Impacts of Land Ownership and Debt Levels on Farm Survival and Financial Growth[1]

By

Dr. John D. Cole[2]

Ms. Nalini Pattanaik[3]

And

Dr. Larry L. Janssen[4]

[1]Selected Paper presented at the 2006 Annual Meeting of the American Agriculture Economics Association, Long Beach, California, July 23-26, 2006

[2] Research Associate, Department of Economics, South Dakota State University

[3] Former Graduate Research Assistant, Department of Economics, South Dakota State University

[4]Professor, Department of Economics, South Dakota State University

Impacts of Land Ownership and Debt Levels on Farm Survival and Financial Growth[1]

Dr. John Cole, Ms. Nalini Pattanaik, and Dr. Larry Janssen[2]

Abstract:

This paper examines the impact of alternative land ownership and debt levels on profitability, growth, and survival of a representative cash grain farms and beef farm, using South Dakota conditions as case examples. Baseline characteristics of three representative farms / ranches in South Dakota are discussed.

Introduction

Production agriculture is a risky business venture. Crops and livestock performance depends on biological processes that are affected by weather, disease, insects, weeds, soil conservation and fertility. Indeed, farms and fortunes are often made or lost though circumstances that the producer can usually anticipate but is often never fully capable of handling (Hardaker, et.al; Boehlje and Eidman). Farm / ranch firm survival and growth rates are also related to the level of ownership, type of leasing, and debt levels of the operation. An empirical examination in the contemporary and projected economic environment provides better understanding of the relative influence of ownership, leasing, and debt levels on farm / ranch growth and survival. This information

---

[1] Selected paper presented at the 2006 Annual Meeting of the American Agricultural Economics Association, Long Beach, California, July 23 - 26.

[2] Dr. Cole is former research associate, Ms. Pattanaik is former graduate research assistant, and Dr. Janssen is professor, Dept. of Economics, South Dakota State University. Funding for this research was from the Agricultural Experiment Station of South Dakota.

is critical to farmers and ranchers, farm lenders, and farm policymakers, especially in farm dependent states like South Dakota.

Objectives and Methods

In this study, we discuss the development and basic characteristics of three representative farms and ranches in South Dakota. Next, we examine the impacts of different ownership / leasing levels and financial leverage on profitability, growth, and survival of representative cash grain and beef farms in north-central South Dakota.

To attain the objectives of this study, a stochastic recursive general farm firm simulation model called FLIPSIM (Farm Level Income and Policy Simulation Model) has been selected. FLIPSIM is one of the most versatile farm simulation models available to analyze the probable consequences of alternative economic conditions, farm policy alternatives and farm management decisions on the economic viability of farmers. FLIPSIM, developed and maintained by the Agricultural and Food Policy Center (AFPC) at Texas A & M University has proven to be applicable to a wide variety of farm studies in all regions of the United States and several other countries for the analysis of farm policies, farm structure, financial management, and growth / survivability conditions. A few examples include works completed in Texas (Gray, et.al., Perry et.al.), North Dakota (Taylor et.al.), South Dakota (Qu; Washnok), Mexico (Ochoa, et.al.) and more recently for 102 representative farms throughout the United States (Outlaw, et.al., 2004). Detailed discussion of FLIPSIM is available in Pattanaik (2005) and various publications by Richardson and Nixon or Richardson.

The main purposes of this report are: (1) to explain the development of two representative farm models and one representative ranch model for South Dakota that can be used for farm management / policy simulation analyses, and (2) to examine the relationship of land ownership, leasing, and debt levels on farm survival and financial growth for one of the representative farms. All of the representative farms and ranches were developed and calibrated for an initial historical period of 2003 and 2004. The simulation period is 2005 – 2011. Using FLIPSIM, these representative firm models can be used to examine probable consequences of alternative farm management / policy strategies and scenarios over a long-term future planning horizon.

The remainder of this report is divided into the following sections:

- Overview of South Dakota representative ranch and farm models with comparison of their farm resource characteristics, common assumptions used in developing each model farm / ranch, and the various approaches to obtaining data and validating each model farm. The representative firm models for South Dakota are:

  Western South Dakota Cattle Ranch model.

  Northern Cash-Grain & Beef Cow Farm model.

  Southeast Corn-Soybean Cash Grain Farm model

- Examine and evaluate the impacts of different levels of financial leverage, land ownership, and rental agreements on farm survivability and growth of the Northern Cash-Grain & Beef Cow Farm model.
- Conclusions and Implications.

Development of Representative Farm / Ranch Models for South Dakota

Overall governing concepts used to develop the model ranch and two model farms for South Dakota are highlighted prior to more detailed discussion of each model.

Governing Concepts / Approaches

First, the concept of a "representative farm" has the implicit assumption that it is possible and useful to develop model farms that have many key economic characteristics of actual farm businesses in a specific region, by type of farm, or some other delimiter. One key guideline that we used in developing the three model farms is that it represent a "family farm / ranch" of sufficient size to require a full-time operator and possibly require additional family labor and/or some hired labor. The enterprises selected in each model farm were represented in combinations typical of farm types (beef cattle ranches, cash grain farms etc.) in the geographic locality. Production coefficients were based, as much as possible, on data from local producers or secondary sources (budgets) for the geographic area and assumed good management practices prevalent in the locality. Finally, initial land tenure conditions were based on regional conditions and differences by farm type, but could easily be altered to examine other management scenarios.

Second, the alternative information gathering approaches used to construct the representative model farms permits qualitative assessment of trade-offs involved in the extent of using producer panels to help develop and validate the model farms. Using a producer panel has the distinct advantage of obtaining producer validation of major resource characteristics of a model farm before it is used for analytical purposes. The producer panel approach is required for including representative farms in the AFPC

national database and was used in developing and validating the Western South Dakota Ranch model.

