	
EQUIP. FUEL & LUBE	ACRE			1.83	
EQUIP. REPAIR COST	ACRE			10.69	
TOTAL OPERATING COST				71.04	
RETURNS TO LAND,LABOR,CAPITAL,MACHINERY, OVERHEAD,RISK,AND MANAGEMENT				77.46	
CAPITAL COST:					
ANNUAL OPERATING CAPITAL		0.130	9.754	1.27	
TRACTOR INVESTMENT		0.130	43.303	5.63	
EQUIPMENT INVESTMENT		0.130	117.180	15.23	
TOTAL INTEREST CHARGE				22.13	
RETURNS TO LAND, LABOR, MACHINERY, OVERHEAD, RISK AND MANAGEMENT				55.33	
OWNERSHIP COST: (DEPRECIATION, TAXES, INSURANCE)					
TRACTOR	HR.			3.63	
EQUIPMENT	HR.			15.87	
TOTAL OWNERSHIP COST				19.50	
RETURNS TO LAND, LABOR, OVERHEAD, RISK AND MANAGEMENT				35.83	
LABOR COST:					
MACHINERY LABOR	HR.	5.000	1.937	9.69	
OTHER LABOR	HR.	5.000	0.300	1.50	
TOTAL LABOR COST			2.237	11.19	
RETURNS TO LAND, OVERHEAD, RISK AND MANAGEMENT				24.64	
LAND CHARGE OR RENT:					
LAND INVESTMENT	ACRE	0.000	0.000	0.00	
LAND TAXES	ACRE			0.00	
TOTAL LAND CHARGE				0.00	
RETURNS TO OVERHEAD, RISK AND MANAGEMENT				24.64	

OWN MACHINERY SAHS

EST. COST IS PRORATED OVER FIVE YEARS 05/01/86 0000011000

BUDGET CODE ID B0030276 BUDGET NUMBER 76120301
WHEAT FOR GRAIN OWN HARVEST EQUIPMENT 76120301
SMALL GRAIN CLAY AND LOAM SOILS 08/01/85
USUALLY USE CLASSES I & II NORTHWEST

CATEGORY	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
PRODUCTION:					
WHEAT	BU.	4.120	30.000	123.60	_____*
S.G. PASTURE	AUMS	0.000	0.500	0.00	_____*
TOTAL RECEIPTS				123.60	_____
OPERATING INPUTS:					
WHEAT SEED	BU.	3.900	1.000	3.90	_____
18-46-0 FERT	CWT.	9.250	1.000	9.25	_____
NITROGEN (N)	LBS.	0.160	40.000	6.40	_____
INSECTICIDE	ACRE	4.500	1.000	4.50	_____
RNTFERTSPRD/ACRE	ACRE	1.250	2.000	2.50	_____
TRACTOR FUEL & LUBE	ACRE			4.95	_____
TRACTOR REPAIR COST	ACRE			3.61	_____
EQUIP. FUEL & LUBE	ACRE			4.20	_____
EQUIP. REPAIR COST	ACRE			7.69	_____
TOTAL OPERATING COST				47.01	_____
RETURNS TO LAND,LABOR,CAPITAL,MACHINERY, OVERHEAD,RISK,AND MANAGEMENT				76.59	_____
CAPITAL COST:					
ANNUAL OPERATING CAPITAL		0.130	24.758	3.22	_____
TRACTOR INVESTMENT		0.130	34.335	4.46	_____
EQUIPMENT INVESTMENT		0.130	44.887	5.84	_____
TOTAL INTEREST CHARGE				13.52	_____
RETURNS TO LAND, LABOR, MACHINERY, OVERHEAD, RISK AND MANAGEMENT				63.07	_____
OWNERSHIP COST: (DEPRECIATION, TAXES, INSURANCE)					
TRACTOR	HR.			2.12	_____
EQUIPMENT	HR.			3.24	_____
TOTAL OWNERSHIP COST				5.36	_____
RETURNS TO LAND, LABOR, OVERHEAD, RISK AND MANAGEMENT				57.71	_____
LABOR COST:					
MACHINERY LABOR	HR.	5.000	1.200	6.00	_____
OTHER LABOR	HR.	5.000	0.130	0.65	_____
TOTAL LABOR COST			1.330	6.65	_____
RETURNS TO LAND, OVERHEAD, RISK AND MANAGEMENT				51.06	_____
LAND CHARGE OR RENT:					
LAND INVESTMENT	ACRE	0.000	0.000	0.00	_____
LAND TAXES	ACRE			0.00	_____
TOTAL LAND CHARGE				0.00	_____
RETURNS TO OVERHEAD, RISK AND MANAGEMENT				51.06	_____

100# 18-46-0 FALL HININGER, HAMILTON
40# NITROGEN SPRING
OWN COMBINE & TRUCK 11/06/85 1100000000

BUDGET CODE ID B0040273 BUDGET NUMBER 73120904
GRAIN SORGHUM 73120904
OWNED HARVEST EQUIPMENT 01/17/86
NORTHWEST

CATEGORY	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
PRODUCTION:					
MILO	CWT.	4.360	24.000	104.64	_____*
S.G. PASTURE	AUMS	0.000	0.200	0.00	_____*
TOTAL RECEIPTS				104.64	_____
OPERATING INPUTS:					
GRAIN SORG SEED	LBS.	0.650	5.000	3.25	_____
18-46-0 FERT	CWT.	13.500	1.000	13.50	_____
NITROGEN (N)	LBS.	0.160	33.500	5.36	_____
RNTFERTSPRD/ACRE	ACRE	1.250	1.000	1.25	_____
2-4-D	LBS.	2.500	0.500	1.25	_____
TRACTOR FUEL & LUBE	ACRE			5.06	_____
TRACTOR REPAIR COST	ACRE			3.70	_____
EQUIP. FUEL & LUBE	ACRE			5.01	_____
EQUIP. REPAIR COST	ACRE			14.96	_____
TOTAL OPERATING COST				53.34	_____
RETURNS TO LAND,LABOR,CAPITAL,MACHINERY, OVERHEAD,RISK,AND MANAGEMENT				51.30	_____
CAPITAL COST:					
ANNUAL OPERATING CAPITAL		0.130	14.918	1.94	_____
TRACTOR INVESTMENT		0.130	35.118	4.57	_____
EQUIPMENT INVESTMENT		0.130	129.595	16.85	_____
TOTAL INTEREST CHARGE				23.35	_____
RETURNS TO LAND, LABOR, MACHINERY, OVERHEAD, RISK AND MANAGEMENT				27.94	_____
OWNERSHIP COST: (DEPRECIATION, TAXES, INSURANCE)					
TRACTOR	HR.			2.17	_____
EQUIPMENT	HR.			9.19	_____
TOTAL OWNERSHIP COST				11.36	_____
RETURNS TO LAND, LABOR, OVERHEAD, RISK AND MANAGEMENT				16.59	_____
LABOR COST:					
MACHINERY LABOR	HR.	5.000	1.800	9.00	_____
OTHER LABOR	HR.	5.000	0.200	1.00	_____
TOTAL LABOR COST			2.000	10.00	_____
RETURNS TO LAND, OVERHEAD, RISK AND MANAGEMENT				6.59	_____
LAND CHARGE OR RENT:					
LAND INVESTMENT	ACRE	0.000	0.000	0.00	_____
LAND TAXES	ACRE			0.00	_____
TOTAL LAND CHARGE				0.00	_____
RETURNS TO OVERHEAD, RISK AND MANAGEMENT				6.59	_____

