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2000 North Dakota Agricultural Outlook: Representative Farms 2000-2009

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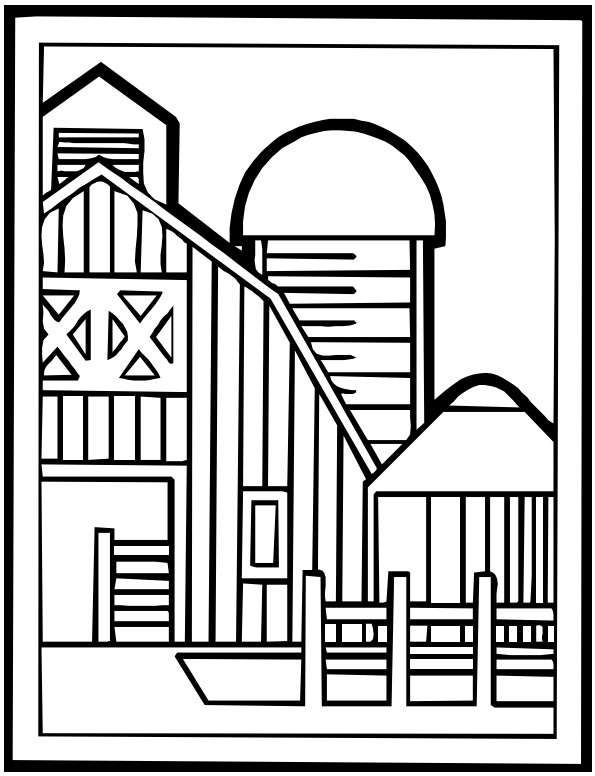

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We would be happy to provide a single copy of this publication free of charge. You can address your inquiry to: Carol Jensen, Department of Agribusiness and Applied Economics, North Dakota State University, P.O. Box 5636, Fargo, ND, 58105-5636, Ph. 701-231-7441, Fax 701-231-7400, e-mail cjensen@ndsuext.nodak.edu . This publication is also available electronically at this web site: http://agecon.lib.umn.edu/ndsu.html

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Abstract

Net farm income for most representative farms in 2009 will be lower than in 1999. Low profit farms, which consist of 25% of the farms in the study, may have negative net farm income throughout the forecasting period, and may not have financial resiliency to survive. This is true under both optimistic and pessimistic scenarios. All farms, except low profit farms, may perform well under the optimistic scenario, while only high profit and large size farms may be able to survive under the pessimistic scenario. Cropland prices and cash rental rates are projected to increase slightly except in the Red River Valley where they are projected to fall. Debt-to-asset ratios for most farms will remain unchanged throughout the forecast period. Debt-to-asset ratios for the low profit and small size farms are higher than those for large and high profit farms. Under the optimistic scenario, all North Dakota farms, except for the low profit farm, may perform well. Under the pessimistic scenario, both the small size and low profit representative farms fail to provide sufficient income for family living

Key Words: Net Farm Income, Debt-to-asset Ratios, Cropland Prices, Land Rental Rates, Farm Operating Expenses, Capitalization Rate

Highlights

Net farm income for the large size farm is predicted to decrease from $120 to $113 thousand for the 1999-2009 period, and the net farm income for the medium size farm will increase from $53 to $54 thousand. Net farm income for the small size farm will decrease from $26 to $13 thousand for the same period.

Net farm income for the high profit farm is predicted to decrease from $203 to $193 thousand for the 1999-2009 period, and net farm income for the average profit farm is predicted to increase from $67 to $80 thousand. Net farm income for the low profit farm will range between $-10 and $-4 thousand for the period.

Debt-to-asset ratios for all representative farms are predicted to vary slightly throughout the forecast period. Debt-to-asset ratios are projected to be 30% for the large size, 33% for the medium size, and 45% for the small size representative farms in 2009. The ratios are also projected to be 26%, 34%, and 49% for high, average, and low profit representative farms in 2009, respectively.

For average profit representative farms, cropland prices will increase 8% from $435 per acre in 1999 to $468 in 2009. Cash rents will increase 3% from $37 per acre in 1999 to $38 in 2009.

Low profit representative farms may not have financial resiliency to survive because of low net farm income and high debt-to-asset ratios.

Under the optimistic scenario, most North Dakota representative farms will perform relatively well. Under the pessimistic scenario, however, both the small size and low profit representative farms fail to provide sufficient income for family living.

2000 North Dakota Agricultural Outlook: Representative Farms 2000-2009

Won W. Koo, Richard D. Taylor, and Andrew L. Swenson*

INTRODUCTION

North Dakota represents a major agricultural area with distinctive climate and crop mix in the United States. The state is uniquely situated in terms of marketing and logistics within the United States because it shares a border with Canada, which is the United States' largest trading partner. Changes in government policies through the 1996 Federal Agriculture Improvement Reform (FAIR) Act and the Uruguay Round Agreement (URA) are likely to have affected the region's economy. Furthermore, the Canada/U.S. Free Trade Agreement (CUSTA) and the North American Free Trade Agreement (NAFTA) have had their greatest effects in this region.

The main objective of this analysis is to evaluate changes in net farm income and debt-to-asset ratios for different sizes and profit categories of representative farms. The representative farms are developed from the North Dakota Farm and Ranch Business Management Education Program farm records over the 2000 to 2009 period under the 1996 FAIR Act, the URA, and CUSTA. The secondary objective is to evaluate the reaction of cropland prices and cash rental rates to the farm income estimates over the same time horizon.

The North Dakota agricultural outlook for the 2000-2009 period is based on the baseline results produced by the FAPRI global model and ND global wheat model under the optimistic and pessimistic scenarios. The optimistic scenario provides an economically desirable situation for the U.S. agricultural economy with increases in U.S. exports to major importing countries, such as India, China, and the Former Soviet Union. It also assumes decreases in exportable surplus of commodities in major exporting countries, such as Canada, the European Union, and Australia. The pessimistic scenario is the reverse case of the optimistic scenario.

U.S. agriculture has been influenced by major changes in agricultural and trade policies. The FAIR Act intended to limit spending for government commodity payments to $35.63 billion between 1996 and 2002. This legislation represents a departure from the supply management and income support strategies of farm programs since the 1930s. The legislation decouples government farm subsidy payments from both price and production and provides farmers with nearly complete planting flexibility. The legislation substitutes a 7-year fixed benefit contract for an annually determined entitlement farm payment. In addition, several trade agreements, such as CUSTA, NAFTA, and the URA, have liberalized agricultural trade and will continue to liberalize agricultural trade for the next decade. Due to falling prices, loan deficiency payments (LDPs) and marketing loans are now subsidies and are coupled to production. The emergency payments made by the federal government for 1999 have been included in the model. Additional payments will be made for 2000.

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DEVELOPMENT OF AN EMPIRICAL MODEL

Major crops produced in North Dakota are hard red spring wheat, durum wheat, barley (malting and feed), corn, soybeans, and minor oilseeds, including sunflower and canola. In addition, the region produces sugarbeets and potatoes. The agricultural sector contributes the largest share to the state economy, followed by the energy sector. Most farms in this state differ from farms of other states in terms of farm structure and marketing options. The average farm size in North Dakota is 1,274 crop acres. About 43% of total farms in North Dakota have a farm size less than 1,000 crop acres. In addition, small farms (less than 200 acres) account for 26% of total farms in North Dakota and only 3% of total farmland.

The North Dakota Representative Farm Model is a deterministic simulation model designed to analyze the impacts of policy changes on farm income. The model projects average net farm incomes, debt-to-asset ratios, cash rents, and cropland prices for representative farms for producing five major crops: wheat, barley, corn, soybeans, and sunflowers. The model is linked to the FAPRI and North Dakota econometric simulation models, and uses the prices of the crops generated from the models (Figure 1). This model assumes an average trend yield based on historical data and average predicted prices received by farmers based on the historical relationships between FAPRI prices and North Dakota prices received by farmers. This model does not incorporate price discounts due to loss of crop quality or decreases in yields due to disease or weather conditions, such as scab or drought, for the forecasting period. In addition, macro policies and assumptions, trade policies, and agricultural policies are incorporated into the model directly or indirectly by the assumptions made by FAPRI in their price series.

Alternative farm policies affect net farm income for the representative farms. Changes in return to cropland, given the market-determined capitalization rate, result in changes in land prices. Changes in return to cropland affect cash rental rates that farmers are willing to pay on land used to produce crops. Changes in land price and cash rental in turn affect net farm income through adjustments in farm expenses. These changes affect the debt-to-asset ratios of the representative farms.

The North Dakota Representative Farm

The model has 24 representative farms; six farms in each of four regions of North Dakota. These regions are the Red River Valley (RRV), North Central (NC), South Central (SC), and Western (West) (Figure 2). The farms in each region are representative of the average, high, and low profit farms and small, medium, and large size farms enrolled in the North Dakota Farm and Ranch Business Management Education Program.