At this time, the Northern Region Farm and Southeast Farm models have not been validated using panels of producers. Many of the resource characteristics and coefficients used in the Southeast Farm model were developed from information gathered by Nicholas Streff (2004) from interviews and discussions with individual producers and extension farm management educators. The same information used in the North-Central Farm model was obtained from secondary data sources and from extension educators.

Third, considerable use of secondary data was required to develop the coefficients in all models. Panels of producers can generally provide information about the diversity of resource and management characteristics that occur on farms and key insights about "central tendencies" (most common characteristic) of farms in their locality. The emergence of producer-level databases, such as FINBIN records, can also assist in developing farm-level coefficients used in farm firm simulation models.

Fourth, FLIPSIM was the common simulation model used to analyze each representative farm / ranch in deterministic or stochastic modes. FLIPSIM requires extensive amounts of farm-level production, cost, and other management data which is integrated with macroeconomic, industry-level, and farm policy data from FAPRI and other sources. Thus, economic performance of different representative farm models in FLIPSIM can be examined using the same macroeconomic and farm policy outlook characteristics. The main drawback in using FLIPSIM is the amount of time required to learn how to properly use the model and maintain / update the model farm coefficients.

Overview of Three Representative Farms / Ranches

The physical geography of South Dakota results in substantial differences in agricultural production and natural resource characteristics of farms and ranches in different regions of the State. Three general, but very different, areas of South Dakota (map 1) were selected for development of the following representative firm models:

Western South Dakota Cattle Ranch model.

Northern Cash-Grain & Beef Cow Farm model.

Southeast Corn-Soybean Cash Grain Farm model

The approaches used to obtain data and validate each model were somewhat different for each representative farm, especially in collection of primary data and model validation from producers. Secondary data from South Dakota Agricultural Statistics, South Dakota Census of Agriculture, and from SDSU Economics Department crop and livestock budgets were used extensively in developing coefficients for each model farm.

The Western South Dakota ranch model was jointly developed by SDSU economists[3] in direct collaboration with personnel from the Agricultural and Food Policy Center (AFPC) of Texas A&M University. The initial rancher panel meetings were held in Faith, SD in June 2003. Various characteristics of a typical ranch were gathered from the panel of four producers. This was followed by a second session (after lunch) when

[3] Drs. Larry Janssen, John Cole, Martin Beutler, and Ms. Stacy Hadrick were SDSU Economics Dept. and Extension personnel involved in the panel process. Ms. Stacy Hadrick and Dr. Beutler were instrumental in contacting potential rancher panelists and making all meeting arrangements. Dr. Cole and Janssen, along with Texas A & M faculty, were responsible for developing the Western South Dakota Ranch model. The rancher panelists involved in the meeting were Mr. Lynn C. Frey, Mr. Wayne Oedekoven, Mr. Leo E. Grubl, and Mr. Scott Phillips. Mr. James Sartwelle from the AFPC center of Texas A & M University led the panel discussions.

the producers were provided pro-forma financial statements for a representative ranch and asked to verify the accuracy of simulated results.

The Western South Dakota ranch model is setup to be representative of ranches located in northwestern and west-central regions of South Dakota. This model ranch is included in the national database of 102 representative farms and ranches and used in national studies of farm economic outlook and agricultural policy analysis conducted by the Agricultural and Food Policy Center of Texas A & M University. It is briefly described in AFPC publications as SDB450 which "is a 450-cow West River (Meade County, SD) beef cattle ranch. This operation produces hay and oats on 1,150 acres of owned cropland, and runs its cows on 6,700 of owned native range. Grazing needs are supplemented with 2,100 AUMs leased from federal and state sources. In 2004, calf and culled cow/bull sales accounted for 92 percent of gross receipts" (AFPC Working Paper 04-7, 2004). The main modification of the ranch model used in SDSU studies is the assumption that 7,400 acres of native rangeland is owned or leased from private land owners and, combined with hay / silage grown on cropland, provides the necessary forage needs to the beef cow herd.

The Northern Cash Grain – Beef Cow model is primarily developed from secondary data sources to represent commercial cash-grain farms with a small beef cow herd. The five-county study region selected included Brown, Spink, Marshall, Day, and Clark counties. This model farm has an operation of 2050 acres including 1600 acres of owned and leased cropland and 400 acres of owned pasture. Crops raised on the farm are corn, soybeans, spring wheat, and alfalfa. An 80 cow beef herd is the livestock enterprise

on the model farm. Crop receipts and farm program payments generally provide 85 – 90 percent of annual gross farm cash receipts (Pattanaik, 2005)

The Southeast Corn – Soybean Farm model is developed from data (both primary and secondary data) contained in Mr. Nicholas Streff's thesis (2004) Economic Incentives for South Dakota Farmers to Participate in the Conservation Security Program. and from additional secondary data for the study region. This cash grain model farm produces corn and soybeans on 1000 acres of owned and leased cropland. It was developed to represent mid-size cash grain farms in six counties of eastern and southeastern South Dakota. The counties represented are Moody, Minnehaha, Lincoln, Union, Clay, and Turner counties. In the Southeast model farm, all gross cash farm receipts are from corn and soybean sales and from Federal farm program payments.

Key assumption used for all three representative farm / ranch models were:

- A common time period, 2003 – 2011, is used for simulation analyses with 2003 and 2004 considered as the "historical" period and 2005 – 2011 as the forecast planning horizon.
- Farm program parameters, average annual prices, crop and livestock yield trends, interest rates, and input cost trends (inflation or deflation) in all models are based on the January 2005 FAPRI baseline projections. All models assume continuation of 2002 farm bill provisions throughout the planning horizon.
- Crop yield trend and variability of yields in the planning horizon are based on historical crop yields from 1991 – 2004 for the multi-county region.