100# 18-46-0 PLUS 100# 33.5-0-0 HAMILTON

04/24/86 1100000000

BUDGET CODE ID B0050289 BUDGET NUMBER 89120701
SMALL GRAIN GRAZE-OUT 89120701
LOAM SOILS 08/01/85
NORTHWEST

CATEGORY	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
PRODUCTION:					
S.G. PASTURE	AUMS	0.000	1.760	0.00	_____*
TOTAL RECEIPTS				0.00	_____
OPERATING INPUTS:					
WHEAT SEED	BU.	3.900	1.330	5.19	_____
18-46-0 FERT.	CWT.	9.250	0.600	5.55	_____
ANHYDROUS AMMON	LBS.	0.130	80.000	10.40	_____
INSECT HERBICIDE	ACRE	4.500	1.000	4.50	_____
TRACTOR FUEL & LUBE	ACRE			4.71	_____
TRACTOR REPAIR COST	ACRE			4.48	_____
EQUIP. REPAIR COST	ACRE			6.69	_____
TOTAL OPERATING COST				41.52	_____
RETURNS TO LAND,LABOR,CAPITAL,MACHINERY, OVERHEAD,RISK,AND MANAGEMENT				-41.52	_____
CAPITAL COST:					
ANNUAL OPERATING CAPITAL		0.130	21.932	2.85	_____
TRACTOR INVESTMENT		0.130	36.547	4.75	_____
EQUIPMENT INVESTMENT		0.130	22.472	2.92	_____
TOTAL INTEREST CHARGE				10.52	_____
RETURNS TO LAND, LABOR, MACHINERY, OVERHEAD, RISK AND MANAGEMENT				-52.05	_____
OWNERSHIP COST: (DEPRECIATION, TAXES, INSURANCE)					
TRACTOR	HR.			1.27	_____
EQUIPMENT	HR.			1.48	_____
TOTAL OWNERSHIP COST				2.75	_____
RETURNS TO LAND, LABOR, OVERHEAD, RISK AND MANAGEMENT				-54.80	_____
LABOR COST:					
MACHINERY LABOR	HR.	5.000	1.050	5.25	_____
TOTAL LABOR COST			1.050	5.25	_____
RETURNS TO LAND, OVERHEAD, RISK AND MANAGEMENT				-61.37	_____
LAND CHARGE OR RENT:					
LAND INVESTMENT	ACRE	0.000	0.000	0.00	_____
LAND TAXES	ACRE			0.00	_____
TOTAL LAND CHARGE				0.00	_____
RETURNS TO OVERHEAD, RISK AND MANAGEMENT				-61.37	_____

HAMILTON

10/28/85 1100000000

BUDGET CODE ID BO100287 BUDGET NUMBER 87121601
SUDAN PASTURE

87120601
01/17/86
NORTHWEST

CATEGORY	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
PRODUCTION:					
PASTURE	AUMS	0.000	5.200	0.00	_____*
TOTAL RECEIPTS				0.00	_____
OPERATING INPUTS:					
SUDAN SEED	LBS.	0.450	20.000	9.00	_____
NITROGEN (N)	LBS.	0.160	50.000	8.00	_____
RNTFERTSPRD/ACRE	ACRE	1.250	1.000	1.25	_____
TRACTOR FUEL & LUBE	ACRE			3.25	_____
TRACTOR REPAIR COST	ACRE			2.38	_____
EQUIP. REPAIR COST	ACRE			2.17	_____
TOTAL OPERATING COST				26.05	_____
RETURNS TO LAND,LABOR,CAPITAL,MACHINERY, OVERHEAD,RISK,AND MANAGEMENT				-26.05	_____
CAPITAL COST:					
ANNUAL OPERATING CAPITAL		0.130	6.512	0.85	_____
TRACTOR INVESTMENT		0.130	22.571	2.93	_____
EQUIPMENT INVESTMENT		0.130	10.787	1.40	_____
TOTAL INTEREST CHARGE				5.18	_____
RETURNS TO LAND, LABOR, MACHINERY, OVERHEAD, RISK AND MANAGEMENT				-31.23	_____
OWNERSHIP COST: (DEPRECIATION, TAXES, INSURANCE)					
TRACTOR	HR.			1.39	_____
EQUIPMENT	HR.			1.26	_____
TOTAL OWNERSHIP COST				2.66	_____
RETURNS TO LAND, LABOR, OVERHEAD, RISK AND MANAGEMENT				-33.89	_____
LABOR COST:					
MACHINERY LABOR	HR.	5.000	0.907	4.53	_____
OTHER LABOR	HR.	5.000	0.200	1.00	_____
TOTAL LABOR COST			1.107	5.53	_____
RETURNS TO LAND, OVERHEAD, RISK AND MANAGEMENT				-39.42	_____
LAND CHARGE OR RENT:					
LAND INVESTMENT	ACRE	0.000	0.000	0.00	_____
LAND TAXES	ACRE			0.00	_____
TOTAL LAND CHARGE				0.00	_____
RETURNS TO OVERHEAD, RISK AND MANAGEMENT				-39.42	_____