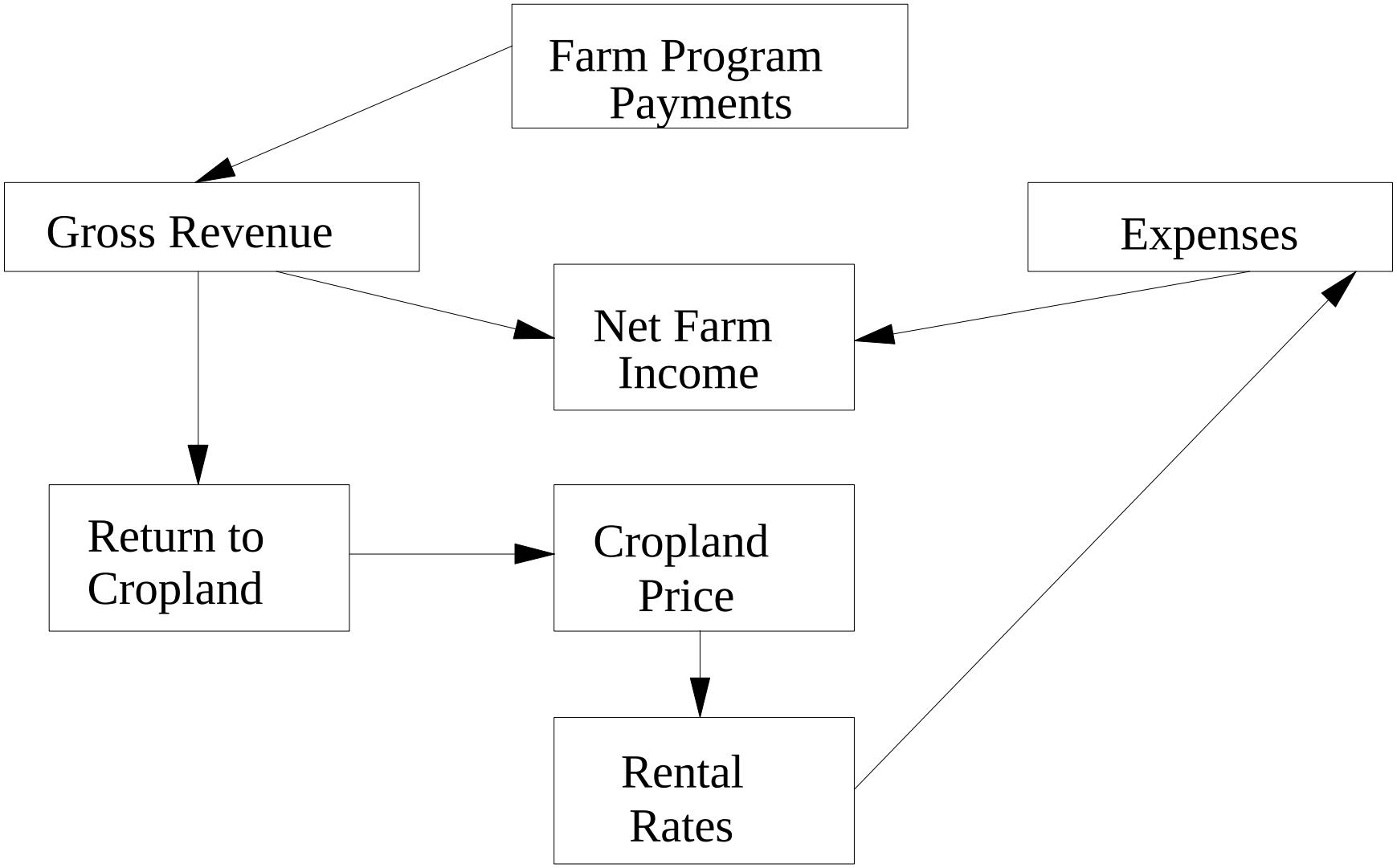
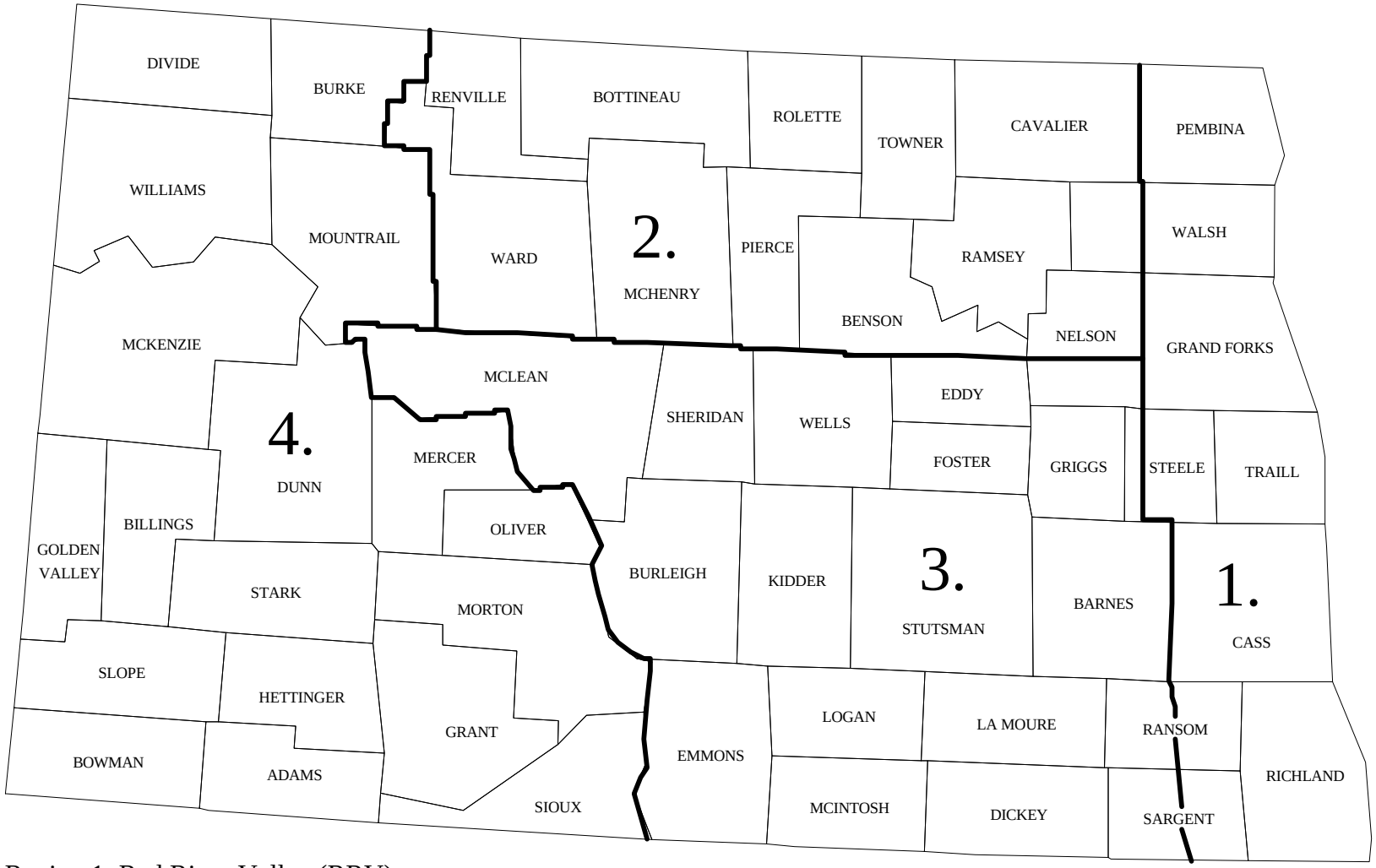


Figure 1. Structure of the North Dakota Representative Farm Model



Region 1. Red River Valley (RRV)
Region 2. North Central (NC)
Region 3. South Central (SC)
Region 4. Western (West)

Figure 2. North Dakota Farm and Ranch Business Management Regions

4

The representative farms average 1,709 acres of cropland and 410 acres of pasture. The farms in the study are about 33% larger than the state average reported by the National Agricultural Statistical Service (NASS). A reason for this difference is the state average farm includes all farms with $1,000 or more in sales; therefore, hobby farms, farms operated as part of combined larger farms, semi-retired farms, and commercial farms are included, while the farms used in this study mainly represent commercial farms.

The average representative farm is an average of all farms in the Farm and Ranch Business Management Records System for the state in each production region. The high profit representative farm is an average of farms in the top 20% of farm profitability for each production region. The low profit representative farm is an average of farms in the low 20% of farm profitability for the state or for each production region. Average farm sizes are 2,783 cropland acres for the high profit farm, 1,709 cropland acres for the average profit farms, and 1,101 cropland acres for the low profit farms (Table 1).

The large farm is the average of the largest 25% of farms in cropland acres for each producing region. The small representative farm is an average of the smallest 25% of the farms for each producing region. Average farm sizes are 3,144 cropland acres for the large size farm, 1,437 cropland acres for the medium size farms, and 586 cropland acres for the small size farms (Table 1).

Table 1. Characteristics of Representative North Dakota Farms, 1999

	Size			Profit		
	Large	Medium	Small	High	Average	Low
Number of Farms	134	267	134	108	535	108
Total Cropland	3,144	1,437	586	2,783	1,709	1,101
Spring Wheat	708	325	176	589	401	266
Durum Wheat	424	243	50	415	268	150
Barley	395	193	85	298	208	137
Corn	345	130	67	220	136	92
Sunflower	412	237	48	355	223	164
Soybeans	319	158	70	209	130	91

Structure of the Representative Farm Model

The model consists of four components: net farm income, debt-to-asset ratio, land price, and cash rent. This section discusses the definition of each component and the formulas used to calculate the components.

Net Farm Income. Net farm income is calculated by subtracting total crop and livestock expenses from total farm income. Crop and livestock expenses consist of direct costs, including seed, fertilizer, fuel, repairs, feed, supplies, feeder livestock purchases, hired labor; and indirect costs that include machinery depreciation, overhead such as insurance and licenses, land taxes, and land rent or interest on real estate debt. Total farm income is the sum of cash receipts from

crop and livestock enterprises, government payments, CRP payments, custom work, patronage dividends, insurance income, and miscellaneous income. Net farm income is calculated as:

$$NFI = \sum_{j=1}^{n} Y_j P_j A_j + \sum_{h=1}^{m} P_h L_h + \sum_{j=1}^{n} S_j A_j + I^o - \sum_{h=1}^{m} EX_h^L - \sum_{j=1}^{n} EX_j^C \tag{1}$$

where

Y_j = yield per acre for crop j
P_j = price of crop j
A_j = planted acres of crop j
P_h = price of livestock h
L_h = number of livestock h sold
S_j = government subsidies for crop j per acre
I^o = other farm income
EX^C_j = total expenses in producing crop j
EX^L_h = total expenses in producing livestock h

Inventory changes, accounts receivable, accounts payable, and prepaid expenses and supplies are assumed to be constant from year to year. Cash receipts are based on predicted cash prices and yields in North Dakota. Cash prices received by farmers are estimated from North Dakota price equations which were estimated on the basis of the historical relationships between North Dakota prices and U.S. export prices of the commodities. Annual data from 1974 to 1998 were used to estimate price equations. The price equations were used to estimate cash prices received by North Dakota farmers for the 2000-2009 period. The FAPRI prices are used as exogenous variables in the price estimates.