- The baseline scenario for each model farm assumes average predicted prices for each commodity in the simulated forecast period are based on historical relationships between state / regional commodity prices and national (FAPRI) prices. In addition, the impacts of projected macroeconomic policies and trade policies are incorporated into each model indirectly through the price, input cost inflation rates, and interest rate forecasts provided by FAPRI.
- Farm size (acres operated and livestock herd size) and operations performed were assumed constant through the 2003 – 2011 planning horizon. The machinery capital stock is assumed to remain constant, indicating that depreciation allowances are reinvested into replacing farm equipment. Approximately 30 percent of the total value of machinery stock is replaced during the study period.
- Family living withdrawals are based on historical consumption patterns with minimum annual withdrawals of $20,000, $25,000 or $30,000 depending on the specific ranch / farm model. Thus, farm profitability has considerable impact on the level of family living withdrawals above the minimum specified level.
- The farm is subject to owner / operator federal income and social security taxes and the farm business pays state sales taxes and local real estate tax rates of 1.0% - 1.5% of estimated market value of farm real estate.
- Initial low levels of farm debt were assumed (2 to 5 percent of farm assets), but were changed to medium levels (20 – 25 percent of farm assets) and high levels (40 – 45 percent of farm assets) in other scenarios.

- The farm level simulation model, in the stochastic mode, incorporates both yield and price risks based on historical yield variability in the locality and past price variability at the national level.

A further summary of key initial characteristics of the three model farms / ranch is provided in table 1.

Case Study of Farm Growth and Survival for Northern Farm

The baseline conditions for the Northern South Dakota Cash Grain – Beef Cow Farm assumes 55 percent of cropland acres and all pasture land and farmstead acres are owned and remaining cropland acres are cash leased. The market value of owned farm assets in 2003 is $1,218,229, with land value of $790,962 (65% of total), building value of $120,150 (10% of total), machinery value of $242,933 (20% of total) and other assets equal to $69,184 (tables 1 and 2).

The initial balance sheet does not include current farm assets except for cash reserves ($5000 is assumed) and does not include any current dept. Operating loans are made and repaid in the same production periods with interest payments recorded on the income statement, Short term carryover debt occurs only in the of a cash flow deficits. In all scenarios, crops are sold in the production year, except for crops fed to livestock.

In 2003, nearly 86% of total cash receipts of $414,982 was generated from crop sales, 9% from livestock sales, and remainder from Federal farm program payments (tables 1 and 3). Farm cash expenses and depreciation, assuming baseline conditions of a 5% debt to asset ratio, were 64.2% of farm cash receipts, excluding operator / family living withdrawals.

Alternative Scenarios

The baseline scenario is modified to simulate the Northern representative farm with different land ownership levels, different debt levels, and alternative lease arrangements of cash rent or share rent. Only cropland is assumed to be leased in all scenarios, while all pastureland, farmstead and other land are owned by the farm.

Alternative scenarios for the Northern Farm dealt with the extent of land ownership, debt level, and use of cash leases or share leases. The proportion of cropland owned varied from 90 percent, 55 percent and 20 percent of owned acres. In each scenario, the total cropland value changes by the amount of land owned multiplied by its price per acre. In a cash lease for additional cropland it would cost the farm the amount of land leased multiplied by the per acre rental rate, whereas in the case of share lease the output and the cost of selected inputs (fertilizer, herbicides, insecticides, and drying) is shared between tenant and property owner at a 2/3-1/3 rate.

The initial cash reserves of the Northern Farm are set at $5,000 in all scenarios. Increases in cash reserves occur for specific years in the planning horizon if net cash farm income exceeds the amount of cash outlays for social security and income taxes paid, for family living / consumption expenses, for scheduled principal payments on intermediate-term and long-term debt, and for required cash down payment on machinery purchases. However, if net cash farm income is lower than the cash outlays above, a short-term loan is taken to refinance the cash flow deficit.

Since principal and interest payments are paid from farm cash receipts, the amount of debt a farm is carrying plays a large role in a farm's ability to cash flow. The

term debt to asset level varies from 5 percent, to 25 percent, to 45 percent for this study. The term debt to asset ratio is defined as the level of intermediate term debt and long term debt as a percent of farm real estate and farm machinery value. Each of the scenarios is simulated with the farm's cash rent or share rent leasing option (table 4). In total, there are 18 scenarios simulated for the representative farm based on the combination of land ownership, term debt level and cash or share leasing option.

Key Results and Discussion

The most important results obtained from this study were:

(1) The simulation results classified the overall financial position for all scenarios with 5% and 25% debt to asset ratio were **good**, which means there is less than a 25% chance of cash flow deficit during the planning horizon. The financial position was classified as **marginal** for all scenarios with a 45% debt to asset ratio, which means there is a 25% to 50% chance of a cash flow deficit, external support to refinance, and losing real net worth. The probability of farm firm survival through 2011 was very high (99%) for all of the 18 scenarios considered. However, the level of profitability varied across the scenarios (tables 5 and 6).

(2) An inverse relationship was shown between the debt level (financial leverage) and level of net farm income. As the level of term debt increased, the average annual profit declined due to increased interest payments.

The deterministic results showed the ending financial situation to be much improved compared to the initial financial situation for most scenarios in the simulation period of 2003 to 2011. The improvement was more prominent at higher cropland land

ownership levels and lower debt levels. In the 5% debt level scenarios, the ending debt level was higher than the initial debt level due to planned machinery purchases and corresponding intermediate loan payments scheduled in specific years of the planning horizon that were higher than initial (2003) loan amount and payment conditions.