50# NITROGEN HAMILTON

05/01/86 1100000000

BUDGET CODE ID B0010185 LAND GROUP 01 BUDGET NUMBER 85230101

NATIVE GRASS PASTURE — 85230101
YEAR-ROUND GRAZING — 01/17/86
GOOD TO EXCELLENT RANGE CONDITIONS — NORTHEAST

CATEGORY	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
PRODUCTION:					
PASTURE	AUMS	0.000	1.380	0.00	_____*
TOTAL RECEIPTS				0.00	_____
OPERATING INPUTS:					
2-4-D	LBS.	4.500	0.250	1.13	_____
TRACTOR FUEL & LUBE	ACRE			0.10	_____
TRACTOR REPAIR COST	ACRE			0.07	_____
EQUIP. FUEL & LUBE	ACRE			0.40	_____
EQUIP. REPAIR COST	ACRE			0.31	_____
TOTAL OPERATING COST				2.00	_____
RETURNS TO LAND,LABOR,CAPITAL,MACHINERY, OVERHEAD,RISK,AND MANAGEMENT				-2.00	_____
CAPITAL COST:					
ANNUAL OPERATING CAPITAL		0.130	0.333	0.04	_____
TRACTOR INVESTMENT		0.130	0.615	0.08	_____
EQUIPMENT INVESTMENT		0.130	1.426	0.19	_____
TOTAL INTEREST CHARGE				0.31	_____
RETURNS TO LAND, LABOR, MACHINERY, OVERHEAD, RISK AND MANAGEMENT				-2.31	_____
OWNERSHIP COST: (DEPRECIATION, TAXES, INSURANCE)					
TRACTOR	HR.			0.03	_____
EQUIPMENT	HR.			0.16	_____
TOTAL OWNERSHIP COST				0.20	_____
RETURNS TO LAND, LABOR, OVERHEAD, RISK AND MANAGEMENT				-2.51	_____
LABOR COST:					
MACHINERY LABOR	HR.	5.000	0.160	0.80	_____
TOTAL LABOR COST			0.160	0.80	_____
RETURNS TO LAND, OVERHEAD, RISK AND MANAGEMENT				-3.31	_____
LAND CHARGE OR RENT:					
LAND INVESTMENT	ACRE	0.000	0.000	0.00	_____
LAND TAXES	ACRE			0.00	_____
TOTAL LAND CHARGE				0.00	_____
RETURNS TO OVERHEAD, RISK AND MANAGEMENT				-3.31	_____

PASTURE UTILIZED 12 MOS. — BURTON,NANCE
3/4 LB. 2,4-D APPLIED ONCE EVERY 3 YEARS

05/01/86 — 0010100000

BUDGET CODE ID B0140287 LAND GROUP 03 BUDGET NUMBER 876*0902
CROP COVER

87360902
01/17/86
SOUTHWEST

CATEGORY	UNITS	PRICE	QUANTITY	VALUE	YOUR VALUE
PRODUCTION:					
TOTAL RECEIPTS				0.00	
OPERATING INPUTS:					
NITROGEN (N)	LBS.	0.170	30.000	5.10	
TRACTOR FUEL & LUBE	ACRE			2.36	
TRACTOR REPAIR COST	ACRE			1.55	
EQUIP. REPAIR COST	ACRE			1.19	
TOTAL OPERATING COST				10.21	
RETURNS TO LAND,LABOR,CAPITAL,MACHINERY, OVERHEAD,RISK,AND MANAGEMENT				-10.21	
CAPITAL COST:					
ANNUAL OPERATING CAPITAL		0.130	6.235	0.81	
TRACTOR INVESTMENT		0.130	25.239	3.28	
EQUIPMENT INVESTMENT		0.130	15.156	1.97	
TOTAL INTEREST CHARGE				6.06	
RETURNS TO LAND, LABOR, MACHINERY, OVERHEAD, RISK AND MANAGEMENT				-16.27	
OWNERSHIP COST: (DEPRECIATION, TAXES, INSURANCE)					
TRACTOR	HR.			3.29	
EQUIPMENT	HR.			2.27	
TOTAL OWNERSHIP COST				5.56	
RETURNS TO LAND, LABOR, OVERHEAD, RISK AND MANAGEMENT				-21.82	
LABOR COST:					
MACHINERY LABOR	HR.	5.000	0.537	2.68	
TOTAL LABOR COST			0.537	2.68	
RETURNS TO LAND, OVERHEAD, RISK AND MANAGEMENT				-24.51	
LAND CHARGE OR RENT:					
LAND INVESTMENT	ACRE	0.000	0.000	0.00	
LAND TAXES	ACRE			0.00	
TOTAL LAND CHARGE				0.00	
RETURNS TO OVERHEAD, RISK AND MANAGEMENT				-24.51	

DRYLAND SUDAN PASTURE SAHS

05/01/86 0000011000

APPENDIX C

MULTIPERIOD LINEAR PROGRAMMING TABLEAU WITH TWO PERCENT INCREASE IN LAND PRICES AND 160 ACRE RENT RESTRICTION

FLP1RR1 MAXEARN	MAXIMIZE	LIMIT (RHS)	OPER1 0	LANDBC1 0	LANDBL1 0	LANDR1 0	LABHIR1 0	BORROW1 0	EARN1 0.9165	MARCON1 0	CAPTR1 0	OPER2 0	LANDBC2 0
LAND1	L	160	1	-1	-1	-1							
RENRES1	L	160				1							
LABOR1	L	2283	2.27				-1						
CAP1	L	110575	161.35	435	236.82	43.5	10	-1					
DEBT1	L	90087			217.5			1					
NETRET1	G	0	136.8		-19.32	-43.5	-10	-0.1664	-1				
FAMLIV1	L	30000							1	-4			
ACCAP1	G	30000		-435	-217.5				1	-1	-1		
LAND2	L	160		-1	-1							1	-1
RENRES2	L	160				-1							
LABOR2	L	2283										2.27	
CAP2	L	110575			38.64						-1	161.35	453
DEBT2	L	91492		-8.78	206.8						-0.5		
NETRET2	G	0			-38.64							136.8	
FAMLIV2	L	30000											
ACCAP2	G	30000											-453
LAND3	L	160		-1	-1								-1
RENRES3	L	160											
LABOR3	L	2283											
CAP3	L	110575			38.64						-1		
DEBT3	L	92956		-17.93	193.34						-0.5		-9.14
NETRET3	G	0			-38.64								
FAMLIV3	L	30000											
ACCAP3	G	30000											
LAND4	L	160		-1	-1								-1
RENRES4	L	160											
LABOR4	L	2283											
CAP4	L	110575			38.64						-1		
DEBT4	L	94479		-27.45	178.79						-0.5		-18.66
NETRET4	G	0			-38.64								
FAMLIV4	L	30000											
ACCAP4	G	30000											
LAND5	L	160		-1	-1								-1
RENRES5	L	160											
LABOR5	L	2283											
CAP5	L	110575			38.64						-1		
DEBT5	L	96063		-37.35	163.02						-0.5		-28.56
NETRET5	G	0			-38.64								
FAMLIV5	L	30000											
ACCAP5	G	30000											
LAND6	L	160		-1	-1								-1
RENRES6	L	160											
LABOR6	L	2283											