Regional North Dakota yield trend equations were estimated from historical yield data reported by NASS from 1974 to 1998. The estimated equations were used to forecast crop yield trends for future years. A dummy variable was used to compensate for two drought years; 1980 and 1988.

Cropland Prices and Cash Rent. Land prices for representative farms are estimated on the basis of the implicit discount rate the farms have previously used and the expected return on land. Therefore, the land prices are defined as the amount that farms can afford to pay for farmland. They are not prevailing market prices. Financial data from average representative farms for each region are used to calculate a dollar return to land. To do this, all production expenses for the crops, including depreciation, land taxes, a labor charge for unpaid family labor, net return from a livestock enterprise, and a management fee equivalent to that charged by bank trust departments for management of share-rented farms, are subtracted from gross farm income. To the remaining balance, interest on real estate debt is added back because the return to land is not affected by ownership of the land. This figure is used as the return allocated to cropland.

The average return allocated to each acre of cropland per year is divided by the average cropland price to determine the long-run capitalization rate used by farmers as follows:

(2) $$R_g = \frac{M_g}{PL_g}$$

where

R_g = long-run capitalization rate in region g
M_g = average net return allocated to cropland in region g
PL_g = average observed price of cropland in region g

For the forecast years, this capitalization rate is applied to the estimated average income per acre allocated to cropland to determine cropland value for land utilized to produce wheat, corn, soybeans, barley, and sunflowers. The average income is an n-year weighted moving average of annual per acre income. Calculation of cropland prices is summarized as:

(3) $$PL_{gT} = \frac{1}{R_g} \sum_{t=T-n}^{T} W_t M_{tg}$$

where

PL_{gT} = cropland price in region g in time T
W_t = weighting factor for year t
M_{tg} = net return allocated to cropland in region g and year t

The price of cropland calculated in Equation 3 can be defined as the amount farmers are willing to pay for the cropland to produce wheat, barley, corn, soybeans, and sunflowers.

<u>Cash Rent</u>. Cash rent for cropland is calculated by multiplying a k-year moving average of estimated price of cropland by the long-run capitalization rate, plus taxes on land. Calculation of cash rent is summarized by

(4) $$CR_{gT} = \sum_{t=T-k}^{T} EM_{gt} R_g + TX_T$$

CR_{gT} = cropland cash rent in region g in time T
EM_{gt} = estimated price of cropland in region g and year t
TX_T = taxes on land in time T

The cash rent is defined as the amount farmers are willing to pay for the rented cropland to produce wheat, barley, corn, soybeans, and sunflowers.

DATA USED FOR THE REPRESENTATIVE FARM

The commodity prices for crops are obtained from FAPRI and ND simulation models for average farm prices of the crops in the United States. The national average farm prices are converted to the prices received by North Dakota representative farms by regressing average farm price of each crop produced in North Dakota against the national average farm price of the same crop. The price equation used for this study is specified in a dynamic framework on the basis of the Nerlove's partial adjustment hypothesis as follows:

(5) $$P_{it} = a_0 + a_1 P_t + a_2 P_{it-1} + e_{it}$$

where P_{it} = average farm price of a crop in region i in time t.
P_t = national average farm price of a crop in time t.

The price equation is estimated for each crop produced in North Dakota using the time series data from 1975 to 1998. The estimated equations are used to predict average prices received by farmers in each region in North Dakota from the national average prices from the FAPRI and ND simulation models. The predicted farm prices under the base, optimistic, and pessimistic scenarios are shown in Table 2.

Crop yields in each region also are predicted by using the estimated yield equations for crops produced in each region. The yield equation for each crop in each region is specified in the same dynamic framework as that in the price equation as follows:

(6) $$y_{it} = b_0 + b_1 \text{ trend} + b_2 y_{it-1} + e_{it}$$

where y_{it} represents yield of a crop in region i in time t and e_{it} is a random error term. A dummy variable was used to compensate for two drought years; 1980 and 1988. The trend variable is included to capture changes in production technology.

This equation is estimated for each crop in each region using time series data from 1976 to 1998. The estimated equations are used to predict crop yields in each region.

Crop mix changes over time as a function of prices of the crops produced in each region. A dynamic acreage equation for each crop is specified on the basis of Nerlove's partial adjustment hypothesis as follows:

(7) $$A_{jit} = c_o + \sum_{j=1}^{n} c_j P_{jit} + c_{n+1} A_{jit-1} + c_{n+2} G_{it} + e_{jit}$$

where A_{jit} = the total acres of the jth crop in region i in time t,
P_{jit} = the price of the jth crop in region i in time t,
G_{it} = government policy variables applied to the jth crop in time t,
$e_{jit.}$ = a random error term.

Table 2. North Dakota Baseline Price Estimates from the Projected FAPRI Baseline, Optimistic, and Pessimistic Price Scenarios

	Spring Wheat	Durum Wheat	Malting Barley	Feed Barley	Soybeans	Corn	Sunflower
	----------dollars/bushel----------						-$/cwt-
Base scenario							
1999	2.93	2.69	1.99	1.34	4.18	1.68	9.75
2000	3.35	3.49	2.34	1.81	4.05	1.91	9.26
2001	3.66	3.94	2.40	1.86	4.30	2.01	9.88
2002	3.74	4.06	2.42	1.86	4.72	2.01	10.85
2003	3.87	4.24	2.52	1.93	4.77	2.08	11.08
2004	3.87	4.24	2.54	1.95	4.94	2.10	11.55
2005	3.97	4.41	2.64	2.02	4.97	2.15	11.74
2006	4.05	4.52	2.70	2.06	5.14	2.19	12.22
2007	4.14	4.65	2.78	2.11	5.21	2.24	12.50
2008	4.19	4.73	2.85	2.17	5.36	2.26	12.92
2009	4.27	4.84	2.97	2.24	5.46	2.34	13.25
Optimistic scenario							
1999	2.93	2.69	1.99	1.34	4.18	1.68	9.75
2000	3.44	3.62	2.44	1.89	4.08	1.96	9.29
2001	3.77	4.10	2.53	1.96	4.33	2.07	9.91
2002	3.89	4.26	2.55	1.98	4.78	2.07	10.91
2003	4.04	4.47	2.65	2.05	4.83	2.16	11.14
2004	4.05	4.49	2.70	2.08	5.03	2.21	11.64
2005	4.17	4.65	2.81	2.16	5.07	2.27	11.84
2006	4.27	4.80	2.88	2.21	5.26	2.33	12.33
2007	4.38	4.95	2.96	2.27	5.35	2.39	12.62
2008	4.45	5.05	3.04	2.33	5.51	2.41	13.06
2009	4.54	5.18	3.16	2.41	5.63	2.50	13.40
Pessimistic scenario							
1999	2.93	2.69	1.99	1.34	4.18	1.68	9.75
2000	3.26	3.37	2.25	1.74	4.03	1.87	9.24
2001	3.55	3.80	2.29	1.76	4.27	1.96	9.85
2002	3.61	3.88	2.30	1.77	4.67	1.96	10.81
2003	3.72	4.05	2.38	1.82	4.71	2.00	11.02
2004	3.71	4.04	2.40	1.83	4.86	2.00	11.48
2005	3.82	4.20	2.49	1.90	4.88	2.05	11.66
2006	3.88	4.29	2.54	1.93	5.03	2.07	12.12
2007	3.96	4.41	2.62	1.98	5.09	2.12	12.39
2008	3.99	4.47	2.69	2.03	5.22	2.13	12.80
2009	4.06	4.57	2.80	2.10	5.31	2.20	13.12

The equations are estimated using time series data from 1976 to 1998. The estimated equations are used to predict the total acres of each crop produced in each region. The predicted prices from Equation 5 are used in the acreage equations. The jth crop share in region i in time t is then calculated as follows:

$$S_{jit} = A_{jit} / \sum_{j=1}^{i} A_{jit} \tag{8}$$

where S_{jit} is an acreage share of the jth crop in region i in time t.

The estimated share of a crop is applied to calculate the total acres of the crop produced in the region by multiplying the total acres in the region by the share.

Other data needed for the model are obtained from the North Dakota Farm and Ranch Business Management Association (farm record system data).

AGRICULTURAL OUTLOOK FOR THE REPRESENTATIVE FARMS, 2000-2009

The North Dakota Representative Farm Model was used to estimate net farm income, debt-to-asset ratio, land prices, and rental rates under the 1996 FAIR Act for 2000-2009.

Additional assumptions used in this study are

1. Net farm income from livestock operation and production of other crops, including potatoes, canola, and dry beans, remains constant during the period.

2. All farm enterprises in size and operation remain constant in the analysis.

3. The farm equipment stock remains constant, indicating that depreciation allowances are invested back into farm equipment.

4. Inventory changes, accounts receivable, accounts payable, and prepaid expenses and supplies are constant from year to year.

5. Government payments continue for the years after 2002, at the same level as 2002.

Net Income for North Dakota Representative Farms

Table 3 presents net farm income for farms by size and profitability. Average net income for North Dakota representative farms varies, depending upon the size of farm and its profitability. The net income for the large size farm will decrease from $120 thousand in 1999 to $93 thousand in 2001 and then increases to $113 thousand in 2009 (Figure 3). The net income in 2009 will be 6% lower than that in 1999. Net farm income for the medium size farm is $53

thousand in 1999, and will decrease to $37 thousand in 2001, and then increase to $54 thousand in 2009. All representative farms benefitted in 1999 from government payments and cash crop insurance proceeds. North Dakota farmers received $1.369 billion in payments (Farmers Union). Most of the net farm income is due to those payments. It has been announced that government payments for 2000 will be similar to 1999. In 2001 and beyond, it is assumed that government payments will be reduced to the FAIR Act level. Net income in 2009 will be 2% higher than that in 1999. Net farm income for the small size farm is $26 thousand in 1999 and will decrease to $8 thousand in 2001 and then increase to $13 thousand in 2009. State average net farm income over the 10-year, 2000-2009 period, is $106 thousand for the large size farm, $48 thousand for the medium size farm, and $13 thousand for the small size farm. This implies that the large size farm has the net income to survive and expand but the medium and small size farms under the 1996 FAIR Act and the current international market conditions may not be able to expand and take advantage of current and future technology.