In the 25% and 45% debt level scenarios, there was considerable reduction in the dollar value of total ending debt. The greatest amount and percent of debt reduction occurs in the 90% ownership, 25% debt level scenarios. In the share lease version of this scenario, there is a 42% reduction in ending debt, compared to a 37% reduction in debt for the cash lease version of this scenario. In most other ownership-debt level scenarios cash leases had slightly lower ending debt levels than corresponding share leases.

(3) The simulation results showed the equity to assets ratio (E/A) is higher at higher levels of land ownership which indicates a greater probability for farm to survive. Hence, the effect of land ownership on net cash farm income is positive. In this research, a positive relationship between land ownership level and net worth gain is expressed. The farm has higher net worth gain at higher cropland ownership and lower debt levels. The results show that with 90% cropland ownership and 5% debt levels, the representative farm is in a very strong financial position.

(4) Positive and increasing cash reserves from 2003 to 2011 are shown in all ownership-lease type scenarios for 5% and 25% debt levels, while short-term loans after 2004 are needed to cover cash flow deficits in all 45% debt level scenarios. The amounts of cash reserves or short term debt levels are highest for the 90% cropland ownership level scenarios and lowest for the 20% cropland ownership scenarios.

The dollar amount of increase (decrease) in cash reserves and possible refinancing cash flow deficits with short-term debt is closely related to the amount of net worth change due to cash generated in the farm operation. The only other cash sources of earned net worth increases in the simulation model are principal payments on debt and equity down payment on machinery purchases. All changes in farm real estate values in all scenarios are due to increases (decreases) in market value of land and buildings minus the amount of depreciation on buildings.

(5) For ownership-lease type scenarios with 5% or 25% debt level, the amount of total assets and net worth was further increased due to increasing cash reserves. However, for all 45% debt level scenarios, the amount of asset and net worth gains were from changes in market value of assets and machinery purchases and scheduled principal payments on term debt and not due to increases in cash reserves. In reality, the amount of net worth gain in the 45% debt level scenarios was reduced by the amount of short-term debt incurred.

(6) The probability of cash flow deficits increases considerably as the proportion of leased land increases and / or the debt level increases. The main reason is the required annual rental payment in the cash lease scenarios and the impact of share leases on reduced gross revenue in the share lease scenarios.

(7) Based on the simulation results, participation in federal commodity program stabilizes the cash receipts, and reduces the magnitude of business risk for farms. The ratio of government payments to cash receipts average 14.13% for cash lease scenarios, whereas for share lease it is slightly lower throughout the simulation period.

(8) The simulation result showed, under the similar level of land owner ship and debt level, that share lease agreements have more negative effect on net farm income, ending cash reserves, and net worth than cash lease agreements. The ratios of cost to receipts and return to equity were also slightly lower for the share lease scenarios.

Conclusions and Implications

Two representative cash grain farm for eastern SD have been developed using secondary data and farmer panels. Both operations are representative of family-sized farms that employ a full-time operator and some hired or family labor. The Southeast and Northeast Farms are 1000 and 2050 acres, respectively, producing corn and soybeans. The Northeast Farm also has a small (80 head) cow/calf operation and grows some alfalfa and spring wheat. The Western Ranch is a 450 head cow / calf operation and operates 8600 acres. The farms and ranch are enrolled in the relevant Federal farm programs, obtain most of their income from crop or livestock sales, and have minimal off-farm earnings.

Different management scenarios were run deterministically and stochastically varying land ownership levels (low, medium, high), term debt levels (low, medium, and high D/A ratios), and use of cash or share lease to examine financial growth and survival probabilities of the representative firms for the 2003 – 2011 time period using the FAPRI macroeconomic / agricultural policy outlook.

Results from stochastic runs for the Northern Farm of 2050 acres indicates average annual cash receipts of $395,000 from 2003 – 2001, farm program payments averaging 14.1% of total receipts, and increases in nominal net worth in all scenarios. Financial

position is rated “good” for the initial 5% and 25% debt / asset level for all ownership (90%, 55%, and 20% cropland owned) scenarios and “marginal” for the 45% debt / asset level, which implies cash flow deficit likelihood exceeding 50% in most years, external refinancing, and potential decreases in real net worth. Across all debt level scenarios, the ratio of costs to receipts and probability of a cash flow deficit increased as the ownership level declined and proportion of farmland leasing increased.

One major implication is that farm growth from earnings is greatly reduced with too much debt. All earned growth rate measures were lower for farms with very high debt scenarios compared to the medium or low debt level scenarios. Cash grain farms with initial high debt levels (45%) have high survival rates, but also have very high probability of liquidity problems and required refinancing.

The level of land ownership and debt contribute significantly in determining the extent of the farm’s economic growth. A positive relationship between land ownership level and the farm growth is expressed, while an inverse relationship between the debt level and the extent of growth is shown.

Economies of size with owned land of the farm may be the primary factor affecting the farm’s level of operating efficiency, concluding that small farms may need to expand by purchasing additional land. However, if the expansion requires a significant amount of additional debt, the effects of altering the debt structure must also be considered. If the increase in profitability increases the total risk constraint enough to compensate for the added financial risk associated with the additional debt, the farm should consider expanding. However, if the increase in profitability does not increase the

total risk constraint enough to compensate for the additional financial risk, the farm should not expand.

Further studies should examine economic growth prospects for other farm types and seek to define the level of profitability necessary for the representative farm to assume additional risk without adversely affecting its economic growth and probability of survival. Other studies should examine scenarios assuming the same initial net worth but varying farm size, land ownership, and debt levels later. This would help farm operators assess possible outcomes from their initial equity capital structure.

REFERENCES

Boehlje, M. D., and Eidman, V. R. 1984. Farm Management. New York: Wiley.

FAPRI 2005 U.S. and World Agricultural Outlook. Food and Agricultural Policy Research Institute, Iowa State University and Univ. of Missouri, Columbia. Ames, IA.