	MAXIMIZE	LIMIT (RHS)	OPER1 0	LANDBC1 0	LANDBL1 0	LANDR1 0	LABHIR1 0	BORROW1 0	EARN1 0.9165	MARCON1 0	CAPTR1 0	OPER2 0	LANDBC2 0
CAP6	L	110575			38.64						-1		
DEBT6	L	97711		-47.65	145.87						-0.5		-38.86
NETRET6	G	0			-38.64								
FAMLIV6	L	30000											
ACCAP6	G	30000											
LAND7	L	160		-1	-1								-1
RENRES7	L	160											
LABOR7	L	2283											
CAP7	L	110575			38.64						-1		
DEBT7	L	99426		-58.37	127.17						-0.5		-49.58
NETRET7	G	0			-38.64								
FAMLIV7	L	30000											
ACCAP7	G	30000											
LAND8	L	160		-1	-1								-1
RENRES8	L	160											
LABOR8	L	2283											
CAP8	L	110575			38.64						-1		
DEBT8	L	101209		-69.51	106.72						-0.5		-60.72
NETRET8	G	0			-38.64								
FAMLIV8	L	30000											
ACCAP8	G	30000											
LAND9	L	160		-1	-1								-1
RENRES9	L	160											
LABOR9	L	2283											
CAP9	L	110575			38.64						-1		
DEBT9	L	103082		-81.22	84.15						-0.5		-72.43
NETRET9	G	0			-38.64								
FAMLIV9	L	30000											
ACCAP9	G	30000											
LAND10	L	160		-1	-1								-1
RENRES10	L	160											
LABOR10	L	2283											
CAP10	L	110575			38.64						-1		
DEBT10	L	105012		-93.38	59.32						-0.5		-84.49
NETRET10	G	0			-38.64								
FAMLIV10	L	30000											
ACCAP10	G	30000											
LANCOUNT	G	160		-1	-1								-1
DEBCOUNT	L	0			137.92								
ASSCOUNT	G	213997.4		-646.39	-646.39						-1		-646.39
NETCOUNT	L	0											
CAPCOUNT	E	0		116.74	116.74								100.64

	LANDBL2	LANDR2	LABHIR2	BORROW2	EARN2	MARCON2	CAPTR2	OPER3	LANDBC3	LANDBL3	LANDR3	LABHIR3	BORROW3
	0	0	0	0	0.816	0	0	0	0	0	0	0	0
LAND1													
RENRES1													
LABOR1													
CAP1													
DEBT1													
NETRET1													
FAMLIV1													
ACCAP1													
LAND2	-1	-1											
RENRES2		1											
LABOR2			-1										
CAP2	246.57	43.5	10	-1									
DEBT2	226.5			1									
NETRET2	-20.07	-43.5	-10	-0.1664	-1								
FAMLIV2					1	-4							
ACCAP2	-226.5				1	-1	-1						
LAND3	-1							1	-1	-1	-1		
RENRES3		-1									1		
LABOR3								2.27				-1	
CAP3	40.14						-1	161.35	470	255.87	43.5	10	-1
DEBT3	214.87						-0.5			235			1
NETRET3	-40.14							136.8		-20.87	-43.5	-10	-0.1664
FAMLIV3													
ACCAP3									-470	-235			
LAND4	-1								-1	-1			
RENRES4											-1		
LABOR4													
CAP4	40.14						-1			41.74			
DEBT4	200.86						-0.5		-9.52	223.41			
NETRET4	-40.14									-41.74			
FAMLIV4													
ACCAP4													
LAND5	-1								-1	-1			
RENRES5													
LABOR5													
CAP5	40.14						-1			41.74			
DEBT5	185.74						-0.5		-19.42	208.85			
NETRET5	-40.14									-41.74			
FAMLIV5													
ACCAP5													
LAND6	-1								-1	-1			
RENRES6													
LABOR6													

	LANDBL2	LANDR2	LABHIR2	BORROW2	EARN2	MARCON2	CAPTR2	OPER3	LANDBC3	LANDBL3	LANDR3	LABHIR3	BORROW3
	0	0	0	0	0.816	0	0	0	0	0	0	0	0
CAP6	40.14						-1			41.74			
DEBT6	169.34						-0.5		-29.72	193.11			
NETRET6	-40.14									-41.74			
FAMLIV6													
ACCAP6													
LAND7	-1								-1	-1			
RENRES7													
LABOR7													
CAP7	40.14						-1			41.74			
DEBT7	151.51						-0.5		-40.44	176.05			
NETRET7	-40.14									-41.74			
FAMLIV7													
ACCAP7													
LAND8	-1								-1	-1			
RENRES8													
LABOR8													
CAP8	40.14						-1			41.74			
DEBT8	132.07						-0.5		-51.58	157.52			
NETRET8	-40.14									-41.74			
FAMLIV8													
ACCAP8													
LAND9	-1								-1	-1			
RENRES9													
LABOR9													
CAP9	40.14						-1			41.74			
DEBT9	110.69						-0.5		-63.29	137.18			
NETRET9	-40.14									-41.74			
FAMLIV9													
ACCAP9													
LAND10	-1								-1	-1			
RENRES10													
LABOR10													
CAP10	40.14						-1			41.74			
DEBT10	87.34						-0.5		-75.35	115.06			
NETRET10	-40.14									-41.74			
FAMLIV10													
ACCAP10													
LANCOUNT	-1								-1	-1			
DEBCOUNT	158.67									178.67			
ASSCOUNT	-646.39						-1		-646.39	-646.39			
NETCOUNT													
CAPCOUNT	100.64								85.73	85.73			

	EARN3	MARCON3	CAPTR3	OPER4	LANDBC4	LANDBL4	LANDR4	LABHIR4	BORROW4	EARN4	MARCON4	CAPTR4	OPER5
	0.726	0	0	0	0	0	0	0	0	0.646	0	0	0
LAND1													
RENRES1													
LABOR1													
CAP1													
DEBT1													
NETRET1													
FAMLIV1													
ACCAP1													
LAND2													
RENRES2													
LABOR2													
CAP2													
DEBT2													
NETRET2													
FAMLIV2													
ACCAP2													
LAND3													
RENRES3													
LABOR3													
CAP3													
DEBT3													
NETRET3	-1												
FAMLIV3	1	-4											
ACCAP3	1	-1	-1										
LAND4				1	-1	-1	-1						
RENRES4							1						
LABOR4				2.27				-1					
CAP4			-1	161.35	489	266.22	43.5	10	-1				
DEBT4			-0.5			244.5			1				
NETRET4				136.8		-21.72	-43.5	-10	-0.1664	-1			
FAMLIV4										1	-4		
ACCAP4					-489	-244.5				1	-1	-1	
LAND5					-1	-1							1
RENRES5							-1						
LABOR5													2.27
CAP5			-1			43.44						-1	161.35
DEBT5			-0.5		-9.9	232.44						-0.5	
NETRET5						-43.44							136.8
FAMLIV5													
ACCAP5													
LAND6					-1	-1							
RENRES6													
LABOR6													