Increases in net farm income from 2001 to 2009 are mainly due to strong import demand for agricultural crops from developing countries. Crop production in the United States and around the world is predicted to be consistent with annual trend line increases, while demand is predicted to increase faster than supply due mainly to the expected increases in income and slow but steady growth in population in developing countries.

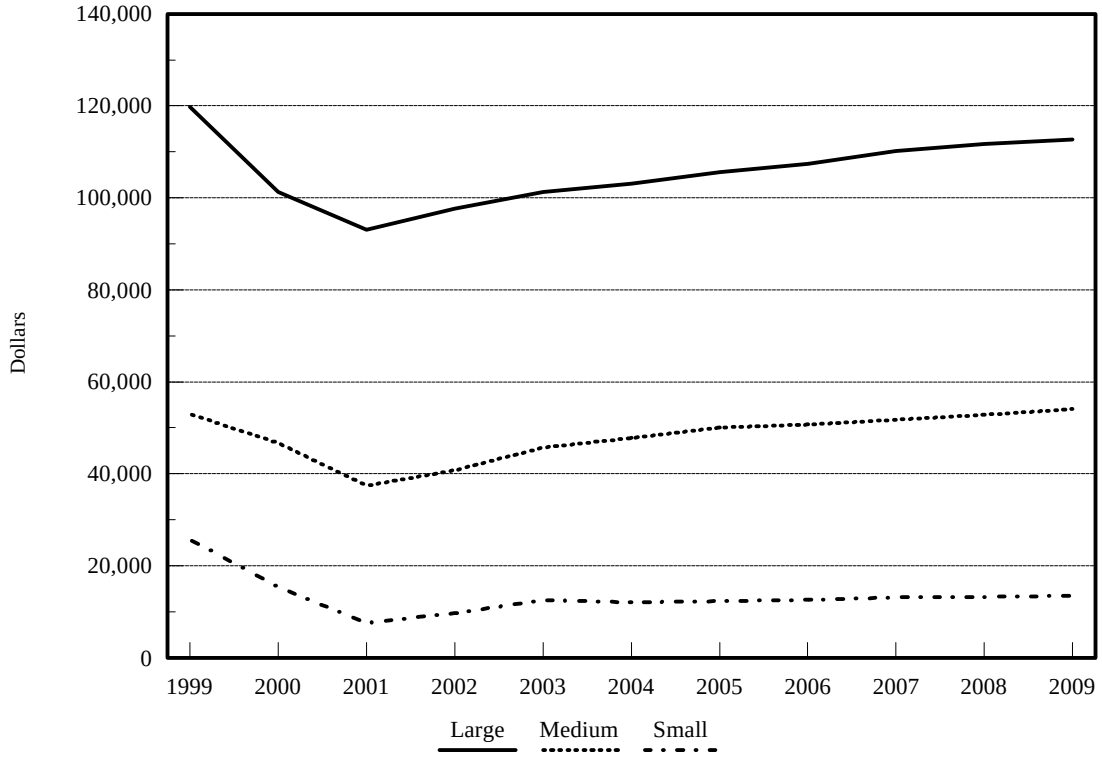


Figure 3. Net Farm Income by Size for North Dakota Representative Farms under the Base Scenario

Table 3. State Average Net Farm Income for Different Size and Profit Representative Farms under Alternative Scenarios

	Size			Profit		
	Large	Medium	Small	High	Average	Low
	----------thousand $----------					
Base scenario						
1999	120	53	26	203	67	6
2000	101	47	15	171	62	-6
2001	93	37	8	158	61	-10
2002	98	41	10	165	65	-8
2003	101	46	12	172	66	-6
2004	103	48	12	176	67	-6
2005	106	50	12	180	68	-6
2006	107	51	13	185	71	-4
2007	110	52	13	188	75	-4
2008	112	53	13	190	78	-5
2009	113	54	13	193	80	-4
2000-2009 Average	104	48	12	178	69	-6
Optimistic scenario						
1999	120	53	26	203	67	6
2000	109	49	17	170	68	-5
2001	100	40	8	167	68	-7
2002	108	45	11	177	71	-5
2003	113	52	14	184	71	-4
2004	116	53	14	185	70	-5
2005	120	56	14	189	72	-5
2006	123	58	15	195	76	-3
2007	127	60	16	199	79	-2
2008	130	61	16	201	80	-3
2009	129	61	17	204	82	-1
2000-2009 Average	118	54	14	187	74	-4
Pessimistic scenario						
1999	120	53	26	203	67	6
2000	95	42	14	157	60	-9
2001	83	33	5	151	58	-12
2002	88	36	7	160	60	-10
2003	91	42	10	166	60	-9
2004	93	42	10	167	60	-9
2005	96	45	10	171	62	-9
2006	99	46	10	176	65	-6
2007	102	48	11	180	68	-5
2008	103	49	11	183	70	-6
2009	103	49	12	183	71	-5
2000-2009 Average	95	44	10	166	63	-8

Net farm income for the high profit farm was $203 thousand in 1999 and will decrease until 2001, and then increases to $193 thousand in 2009 (Figure 4). The income in 2009 is 5% lower than that in 1999. Net farm income for the low profit farm is negative and remains negative throughout the forecast period. This clearly indicates that management efficiency plays an important role in farm operation. The low profit farm may not have financial resiliency to survive in a more market oriented environment. State average net farm income over the 2000-2009 period is $180 thousand for the high profit farm, $69 thousand for the average profit farm, and $-5 thousand for the low profit farm.

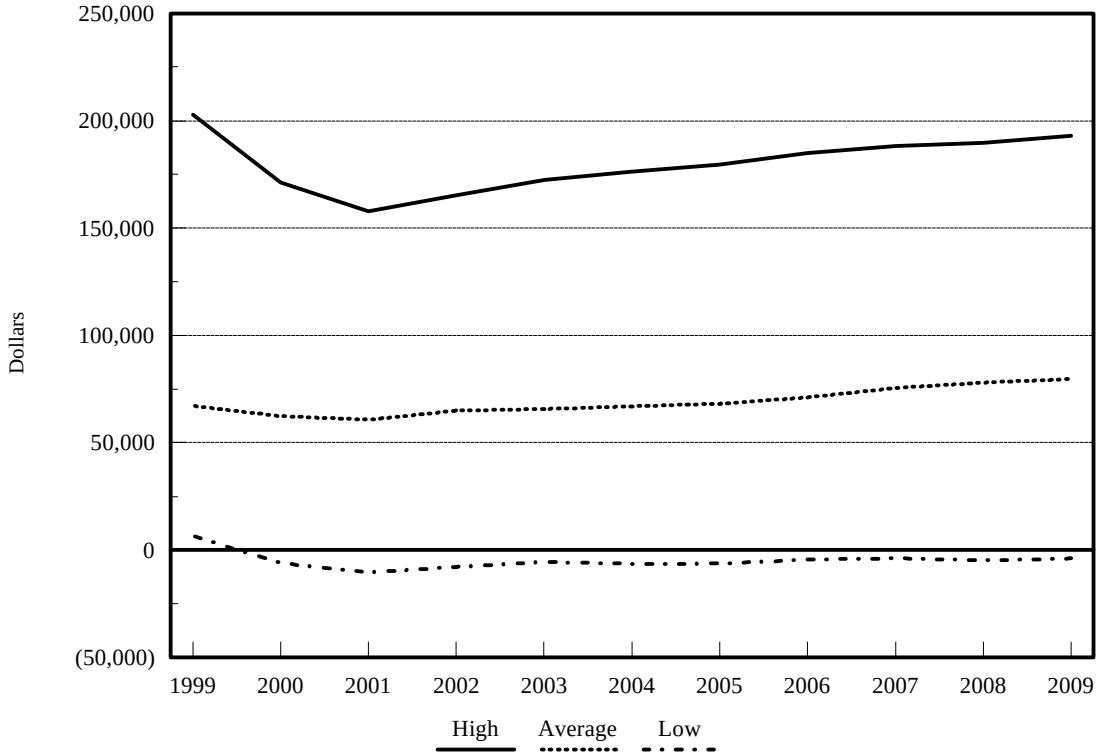


Figure 4. Net Farm Income by Profit for North Dakota Representative Farms under the Base Scenario

Net farm income increases for most farms under the optimistic scenario. Net farm income for the large size farm under the optimistic scenario increases 8% by 2009 to $129 thousand, increases 15% to $61 thousand for the medium size farm, but decreases 25% to $17 thousand for the small size farm (Figure 5).

Under the pessimistic scenario, the net farm income for the large, medium, and small size farms falls 14%, 8%, and 54%, respectively, by the year 2009. Net farm income for the high profit farm decreases 18% from 1999 to 2001 and then increases through 2009 (Figure 6). For the average profit farm, net farm income increases 22% from 1999 to 2009. The low profit farm does not have a positive net farm income under even the optimistic scenario. Under the pessimistic scenario, the net farm income for the high profit farm falls 10% to $183 thousand.