FLIPSIM 2004. Coding Instructions for FLIPSIM. Version 2004.03.

Gray, A. W., Harman, W. L., Richardson, J. W., Wiese, A. F., Zimmel, P. T. and Lansford, V. D. 1997. Economic and financial viability of residue management: an application to Texas. Journal of Production Agriculture 10 (1): 175-183.

Hardaker, J. B., Huirne, R. B., and Anderson, J. R. 1997. Coping with risk in agriculture. Wallingford, U.K.: Cab International.

Ochoa, R. F., Anderson, D. P., Outlaw, J., Richardson, J. W., Knutson, R. D., Schwart, R., and Miller, J. 1998. Mexican representative farms 1998 economic outlook. AFPC Working Paper 98-7. Agricultural and Food Policy Center, Texas A & M University; College Station, Texas, USA.

Outlaw, J. L., Richardson, J. W., Herbst, B. K., Anderson, D. P., Sartwelle III, J. D., Raulston, J. M., Feldman, P., Schumann, K., Klose, S. L., Schwart, Jr., R. B., Zimmel, P. 2004. Representative farms economic outlook for the August 2004 FAPRI/AFPC baseline. AFPC Working Paper 04-2. Agricultural and Food Policy Center, Texas A & M University, College Station, Texas, USA.

Pattanaik, N. K. 2005. Survivability and growth of grain farms in North Central and Northeast South Dakota. Unpublished MS Thesis. Economics Department, South Dakota State University, Brookings, SD.

Perry, G. M., Rister, M. E., Richardson, J. W. and Grant, W. R. 1986. Analyzing tenure arrangements and crop rotations using farm simulation and profit analysis. Southern Journal of Agricultural Economics 18 (2): 165-174.

Qu, Y. 1992. Effects of different financial leverage, land ownership, and rental agreements on cash grain family farms' survivability and growth in North East South Dakota. Unpublished MS Thesis. Economics Department, South Dakota State University, Brookings, SD.

Richardson, J. W. and Nixon, C. J. 2004. Description of FLIPSIM: The firm level income and simulation model. Agricultural and Food Policy Center, Texas A & M University; College Station, Texas; USA

Richardson, J. W. 1988. Modeling of economic systems. Agricultural and Food Policy Center, Texas A & M University, College Station, Texas; USA

Richardson, J. W. and Nixon, C. J. 1988 Description of FLIPSIM V: a general firm level policy simulation model. Bulletin, Texas Agricultural Experiment Station. No. B-1528, 181 pp. Texas A & M University; College Station, Texas; USA

South Dakota Agricultural Statistics Service, U.S. Department of Agriculture. South Dakota Agriculture, 2004. Sioux Falls SD. Available at: www.nass.usda.gov/sd/

Streff, N. 2004. Economic incentives for South Dakota farms to participate in the Conservation Security Program. . Unpublished MS Thesis. Economics Department, South Dakota State University, Brookings, SD.

Taylor, R. D., Koo, W. W., and Swenson, A. L. 2003. 2003 North Dakota agricultural outlook: Representative Farms, 2003-2012. Centre for Agricultural Policy and Trade Studies, Department of Agribusiness and Applied Economics. North Dakota State University, Fargo, ND.

U.S. Department of Agriculture.2002 Census of Agriculture, National Agricultural statics service, AC-02-A-41: South Dakota state and county data. Available at www. nass.usda .gov/census/

Washnok, G. A. 1990. Effects of tenure, leverage, and farm commodity program participation on farm firm survival and growth in South Dakota. Unpublished MS Thesis. Economics Department, South Dakota State University, Brookings, SD.

Table 1 Characteristics of three representative farms and ranches, South Dakota

	Western Ranch	Northeast Farm	Southeast Farm
Size: (acres operated)	8,600	2,050	1,050
Land Use: (acres)			
Crop / Hay	1,150	1,600	1,000
Pasture / Range	7,400	400	0
Farm site and other	50	50	50
Beef cow herd (no. of bred cows)	450	80	--
Crops Raised:	Alfalfa, Oats Grass Hay Sudan/Millet	Corn Soybean Wheat , Alfalfa	Corn Soybean
Initial Land Values/$/A		2003 2004	
(2003) Cropland	$317	$695 $823	$1,500
Pasture/Rangeland	$212	$361	--
Initial Percent of Land Acres:			
Owned	92%	55% cropland all pasture	55%
Leased	8%	45% cropland	45%
Family Living Withdrawals:			
Minimum	$20,000	$20,000	$15,000
Initialized in 2003	$20,000	$30,000	$25,000
Major Data Sources:	Producer Panel	Secondary	Thesis
2003 Values: (thousands of dollars)			
Balance Sheet –Assets operated	$2,652.5	$1,718.6	$1,926.6
Owned Assets	$2,504.5	$1,218.2	$1251.6
Gross Cash Receipts	$223.7	$415.0	$361.0
Cash Expenses	$155.1	$251.6	$217.4
Net Cash Income	$86.6	$163.3	$143.6
Net Farm Income	$33.1	$148.7	$115.6
Percent of Cash Receipts from:			
Livestock sales	86.1%	9.0%	0.0%
Crop sales	10.6%	85.7%	75.2%
Farm program payments	3.3%	5.3%	24.8%

Source: Authors

Table 2. Balance sheet for the baseline Northern SD representative farm, 2003

Assets	**$**
Market value of owned cropland	611,952
Market value of buildings	120,150
Market value of owned pastureland	144,240
Market value of owned farmstead	34,770
Market value of all farm machinery	242,933
Market value of all livestock	64,184
Beginning cash reserve	5,000
Total value of assets	1,218,229
Liabilities	
Total long-term debt	43,817
Total intermediate-term debt	12,147
Total debt	55,964
Beginning net worth (market value)	1,167,265

Source: Pattanaik, 2005

Table 3. Income statement for the baseline Northern SD Representative farm, 2003.