	EARN3	MARCON3	CAPTR3	OPER4	LANDBC4	LANDBL4	LANDR4	LABHIR4	BORROW4	EARN4	MARCON4	CAPTR4	OPER5
	0.726	0	0	0	0	0	0	0	0	0.646	0	0	0
CAP6			-1			43.44						-1	
DEBT6			-0.5		-20.2	217.29						-0.5	
NETRET6						-43.44							
FAMLIV6													
ACCAP6													
LAND7					-1	-1							
RENRES7													
LABOR7													
CAP7			-1			43.44						-1	
DEBT7			-0.5		-30.92	200.92						-0.5	
NETRET7						-43.44							
FAMLIV7													
ACCAP7													
LAND8					-1	-1							
RENRES8													
LABOR8													
CAP8			-1			43.44						-1	
DEBT8			-0.5		-42.06	183.18						-0.5	
NETRET8						-43.44							
FAMLIV8													
ACCAP8													
LAND9					-1	-1							
RENRES9													
LABOR9													
CAP9			-1			43.44						-1	
DEBT9			-0.5		-53.77	163.78						-0.5	
NETRET9						-43.44							
FAMLIV9													
ACCAP9													
LAND10					-1	-1							
RENRES10													
LABOR10													
CAP10			-1			43.44						-1	
DEBT10			-0.5		-65.83	142.74						-0.5	
NETRET10						-43.44							
FAMLIV10													
ACCAP10													
LANCOUNT					-1	-1							
DEBCOUNT						198.11							
ASSCOUNT			-1		-646.39	-646.39						-1	
NETCOUNT													
CAPCOUNT					71.91	71.91							

	LANDBC5	LANDBL5	LANDR5	LABHIR5	BORROW5	EARN5	MARCON5	CAPTR5	OPER6	LANDBC6	LANDBL6	LANDR6	LABHIR6
	0	0	0	0	0	0.575	0	0	0	0	0	0	0
LAND1													
RENRES1													
LABOR1													
CAP1													
DEBT1													
NETRET1													
FAMLIV1													
ACCAP1													
LAND2													
RENRES2													
LABOR2													
CAP2													
DEBT2													
NETRET2													
FAMLIV2													
ACCAP2													
LAND3													
RENRES3													
LABOR3													
CAP3													
DEBT3													
NETRET3													
FAMLIV3													
ACCAP3													
LAND4													
RENRES4													
LABOR4													
CAP4													
DEBT4													
NETRET4													
FAMLIV4													
ACCAP4													
LAND5	-1	-1	-1										
RENRES5			1										
LABOR5				-1									
CAP5	509	277.11	43.5	10	-1								
DEBT5		254.5			1								
NETRET5		-22.61	-43.5	-10	-0.1664	-1							
FAMLIV5						1	-4						
ACCAP5	-509	-254.5				1	-1	-1					
LAND6	-1	-1							1	-1	-1	-1	
RENRES6			-1									1	
LABOR6									2.27				-1

	LANDBC5	LANDBL5	LANDR5	LABHIR5	BORROW5	EARN5	MARCON5	CAPTR5	OPER6	LANDBC6	LANDBL6	LANDR6	LABHIR6
	0	0	0	0	0	0.575	0	0	0	0	0	0	0
CAP6		45.22						-1	161.35	530	288.54	43.5	10
DEBT6	-10.3	241.95						-0.5			265		
NETRET6		-45.22							136.8		-23.54	-43.5	-10
FAMLIV6													
ACCAP6										-530	-265		
LAND7	-1	-1								-1	-1		
RENRES7												-1	
LABOR7													
CAP7		45.22						-1			47.08		
DEBT7	-21.02	226.19						-0.5		-10.72	251.94		
NETRET7		-45.22									-47.08		
FAMLIV7													
ACCAP7													
LAND8	-1	-1								-1	-1		
RENRES8													
LABOR8													
CAP8		45.22						-1			47.08		
DEBT8	-32.16	209.16						-0.5		-21.86	235.55		
NETRET8		-45.22									-47.08		
FAMLIV8													
ACCAP8													
LAND9	-1	-1								-1	-1		
RENRES9													
LABOR9													
CAP9		45.22						-1			47.08		
DEBT9	-43.87	190.58						-0.5		-33.57	217.71		
NETRET9		-45.22									-47.08		
FAMLIV9													
ACCAP9													
LAND10	-1	-1								-1	-1		
RENRES10													
LABOR10													
CAP10		45.22						-1			47.08		
DEBT10	-55.93	170.52						-0.5		-45.63	198.5		
NETRET10		-45.22									-47.08		
FAMLIV10													
ACCAP10													
LANCOUNT	-1	-1								-1	-1		
DEBCOUNT		217.1									235.79		
ASSCOUNT	-646.39	-646.39						-1		-646.39	-646.39		
NETCOUNT													
CAPCOUNT	59.12	59.12								47.28	47.28		

	BORROW6 0	EARN6 0.512	MARCON6 0	CAPTR6 0	OPER7 0	LANDBC7 0	LANDBL7 0	LANDR7 0	LABHIR7 0	BORROW7 0	EARN7 0.4555	MARCON7 0	CAPTR7 0
CAP6	-1												
DEBT6	1												
NETRET6	-0.1664	-1											
FAMLIV6		1	-4										
ACCAP6		1	-1	-1									
LAND7					1	-1	-1	-1					
RENRES7								1					
LABOR7					2.27				-1				
CAP7				-1	161.35	551	299.97	43.5	10	-1			
DEBT7				-0.5			275.5			1			
NETRET7					136.8		-24.47	-43.5	-10	-0.1664	-1		
FAMLIV7											1	-4	
ACCAP7						-551	-275.5				1	-1	-1
LAND8						-1	-1						
RENRES8								-1					
LABOR8													
CAP8				-1			48.94						-1
DEBT8				-0.5		-11.14	261.93						-0.5
NETRET8							-48.94						
FAMLIV8													
ACCAP8													
LAND9						-1	-1						
RENRES9													
LABOR9													
CAP9				-1			48.94						-1
DEBT9				-0.5		-22.85	244.75						-0.5
NETRET9							-48.94						
FAMLIV9													
ACCAP9													
LAND10						-1	-1						
RENRES10													
LABOR10													
CAP10				-1			48.94						-1
DEBT10				-0.5		-34.91	226.32						-0.5
NETRET10							-48.94						
FAMLIV10													
ACCAP10													
LANCOUNT						-1	-1						
DEBCOUNT							253.8						
ASSCOUNT				-1		-646.39	-646.39						-1
NETCOUNT													
CAPCOUNT						36.31	36.31						