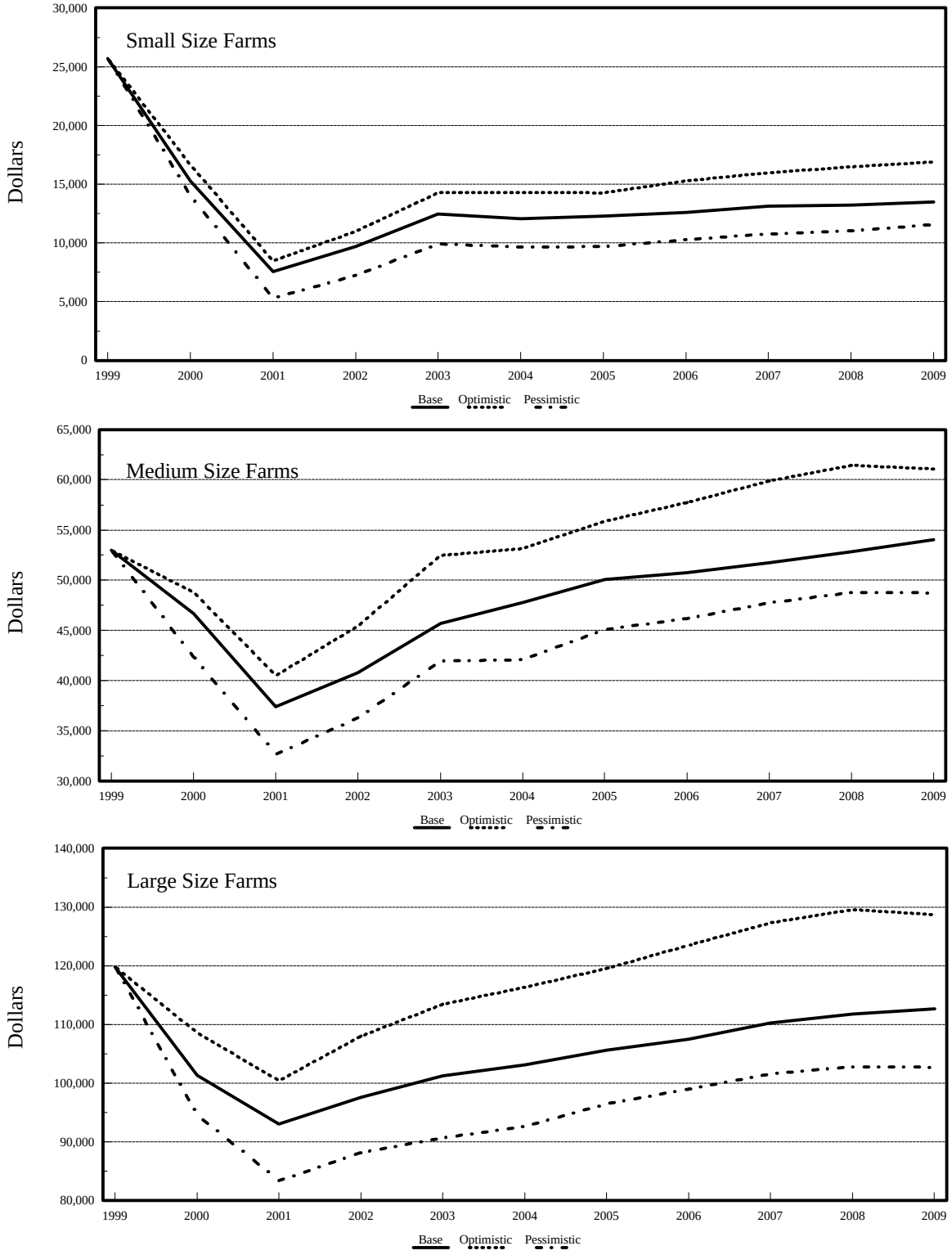


Figure 5. North Dakota Net Farm Income by Size under the Optimistic and Pessimistic Scenarios

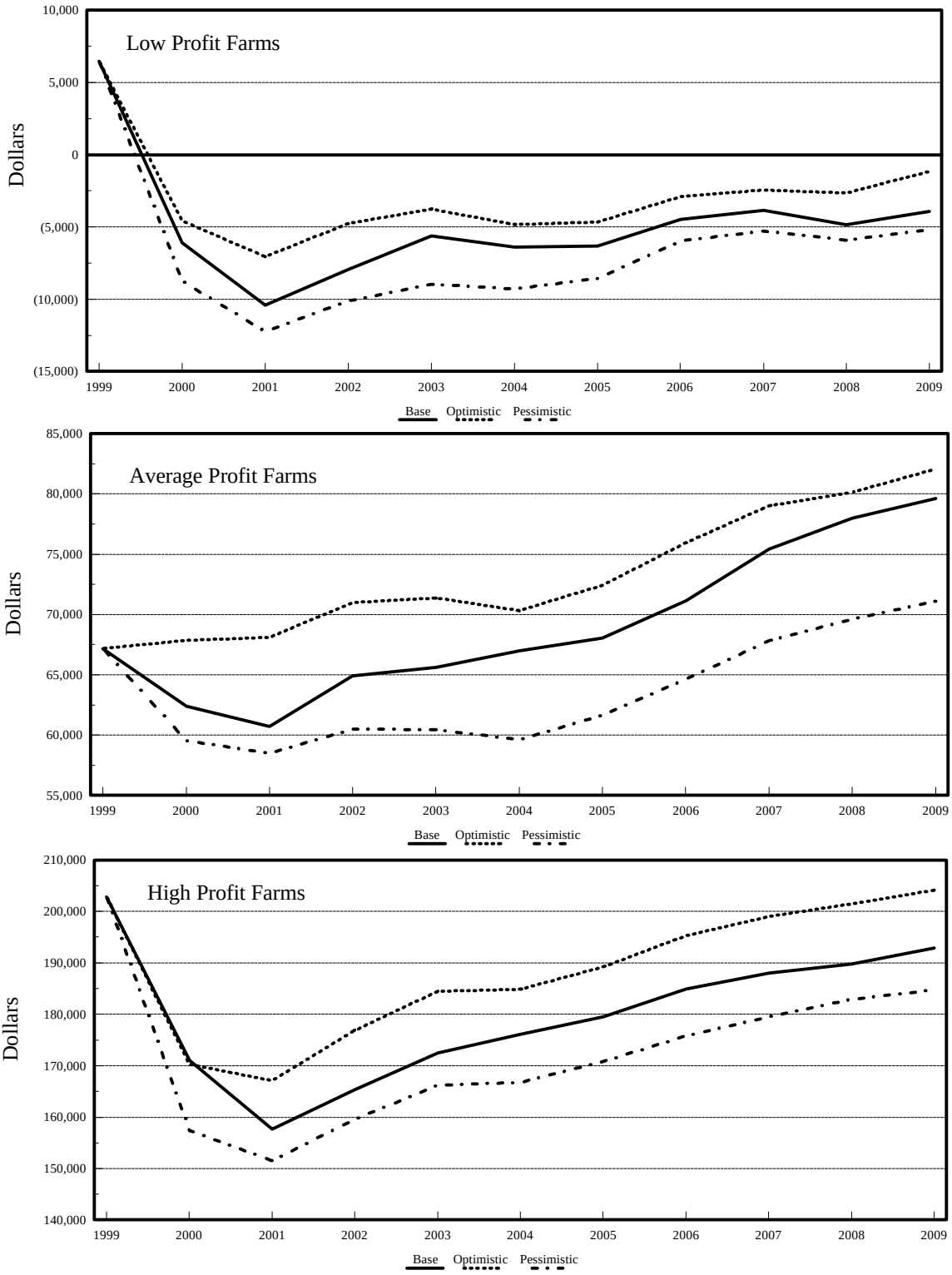


Figure 6. North Dakota Net Farm Income by Profit under the Optimistic and Pessimistic Scenarios

Debt-to-asset Ratio for North Dakota Representative Farms

Debt-to-asset ratios for all size farms remain relatively constant throughout the forecast period (Table 4). For the 1999-2000 period, the debt-to-asset ratio increases slightly for all size farms until 2001 and then declines slightly (Figure 7). The debt-to-asset ratios for the small size farm are higher than those for other farms, but do not reach a critical level that would impair access to new bank credit.

Debt-to-asset ratios for high, average, and low profit farms remain relatively constant throughout the forecast period (Figure 8). The debt-to-asset ratio for the high profit farm is 0.26 in 1999, rises to 0.28 in 2001, and then decreases to 0.25 in 2009. The debt-to-asset ratio for the average profit farm is 0.36 in 1999, rises to 0.37 in 2001, and then decreases to 0.34 in 2009. The debt-to-asset ratio for the low profit farm is 0.49 in 1999, rises to 0.53 in 2001, and then decreases to 0.49 in 2000.

Higher debt-to-asset ratios for the low profit and small size farms, when coupled with low net farm income, suggest serious problems in sustaining the farm business unless substantial off-farm income is earned. This is especially true for the low profit farm, which has negative net farm income. Without off-farm income to provide family living requirements, it is unlikely that the low profit farm can survive or is able to obtain operating credit. The farm operator may wish to investigate other investment opportunities in which higher returns can be earned or markedly restructure the farming operation to improve its profitability.