Cash income	**($)**
Cash receipts for crops	355,458
Livestock cash receipts	37,254
CCP payments	0
Fixed payments	21,319
LDP payments	951
Total cash receipts	414,982
Cash farm expense	
Total crop production costs	135,667
Cow/calf production costs	4,695
Purchased beef cattle	2,000
Cash rent for cropland	33,264
Property tax	13,904
Accountant and legal fees	1,000
Maintenance	24,000
Utilities	5,500
Fuel and lube	4,431
Liability insurance	4,500
Miscellaneous costs	1,000
CAT premiums	240
Crop insurance premiums	8,680
Interest on long-term debt	3,299
Interest on intermediate term debt	463
Interest on operating debt	8,977
Total cash expense	251,624
Net cash farm income	163,358
Depreciation	-14626
Net farm income	148,723

Source: Pattanaik, 2005

Table 4: Scenario variations for the Northern SD representative farm

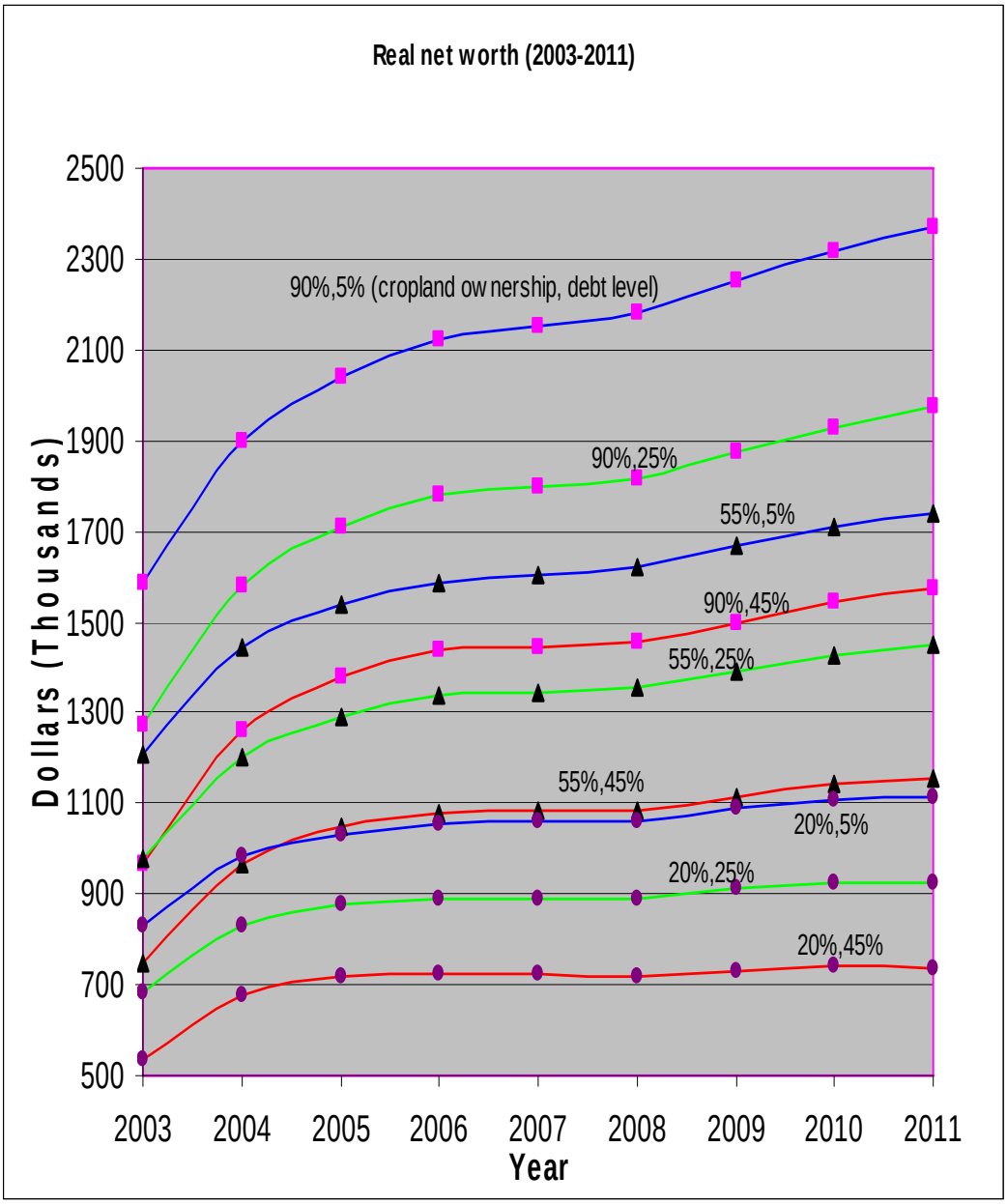
Scenario	Cropland Owned,%	Total Acres Cropland	Acres Owned	Acres Leased	Term Debt Level, %	Tenure Type
1,10	90	1600	1440	160	5	Cash/Share
2,11	90	1600	1440	160	25	Cash/Share
3,12	90	1600	1440	160	45	Cash/Share
4,13	55	1600	880	720	5	Cash/Share
5,14	55	1600	880	720	25	Cash/Share
6,15	55	1600	880	720	45	Cash/Share
7,16	20	1600	320	1280	5	Cash/Share
8,17	20	1600	320	1280	25	Cash/Share
9,18	20	1600	320	1280	45	Cash/Share

Note: scenarios 1-9 assumes cropland acres are cash leased and scenarios 10-18 assumes cropland acres are share leased.