	OPER8	LANDBC8	LANDBL8	LANDR8	LABHIR8	BORROW8	EARN8	MARCON8	CAPTR8	OPER9	LANDBC9	LANDBL9	LANDR9
	0	0	0	0	0	0	0.4055	0	0	0	0	0	0
CAP6													
DEBT6													
NETRET6													
FAMLIV6													
ACCAP6													
LAND7													
RENRES7													
LABOR7													
CAP7													
DEBT7													
NETRET7													
FAMLIV7													
ACCAP7													
LAND8	1	-1	-1	-1									
RENRES8				1									
LABOR8	2.27				-1								
CAP8	161.35	574	312.49	43.5	10	-1							
DEBT8			287			1							
NETRET8	136.8		-25.49	-43.5	-10	-0.1664	-1						
FAMLIV8							1	-4					
ACCAP8		-574	-287				1	-1	-1				
LAND9		-1	-1							1	-1	-1	-1
RENRES9				-1									1
LABOR9										2.27			
CAP9			50.98						-1	161.35	597	325.01	43.5
DEBT9		-11.71	272.76						-0.5			298.5	
NETRET9			-50.98							136.8		-26.51	-43.5
FAMLIV9													
ACCAP9											-597	-298.5	
LAND10		-1	-1								-1	-1	
RENRES10													-1
LABOR10													
CAP10			50.98						-1			53.02	
DEBT10		-23.77	255.01						-0.5		-12.06	283.81	
NETRET10			-50.98									-53.02	
FAMLIV10													
ACCAP10													
LANCOUNT		-1	-1								-1	-1	
DEBCOUNT			272.14									289.95	
ASSCOUNT		-646.39	-646.39						-1		-646.39	-646.39	
NETCOUNT													
CAPCOUNT		26.16	26.16								16.76	16.76	

	LABHIR9	BORROW9	EARN9	MARCON9	CAPTR9	OPER10	LANDBC10	LANDBL10	LANDR10	LABHIR10	BORROW10	EARN10	MARCON10
	0	0	0.3605	0	0	0	0	0	0	0	0	0.3215	0
CAP6													
DEBT6													
NETRET6													
FAMLIV6													
ACCAP6													
LAND7													
RENRES7													
LABOR7													
CAP7													
DEBT7													
NETRET7													
FAMLIV7													
ACCAP7													
LAND8													
RENRES8													
LABOR8													
CAP8													
DEBT8													
NETRET8													
FAMLIV8													
ACCAP8													
LAND9													
RENRES9													
LABOR9	-1												
CAP9	10	-1											
DEBT9		1											
NETRET9	-10	-0.1664	-1										
FAMLIV9			1	-4									
ACCAP9			1	-1	-1								
LAND10						1	-1	-1	-1				
RENRES10									1				
LABOR10						2.27				-1			
CAP10					-1	161.35	621	338.08	43.5	10	-1		
DEBT10					-0.5			310.5			1		
NETRET10						136.8		-27.58	-43.5	-10	-0.1664	-1	
FAMLIV10												1	-4
ACCAP10							-621	-310.5				1	-1
LANCOUNT							-1	-1					
DEBCOUNT								307.76					
ASSCOUNT					-1		-646.39	-646.39					
NETCOUNT													
CAPCOUNT							8.06	8.06					

	CAPTR10	LANTOT	DEBTOT	ASSTOT	NWTOT	CGTOT
	0	0	0	0	0	1
CAP6						
DEBT6						
NETRET6						
FAMLIV6						
ACCAP6						
LAND7						
RENRES7						
LABOR7						
CAP7						
DEBT7						
NETRET7						
FAMLIV7						
ACCAP7						
LAND8						
RENRES8						
LABOR8						
CAP8						
DEBT8						
NETRET8						
FAMLIV8						
ACCAP8						
LAND9						
RENRES9						
LABOR9						
CAP9						
DEBT9						
NETRET9						
FAMLIV9						
ACCAP9						
LAND10						
RENRES10						
LABOR10						
CAP10						
DEBT10						
NETRET10						
FAMLIV10						
ACCAP10	-1					
LANCOUNT		1				
DEBCOUNT			-1			
ASSCOUNT	-1			1		
NETCOUNT			-1	1	-1	
CAPCOUNT						-1

APPENDIX D

SUMMARY OF LINEAR PROGRAM RESULTS

TABLE IV

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE HELD CONSTANT
AND RENTAL LAND UNRESTRICTED

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$86,300	853	-	-	-
2	102,438	1131	-	-	-
3	123,202	1489	-	-	-
4	149,918	1950	-	-	-
5	184,292	2543	-	-	-
6	228,518	3306	-	-	-
7	285,422	4287	-	-	-
8	358,638	5550	-	-	-
9	452,840	7175	-	-	-
10	574,044	9265	-	-	-

TABLE V

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE HELD CONSTANT
AND 160 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$41,457	160	-	40	687
2	63,404	320	-	115	349
3	75,232	480	21	-	233
4	91,251	640	24	-	161
5	104,805	800	46	-	106
6	120,073	960	63	-	78
7	137,491	1120	85	-	56
8	158,756	1280	-	106	36
9	181,429	1440	-	151	21
10	206,693	1600	-	183	8

TABLE VI

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE HELD CONSTANT
AND 320 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$58,969	320	17	66	394
2	80,038	640	-	-	262
3	100,004	960	-	-	154
4	119,328	1280	10	-	141
5	141,415	1600	42	-	107
6	166,581	1920	71	-	78
7	195,283	2240	107	-	56
8	229,897	2560	-	142	36
9	267,351	2880	-	211	21
10	309,238	3200	-	265	8

TABLE VII

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE HELD CONSTANT
AND 480 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$64,414	480	-	-	285
2	94,106	960	-	-	92
3	114,540	1340	-	-	-
4	135,754	1800	-	-	-
5	169,087	2281	-	-	88
6	203,004	2761	76	-	78
7	241,541	3241	111	-	56
8	287,709	3721	-	164	36
9	338,096	4201	-	251	21
10	394,614	4681	-	323	8

TABLE VIII

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE HELD CONSTANT
AND 640 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$73,888	640	-	-	234
2	98,880	1070	-	-	-
3	118,624	1410	-	-	-
4	144,028	1848	-	-	-
5	172,253	2475	-	-	-
6	217,490	3115	-	-	70
7	263,008	3755	105	-	56
8	316,666	4395	-	147	36
9	376,230	5035	-	248	21
10	443,065	5675	-	334	8

TABLE IX

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE HELD CONSTANT
AND 800 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$83,362	800	-	-	247
2	101,596	1116	-	-	-
3	122,119	1471	-	-	-
4	148,524	1926	-	-	-
5	182,498	2512	-	-	-
6	222,965	3312	-	-	1
7	278,429	4112	40	-	56
8	339,064	4912	-	139	36
9	406,430	5712	-	232	21
10	482,618	6512	-	333	8