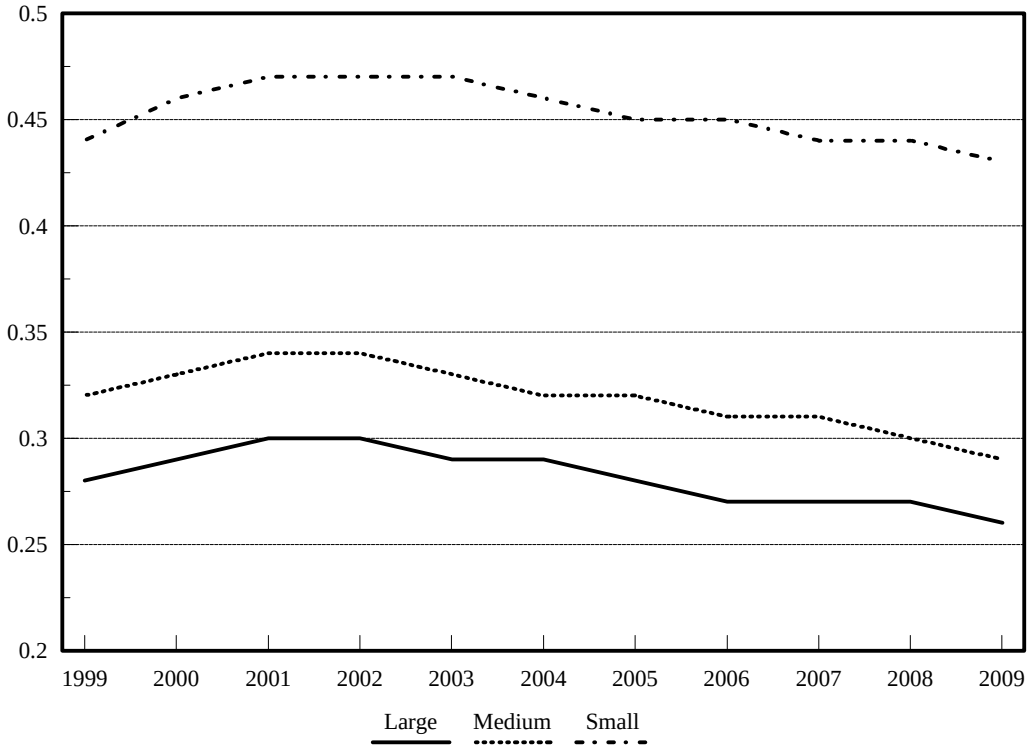


Figure 7. Debt-to-asset Ratio by Size for North Dakota Representative Farms under the Base Scenario

Table 4. State Average Debt-to-asset Ratios for Different Size and Profit Representative Farms under Alternative Scenarios

	Size			Profit		
	Large	Medium	Small	High	Average	Low
Base scenario						
1999	0.28	0.32	0.44	0.26	0.36	0.49
2000	0.29	0.33	0.46	0.27	0.37	0.53
2001	0.30	0.34	0.47	0.28	0.37	0.53
2002	0.30	0.34	0.47	0.27	0.36	0.53
2003	0.29	0.33	0.47	0.26	0.36	0.53
2004	0.29	0.32	0.46	0.26	0.36	0.52
2005	0.28	0.32	0.45	0.26	0.36	0.51
2006	0.27	0.31	0.45	0.26	0.35	0.50
2007	0.27	0.31	0.44	0.25	0.34	0.50
2008	0.27	0.30	0.44	0.25	0.34	0.49
2009	0.26	0.29	0.43	0.25	0.34	0.49
2000-2009 Average	0.28	0.32	0.45	0.26	0.36	0.51
Optimistic scenario						
1999	0.28	0.32	0.44	0.26	0.36	0.49
2000	0.29	0.33	0.45	0.26	0.36	0.51
2001	0.29	0.33	0.46	0.26	0.36	0.51
2002	0.28	0.32	0.46	0.25	0.34	0.50
2003	0.28	0.32	0.45	0.25	0.34	0.49
2004	0.27	0.30	0.44	0.25	0.33	0.47
2005	0.26	0.30	0.43	0.24	0.33	0.47
2006	0.25	0.29	0.43	0.24	0.32	0.45
2007	0.25	0.28	0.42	0.23	0.31	0.45
2008	0.24	0.27	0.41	0.23	0.30	0.44
2009	0.24	0.27	0.41	0.23	0.31	0.44
2000-2009 Average	0.26	0.30	0.44	0.25	0.33	0.47
Pessimistic Scenario						
1999	0.28	0.32	0.44	0.26	0.36	0.49
2000	0.30	0.34	0.46	0.28	0.38	0.54
2001	0.31	0.35	0.48	0.29	0.39	0.56
2002	0.31	0.35	0.49	0.28	0.39	0.56
2003	0.31	0.35	0.48	0.28	0.39	0.56
2004	0.30	0.34	0.48	0.28	0.39	0.56
2005	0.30	0.34	0.47	0.28	0.39	0.56
2006	0.29	0.33	0.47	0.28	0.38	0.55
2007	0.29	0.33	0.47	0.28	0.38	0.55
2008	0.29	0.32	0.46	0.28	0.37	0.54
2009	0.28	0.31	0.45	0.28	0.38	0.55
2000-2009 Average	0.30	0.34	0.47	0.28	0.38	0.55

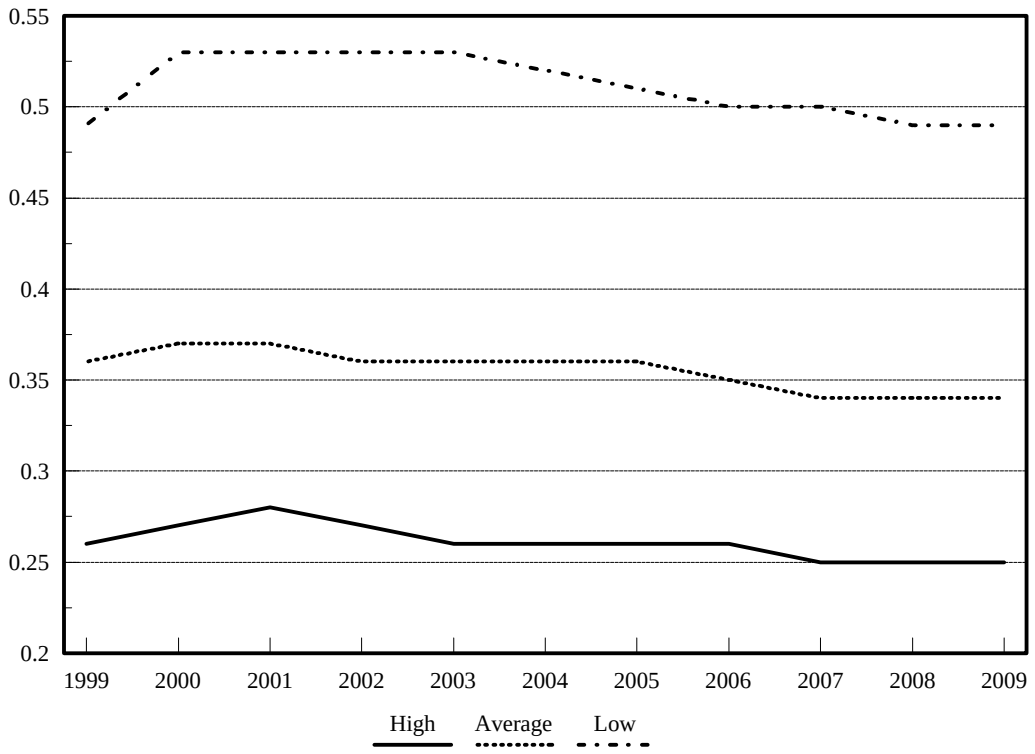


Figure 8. Debt-to-asset Ratio by Profit for North Dakota Representative Farms under the Base Scenario

Under the optimistic scenario, all debt-to-asset ratios decrease. From 1999 to 2009 the debt-to-asset ratio for the large, medium, and small size farm falls from 0.28 to 0.24, from 0.32 to 0.27, and from 0.44 to 0.41, respectively (Figure 9). Under the pessimistic scenario, the debt-to-asset ratios remain relatively constant throughout the forecast period.

Under the optimistic scenario, the debt-to-asset ratio for the high, average, and low profit farm falls from 0.26 to 0.23 (Figure 10), from 0.36 to 0.31, and from 0.49 to 0.44, respectively. Under the pessimistic scenario, the debt-to-asset ratios increase in 2001 and then remain relatively stable throughout the forecast period. However, the debt-to-asset ratios do not reach the level that imperils creditworthiness.

Land Value and Cash Rents

Table 5 presents land prices for various representative farms in North Dakota. Land values for the average profit representative farms are shown in Figure 8. Land prices differ between the regions; the highest prices are in the RRV and the lowest are in the West region (Figures 11 and 12). Land prices also change over the forecast period. They are highest in 1999 due to the lagged impact of higher net farm income in 1995 and 1996. The prices decrease gradually until 2003, and then they increased modestly until 2009.