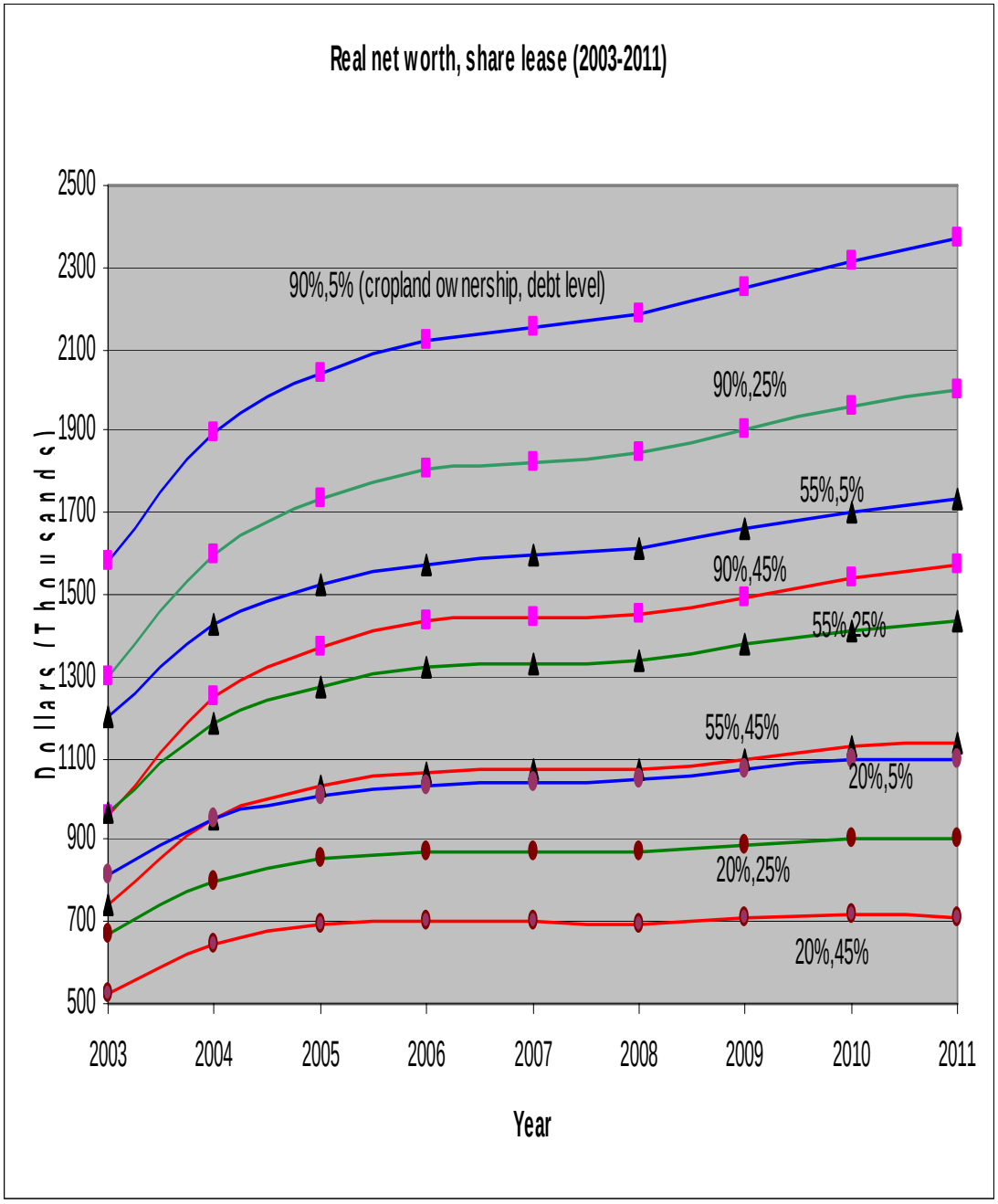
Source: Pattanaik, 2005.

Figure 1. Trend in real net worth (2003-2011), by cash lease and share lease scenarios

Cash lease scenarios



Share lease scenarios



Source: Pattanaik, 2005.

Table 5. Stochastic results: cash lease scenarios for Northern SD representative farm

Cropland ownership level	----------90%---------			---------55%--------			----------20%---------		
Debt level	5%	25%	45%	5%	25%	45%	5%	25%	45%
Overall financial position,2006-2011 2006-2011 ranking	Good	Good	Marginal	Good	Good	Marginal	Good	Good	Marginal
AveChange real net worth(%),2006-2011	2.556	2.566	2.518	2.398	2.378	2.317	2.091	2.045	1.953
Govt.payments/ receipts (%), 2006-2011 average	14.128	14.128	14.128	14.128	14.128	14.128	14.128	14.128	14.128
Prob.remaining solvent through year 2011 (%)	99.00	99.00	99.00	99.00	99.00	99.00	99.00	99.00	99.00
Total cash receipts ($1000), 2006-2011 average	395.04	395.04	395.04	395.04	395.04	395.04	395.04	395.04	395.04
Net cash farm income($1000), 2006-2011 average	158.87	138.45	115.88	132.95	117.75	101.29	106.73	97.08	86.70
Prob. of a cash flow deficit (%)									
2005	1.00	99.00	99.00	1.00	99.00	99.00	1.00	99.00	99.00
2006	1.00	25.00	88.00	7.00	35.00	85.00	28.00	46.00	82.00
2007	12.00	46.00	93.00	29.00	56.00	89.00	46.00	63.00	84.00
2008	1.00	29.00	96.00	11.00	40.00	91.00	30.00	46.00	88.00
2009	1.00	15.00	86.00	3.00	20.00	82.00	18.00	29.00	73.00
2010	1.00	14.00	82.00	2.00	29.00	80.00	12.00	37.00	73.00
2011	8.00	53.00	88.00	25.00	56.00	86.00	56.00	86.00	52.00