TABLE X

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS WITH THE REAL LAND PRICE INCREASING 2 % AND RENTAL LAND UNRESTRICTED

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$86,300	853	-	-	-
2	102,640	1137	-	-	-
3	123,673	1503	-	-	-
4	150,742	1973	-	-	-
5	185,580	2577	-	-	-
6	230,414	3353	-	-	-
7	288,108	4351	-	-	-
8	362,349	5635	-	-	-
9	457,885	7287	-	-	-
10	580,813	9411	-	-	-

TABLE XI

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS WITH THE REAL LAND PRICE INCREASING 2 % AND 160 ACRE RENT RESTRICTION

Period.	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$41,457	160	-	40	751
2	62,811	320	-	109	351
3	74,772	480	29	-	223
4	90,474	640	22	-	155
5	103,356	800	44	-	103
6	117,484	960	56	-	77
7	133,045	1120	72	-	56
8	151,653	1280	-	85	38
9	169,539	1440	-	-	22
10	192,094	1600	-	270	8

TABLE XII

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS WITH THE REAL LAND PRICE INCREASING 2 % AND 320 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$59,436	320	11	80	373
2	80,259	640	-	-	229
3	100,053	960	-	-	107
4	119,299	1280	13	-	133
5	140,870	1600	40	-	103
6	164,881	1920	64	-	77
7	191,446	2240	91	-	56
8	222,755	2560	-	114	38
9	253,884	2880	-	-	22
10	292,160	3200	-	385	8

TABLE XIII

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS WITH THE REAL LAND PRICE INCREASING 2 % AND 480 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$64,414	480	-	-	285
2	94,106	960	-	-	92
3	114,953	1352	-	-	-
4	135,946	1830	-	-	-
5	170,120	2310	-	-	88
6	202,989	2790	70	-	77
7	239,517	3270	94	-	56
8	282,174	3750	-	133	38
9	325,407	4230	-	-	22
10	377,818	4710	-	465	8

TABLE XIV

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS WITH THE REAL LAND PRICE INCREASING 2 % AND 640 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$73,888	640	-	-	230
2	99,082	1076	-	-	-
3	119,095	1423	-	-	-
4	144,853	1871	-	-	-
5	173,407	2511	-	-	10
6	218,969	3151	4	-	77
7	262,745	3791	92	-	56
8	313,458	4431	-	120	38
9	366,231	5071	-	-	22
10	428,971	5711	-	475	8

TABLE XV

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS WITH THE REAL LAND PRICE INCREASING 2 % AND 800 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$83,362	800	-	-	245
2	101,798	1123	-	-	-
3	122,589	1484	-	-	-
4	149,348	1949	-	-	-
5	183,787	2546	-	-	-
6	225,820	3346	-	-	1
7	279,431	4146	44	-	56
8	337,425	4946	-	113	38
9	398,617	5746	-	-	22
10	470,641	6546	-	463	8

TABLE XVI

SUMMARY OF MULTIPERIOD LINEAR PROGRAM
RESULTS WITH THE REAL LAND PRICE
DECREASING 2 % AND RENTAL
LAND UNRESTRICTED

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$86,300	853	-	-	-
2	102,239	1125	-	-	-
3	122,757	1476	-	-	-
4	149,162	1929	-	-	-
5	183,143	2513	-	-	-
6	226,872	3265	-	-	-
7	283,142	4234	-	-	-
8	355,548	5480	-	-	-
9	448,716	7085	-	-	-
10	568,594	9151	-	-	-

TABLE XVII

SUMMARY OF MULTIPERIOD LINEAR PROGRAM
RESULTS WITH THE REAL LAND PRICE
DECREASING 2 % AND 160 ACRE
RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$36,316	160	-	-	488
2	51,744	320	-	-	403
3	66,672	480	-	-	327
4	81,600	640	-	-	259
5	96,528	800	-	-	199
6	108,862	960	-	-	145
7	120,158	1120	-	-	109
8	131,454	1280	-	-	77
9	142,750	1440	-	-	48
10	154,046	1600	-	-	23

TABLE XVIII

SUMMARY OF MULTIPERIOD LINEAR PROGRAM
RESULTS WITH THE REAL LAND PRICE
DECREASING 2 % AND 320 ACRE
RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$51,744	320	-	-	424
2	76,602	640	-	-	272
3	98,340	960	-	-	191
4	117,340	1280	-	-	154
5	138,721	1600	-	-	124
6	162,764	1920	-	-	98
7	189,809	2240	-	-	78
8	220,228	2560	-	-	61
9	244,414	2880	-	-	48
10	267,006	3200	-	-	23

TABLE XIX

SUMMARY OF MULTIPERIOD LINEAR PROGRAM
RESULTS WITH THE REAL LAND PRICE
DECREASING 2 % AND 480 ACRE
RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$64,414	480	-	-	271
2	94,106	960	-	-	87
3	114,151	1328	-	-	-
4	135,528	1775	-	-	-
5	168,163	2255	-	-	83
6	201,119	2735	-	-	70
7	238,188	3215	-	-	67
8	279,883	3695	-	-	49
9	326,782	4175	-	-	34
10	369,713	4655	-	-	23

TABLE XX

SUMMARY OF MULTIPERIOD LINEAR PROGRAM
RESULTS WITH THE REAL LAND PRICE
DECREASING 2 % AND 640 ACRE
RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$73,888	640	-	-	230
2	98,682	1064	-	-	-
3	118,179	1397	-	-	-
4	143,272	1828	-	-	-
5	171,671	2438	-	-	-
6	216,006	3078	-	-	68
7	260,170	3718	-	-	60
8	309,846	4358	-	-	40
9	365,722	4998	-	-	24
10	428,570	5638	-	-	11

TABLE XXI

SUMMARY OF MULTIPERIOD LINEAR PROGRAM
RESULTS WITH THE REAL LAND PRICE
DECREASING 2 % AND 800 ACRE
RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$83,362	800	-	-	241
2	101,398	1111	-	-	-
3	121,673	1458	-	-	-
4	147,767	1905	-	-	-
5	181,350	2482	-	-	-
6	220,556	3282	-	-	8
7	276,396	4082	-	-	60
8	333,335	4882	-	-	40
9	397,380	5682	-	-	24
10	469,418	6482	-	-	11

TABLE XXII

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE INCREASING 2 %
AFTER DROPPING TO 335 IN PERIOD TWO
AND RENTAL LAND UNRESTRICTED