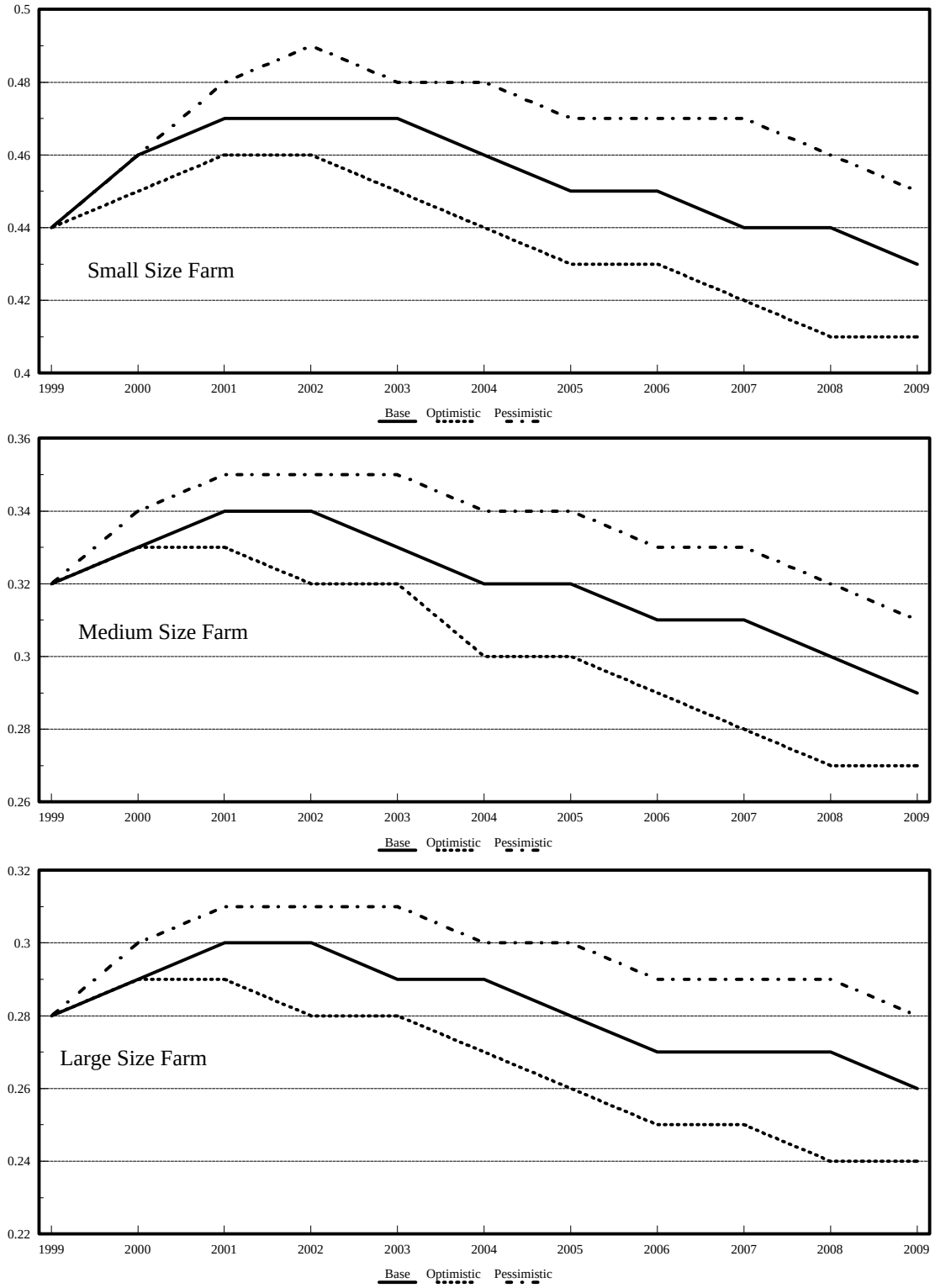


Figure 9. North Dakota Debt-to-asset Ratio by Size under the Optimistic and Pessimistic Scenarios

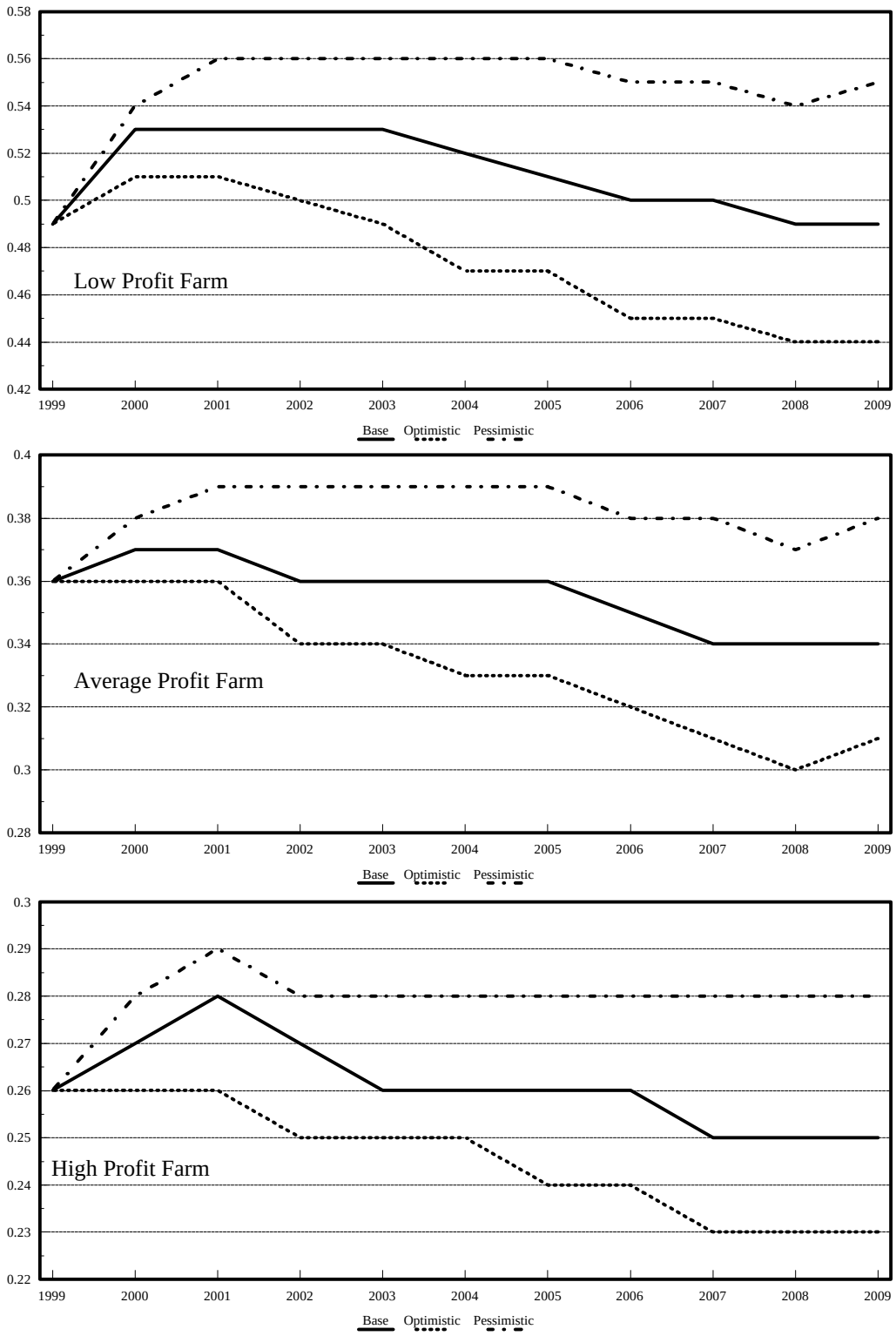


Figure 10. North Dakota Debt-to-asset Ratio by Profit under the Optimistic and Pessimistic Scenarios

Table 5. North Dakota Land Prices for Average Profit Representative Farms under Alternative Scenarios

	RRV	NC	SC	West	State
	----------$/acre----------				
Base scenario					
1999	717	385	360	279	435
2000	686	383	360	279	427
2001	667	386	341	266	415
2002	664	379	332	260	409
2003	655	369	330	258	403
2004	658	371	335	264	407
2005	677	382	360	275	424
2006	697	401	388	284	442
2007	700	417	403	286	452
2008	708	425	417	291	460
2009	717	433	425	298	468
2000-2009 Average	683	395	369	276	431
Optimistic scenario					
1999	717	385	360	279	435
2000	686	383	360	279	427
2001	688	389	367	287	420
2002	694	392	367	299	430
2003	715	393	406	325	460
2004	723	413	439	347	482
2005	751	427	465	363	502
2006	756	449	480	374	515
2007	797	474	508	385	541
2008	826	497	525	400	562
2009	836	507	547	410	575
2000-2009 Average	747	432	447	347	491
Pessimistic scenario					
1999	717	385	360	279	435
2000	686	383	360	279	427
2001	655	374	329	255	389
2002	629	362	293	236	371
2003	619	349	299	220	372
2004	596	353	299	215	368
2005	596	364	301	214	369
2006	580	381	298	215	368
2007	598	390	307	212	379
2008	608	397	309	215	387
2009	607	403	321	218	392
2000-2009 Average	617	376	312	228	382

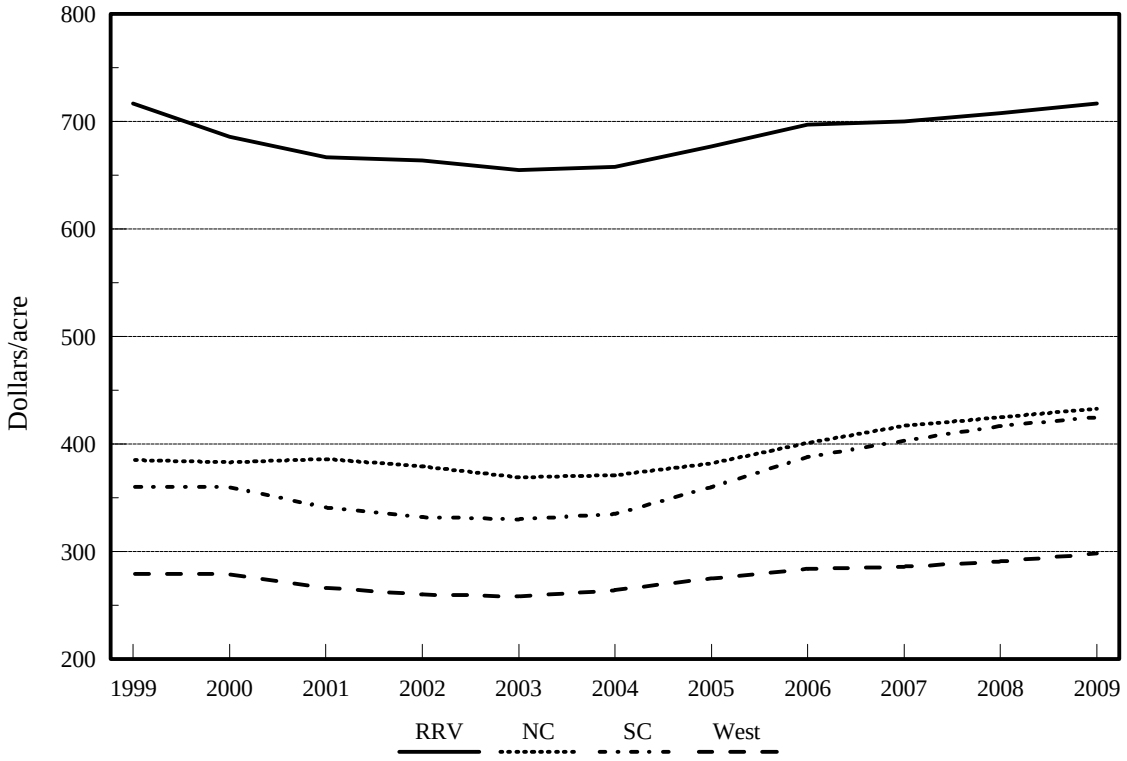


Figure 11. Average Prices of Cropland under the Base Scenario

In all regions under the optimistic scenario, land values rise substantially. North Dakota average land value increases from $435 in 1999 to $575 in 2009. Under the pessimistic scenario, average land value decreases from $435 in 1999 to $392 in 2009. The model assumes that the rate of return on land that the farmer is willing to accept is constant. Therefore, land values and cash rents increase or decrease more than in actual practice. When return to land increases (optimistic scenario), farmers generally increase their rate of return on land and, likewise, when return to land decreases (pessimistic scenario), farmers generally decrease their rate of return on land.