Table 5: Stochastic results: cash lease scenarios – continued

Cropland ownership level	----------90%-------			----------55%--------			---------20%---------		
Debt level	5%	25%	45%	5%	25%	45%	5%	25%	45%
Ending cash reserves ($1000)									
2003	89.38	50.85	12.70	77.89	46.33	14.77	66.78	41.80	16.83
2004	158.63	82.89	7.76	137.03	74.59	12.14	116.05	66.29	16.52
2005	195.69	78.39	-37.88	159.80	63.29	-33.22	124.96	48.20	-28.56
2006	240.80	99.84	-39.48	192.23	79.70	-33.15	145.71	59.56	-26.92
2007	273.99	108.18	-55.94	212.36	82.46	-47.82	153.08	56.92	-39.95
2008	316.01	124.42	-65.17	241.17	93.66	-54.20	169.92	63.90	-42.80
2009	371.61	153.80	-62.88	283.88	117.64	-49.05	199.56	83.11	-34.34
2010	428.84	184.72	-60.42	328.51	142.96	-43.63	231.09	103.21	-25.94
2011	467.79	197.16	-77.69	354.95	149.90	-57.56	244.64	104.98	-36.14
Cost to receipts ratio (%), 2006-2011 average	60.82	66.09	71.90	67.50	71.42	75.66	74.25	76.73	79.41
Ending nominal networth($1000)	2524.50	2116.97	1707.38	1874.62	1576.29	1275.53	1229.43	1037.93	844.99
Prob. of decreasing real net worth (%), over 2003-2011	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ending intermediate debt ($1000)	66.09	66.09	66.09	66.09	66.09	66.09	66.09	66.09	66.09
Ending long-term debt ($1000)	31.53	168.43	303.17	23.32	116.61	209.90	12.96	64.79	116.62
Return to equity (%), 2006-2011 average	6.73	6.96	7.15	6.99	7.24	7.51	7.44	7.79	8.20

Table 6. Stochastic results: share lease scenarios for Northern SD representative farm

Cropland ownership level	----------90%-------			----------55%--------			----------20%----------		
Debt level	5%	25%	45%	5%	25%	45%	5%	25%	45%
Overall financial position,2006-2011 ranking	Good	Good	Marginal	Good	Good	Marginal	Good	Good	Marginal
Ave Change real net worth(%),2006-2011	2.553	2.568	2.501	2.367	2.321	2.194	1.978	1.847	1.611
Govt.payments/ receipts (%), 2006-2011 average	14.090	14.090	14.090	13.924	13.924	13.924	13.695	13.695	13.695
Prob. remaining solvent through year 2011 (%)	99.00	99.00	99.00	99.00	99.00	99.00	99.00	99.00	99.00
Total cash receipts ($1000), 2006-2011 average	382.84	382.84	382.84	340.31	340.31	340.31	298.07	298.07	298.07
Net cash farm income ($1000), 2006-2011 average	157.58	139.39	114.68	127.78	112.85	96.04	98.08	88.36	77.44
Prob. of a cash flow deficit (%)									
2005	1.00	99.00	99.00	1.00	99.00	99.00	1.00	99.00	99.00
2006	1.00	16.00	90.00	1.00	30.00	94.00	9.00	42.00	98.00
2007	10.00	42.00	93.00	23.00	60.00	94.00	48.00	72.00	97.00
2008	1.00	27.00	99.00	4.00	37.00	99.00	25.00	51.00	99.00
2009	1.00	11.00	88.00	2.00	18.00	92.00	5.00	24.00	95.00
2010	1.00	8.00	84.00	1.00	22.00	87.00	5.00	29.00	90.00
2011	7.00	46.00	89.00	21.00	56.00	92.00	47.00	67.00	92.00

Table 6 – Stochastic results: share lease scenarios - continued

Cropland ownership level	----------90%--------			----------55%--------			----------20%---------		
Debt level	5%	25%	45%	5%	25%	45%	5%	25%	45%
Ending cash reserves ($1000)									
2003	87.53	46.43	10.85	69.55	37.99	6.43	51.96	26.99	2.01
2004	154.76	78.70	3.89	119.43	56.99	-5.46	84.72	34.95	-14.82
2005	192.82	77.80	-40.74	146.83	50.32	-46.25	101.81	25.06	-51.85
2006	238.05	101.54	-42.77	179.20	65.74	-47.86	121.79	34.90	-52.58
2007	271.19	112.25	-59.61	198.51	67.38	-64.22	127.46	30.00	-68.57
2008	312.97	130.93	-69.37	226.44	76.93	-72.83	141.90	33.89	-75.26
2009	368.25	162.85	-67.63	268.04	99.32	-70.21	169.20	49.72	-71.09
2010	425.26	196.56	-65.64	311.67	123.38	-66.80	198.84	67.35	-66.09
2011	463.86	211.89	-83.43	336.56	128.77	-83.00	209.85	66.04	-80.35
Cost to receipts ratio (%), 2006-2011 average	59.85	64.70	71.26	63.51	67.98	73.00	68.20	71.52	75.24
Ending nominal net worth ($1000)	2520.52	2147.64	1701.59	1856.18	1555.11	1250.05	1194.59	998.95	800.73
Prob. of real net worth decline (%)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ending intermediate debt ($1000)	66.09	66.09	66.09	66.09	66.09	66.09	66.09	66.09	66.09
Ending long-term debt ($1000)	31.53	152.44	303.17	23.32	116.61	209.90	12.96	64.79	116.62
Return to equity (%),2006-2011 ave	6.69	6.91	7.10	6.75	6.98	7.17	6.86	7.11	7.33