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$86,300	853	-	-	-
2	101,287	1096	-	-	-
3	121,877	1453	-	-	-
4	148,379	1912	-	-	-
5	182,476	2503	-	-	-
6	226,358	3262	-	-	-
7	282,825	4238	-	-	-
8	355,485	5494	-	-	-
9	448,974	7109	-	-	-
10	569,276	9187	-	-	-

TABLE XXIII

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE INCREASING 2 %
AFTER DROPPING TO 335 IN PERIOD TWO
AND 160 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$40,076	160	8	18	620
2	68,058	320	-	170	336
3	79,324	480	-	-	162
4	96,292	640	48	-	110
5	111,018	800	59	-	85
6	127,871	960	83	-	64
7	148,222	1120	-	103	45
8	169,820	1280	-	145	30
9	193,431	1440	-	173	17
10	219,503	1600	-	206	6

TABLE XXIV

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE INCREASING 2 %
AFTER DROPPING TO 335 IN PERIOD TWO
AND 320 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$51,744	320	-	-	483
2	81,949	640	-	83	226
3	100,734	960	-	-	86
4	120,406	1280	16	-	110
5	143,196	1600	50	-	85
6	169,295	1920	83	-	64
7	200,444	2240	-	116	45
8	234,286	2560	-	175	30
9	271,652	2880	-	220	17
10	313,055	3200	-	272	6

TABLE XXV

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE INCREASING 2 %
AFTER DROPPING TO 335 IN PERIOD TWO
AND 480 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$64,414	480	-	-	298
2	94,106	960	-	-	96
3	113,545	1309	-	-	-
4	137,659	1728	-	-	-
5	167,285	2208	23	-	85
6	201,454	2688	73	-	64
7	241,861	3168	-	117	45
8	286,460	3648	-	188	30
9	335,974	4128	-	250	17
10	390,958	4608	-	318	6

TABLE XXVI

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE INCREASING 2 %
AFTER DROPPING TO 335 IN PERIOD TWO
AND 640 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$73,888	640	-	-	242
2	97,729	1035	-	-	-
3	117,299	1374	-	-	-
4	142,489	1811	-	-	-
5	174,898	2372	-	-	-
6	214,515	3012	32	-	64
7	261,134	3652	-	93	45
8	313,340	4292	-	168	30
9	371,719	4932	-	243	17
10	436,681	5572	-	324	6

TABLE XXVII

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE INCREASING 2 %
AFTER DROPPING TO 335 IN PERIOD TWO
AND 800 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$83,362	800	-	-	253
2	100,445	1081	-	-	-
3	120,793	1434	-	-	-
4	146,985	1888	-	-	-
5	180,682	2472	-	-	-
6	224,050	3222	-	-	-
7	276,191	4022	-	61	45
8	335,521	4822	-	142	30
9	402,135	5622	-	228	17
10	476,406	6422	-	321	6

TABLE XXVIII

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE INCREASING 4 %
AFTER DROPPING TO 335 IN PERIOD TWO
AND RENTAL LAND UNRESTRICTED

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$86,300	853	-	-	-
2	101,287	1096	-	-	-
3	122,036	1458	-	-	-
4	148,757	1923	-	-	-
5	183,167	2522	-	-	-
6	227,469	3291	-	-	-
7	284,503	4281	-	-	-
8	357,921	5553	-	-	-
9	452,421	7190	-	-	-
10	574,050	9295	-	-	-

TABLE XXIX

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE INCREASING 4 %
AFTER DROPPING TO 335 IN PERIOD TWO
AND 160 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$40,454	160	6	24	628
2	68,241	320	-	171	318
3	79,516	480	-	-	126
4	96,211	640	50	-	97
5	110,469	800	59	-	77
6	127,402	960	-	77	59
7	144,726	1120	-	106	43
8	162,935	1280	-	124	29
9	182,059	1440	-	143	17
10	201,765	1600	-	162	6

TABLE XXX

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE INCREASING 4 %
AFTER DROPPING TO 335 IN PERIOD TWO
AND 320 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$51,744	320	-	-	483
2	82,149	640	-	86	198
3	100,823	960	-	-	43
4	120,479	1280	19	-	97
5	142,881	1600	49	-	77
6	169,058	1920	-	75	59
7	197,029	2240	-	116	43
8	226,999	2560	-	147	29
9	258,899	2880	-	179	17
10	292,289	3200	-	211	6

TABLE XXXI

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE INCREASING 4 %
AFTER DROPPING TO 335 IN PERIOD TWO
AND 480 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$64,414	480	-	-	301
2	94,106	960	-	-	97
3	113,704	1314	-	-	-
4	138,037	1739	-	-	-
5	167,550	2219	24	-	77
6	201,846	2699	-	66	59
7	239,332	3179	-	114	43
8	279,988	3659	-	158	29
9	323,556	4139	-	202	17
10	369,523	4619	-	245	6

TABLE XXXII

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE INCREASING 4 %
AFTER DROPPING TO 335 IN PERIOD TWO
AND 640 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$73,888	640	-	-	243
2	97,729	1035	-	-	-
3	117,458	1379	-	-	-
4	142,868	1822	-	-	-
5	175,589	2391	-	-	-
6	215,390	3031	-	32	59
7	260,196	3671	-	89	43
8	309,177	4311	-	143	29
9	362,017	4951	-	198	17
10	418,156	5591	-	251	6

TABLE XXXIII

SUMMARY OF MULTIPERIOD LINEAR PROGRAM RESULTS
WITH THE REAL LAND PRICE INCREASING 4 %
AFTER DROPPING TO 335 IN PERIOD TWO
AND 800 ACRE RENT RESTRICTION

Period	Earnings	Land Rented	Land Bought With Cash	Land Bought With Loan	Shadow Price Of Rent Land
1	$83,362	800	-	-	254
2	100,445	1081	-	-	-
3	120,952	1439	-	-	-
4	147,363	1899	-	-	-
5	181,373	2491	-	-	-
6	225,162	3251	-	-	-
7	276,660	4051	-	58	43
8	333,511	4851	-	123	29
9	395,127	5651	-	187	17
10	460,943	6451	-	251	6

VITA

John E. Thomason

Candidate for the Degree of

Master of Science

Thesis: INSTITUTIONAL INVESTMENTS IN FARMLAND: A SOURCE OF EXTERNAL EQUITY FOR THE FARM SECTOR

Major Field: Agricultural Economics

Biographical:

Personal Data: Born in Guthrie, Oklahoma, March 16, 1963, the son of John D. and Linda Thomason.

Education: Graduated from Mulhall-Orlando High School, Orlando, Oklahoma, in May, 1981; received Bachelor of Science Degree in Agricultural Economics from Oklahoma State University in May, 1985; completed requirements for the Master of Science Degree at Oklahoma State University in May, 1987.

Professional Experience: Graduate Researh Assistant, Oklahoma State University, June, 1985, to January 1987.