Cash rents for the average profit farms are highest in 1999, they decrease until 2003, and then increase modestly over the remaining period (Table 6). Cash rents also differ between regions; the highest are in the RRV and the lowest are in the West (Figures 13 and 14). The RRV is the only region where cash rents are projected to be lower in 2009 than in 1999.

For the average profit farm under the optimistic scenario, the state average cash rents increase from $37 in 1999 to $45 in 2009, while the state average cash rents decrease from $37 in 1999 to $31 in 2009 under the pessimistic scenario.

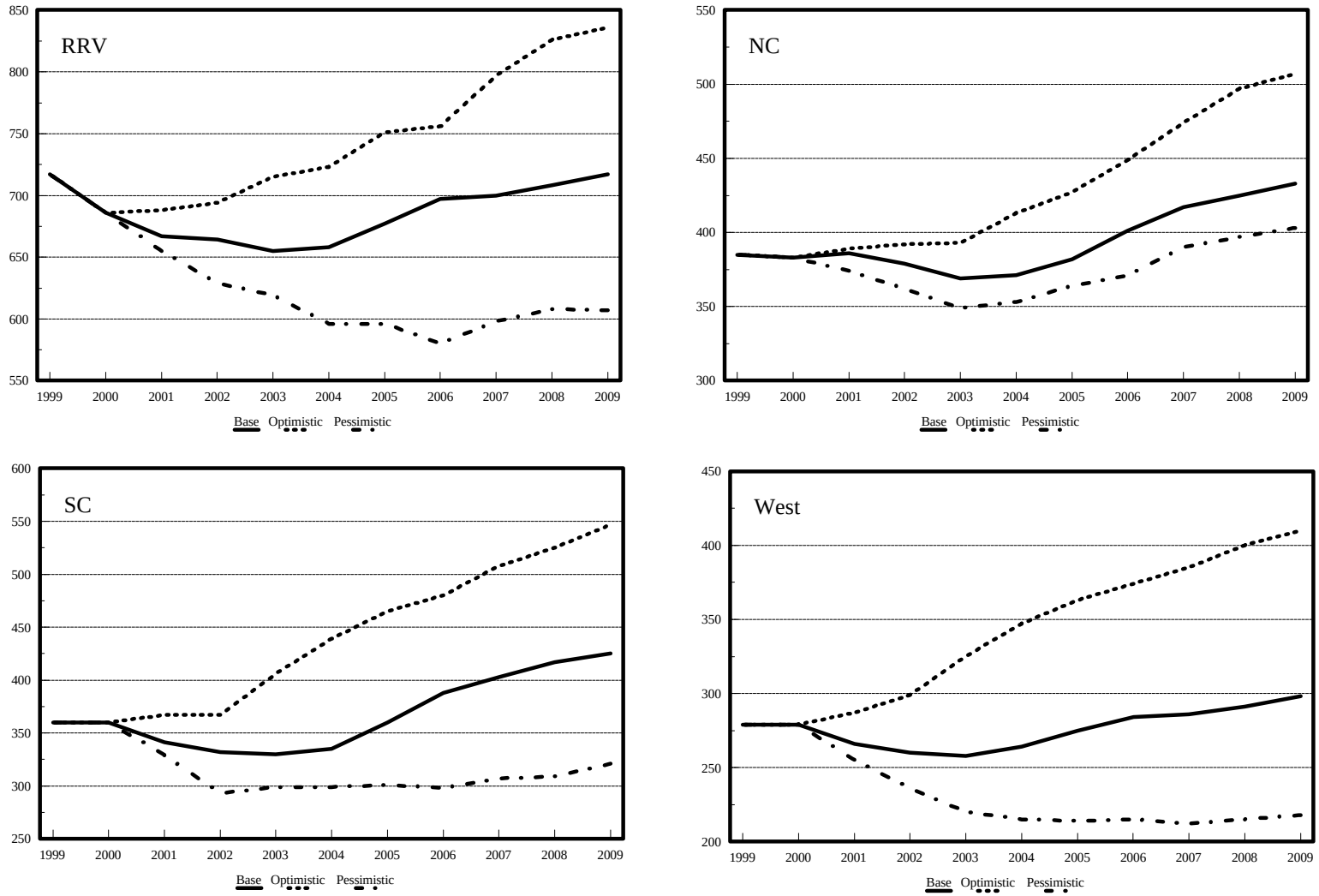


Figure 12. North Dakota Cropland Prices under the Optimistic and Pessimistic Scenarios

Table 6. Cash Rent for Average Profit Representative Farms under Alternative Scenarios

	RRV	NC	SC	West	State
	----------$/acre----------				
Base scenario					
1999	55	32	31	29	37
2000	53	33	31	29	37
2001	50	32	31	28	35
2002	49	32	31	28	35
2003	47	31	30	27	34
2004	48	32	30	28	34
2005	48	32	31	29	35
2006	49	32	32	29	36
2007	49	33	33	30	36
2008	50	34	34	30	37
2009	51	35	35	31	38
2000-2009 Average	49	33	32	29	36
Optimistic scenario					
1999	55	32	31	29	37
2000	53	33	31	29	37
2001	50	33	31	28	36
2002	49	33	31	30	36
2003	48	33	32	31	36
2004	49	33	34	33	38
2005	50	34	36	35	39
2006	51	35	39	37	41
2007	52	36	41	39	42
2008	55	37	43	40	44
2009	57	38	45	41	45
2000-2009 Average	52	34	36	34	39
Pessimistic scenario					
1999	55	32	31	29	37
2000	53	33	31	29	37
2001	50	32	31	28	36
2002	48	31	30	27	34
2003	46	30	27	25	32
2004	45	31	26	24	31
2005	43	30	26	23	31
2006	42	31	26	23	30
2007	42	31	26	23	30
2008	42	32	26	22	31
2009	42	32	27	22	31
2000-2009 Average	45	31	28	25	31

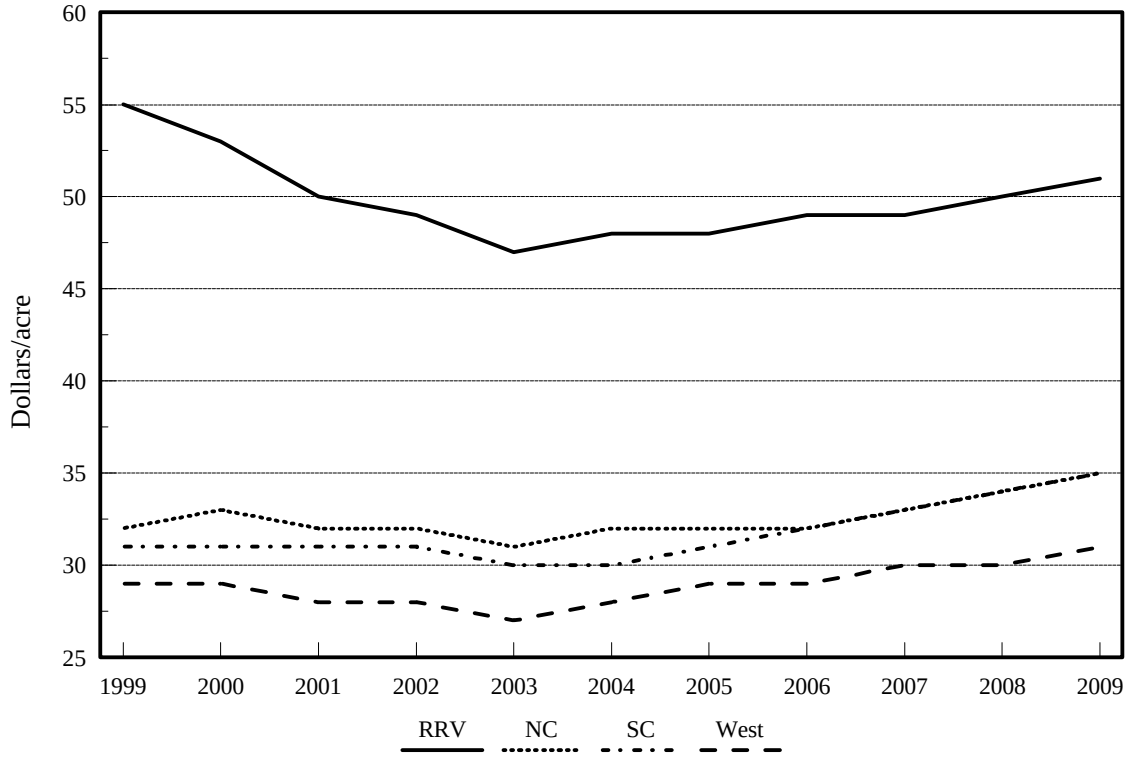


Figure 13. Cash Rent Paid for Cropland under the Base Scenario

CONCLUDING REMARKS

The federal government no longer manages supplies of program crops through acreage bases and planting controls. Farm subsidy levels are fixed at a decreasing level through a 7-year contract, a sharp change from past programs in which government spending was counter cyclical to market price levels for program crops and acreage set-asides. The largest annual decreases in subsidy levels come in the last 2 years of the 7-year contract. In the final year of the contract, the USDA is providing about $4 billion in annual farm subsidies and LDPs. Emergency payments have been made in 1998 and 1999 to offset low commodity prices and low yields due to weather and disease. Emergency payments of about $800 million will be made for 2000.

Net farm income in 2009 will be lower than 1999, except for the medium size and average profit farms. Net farm income for all representative farms is projected to fall until 2001, and then slowly recover, mainly due to strong import demand for agricultural crops from developing countries. Crop production in the United States and around the world is assumed to be normal with annual trend line increases.

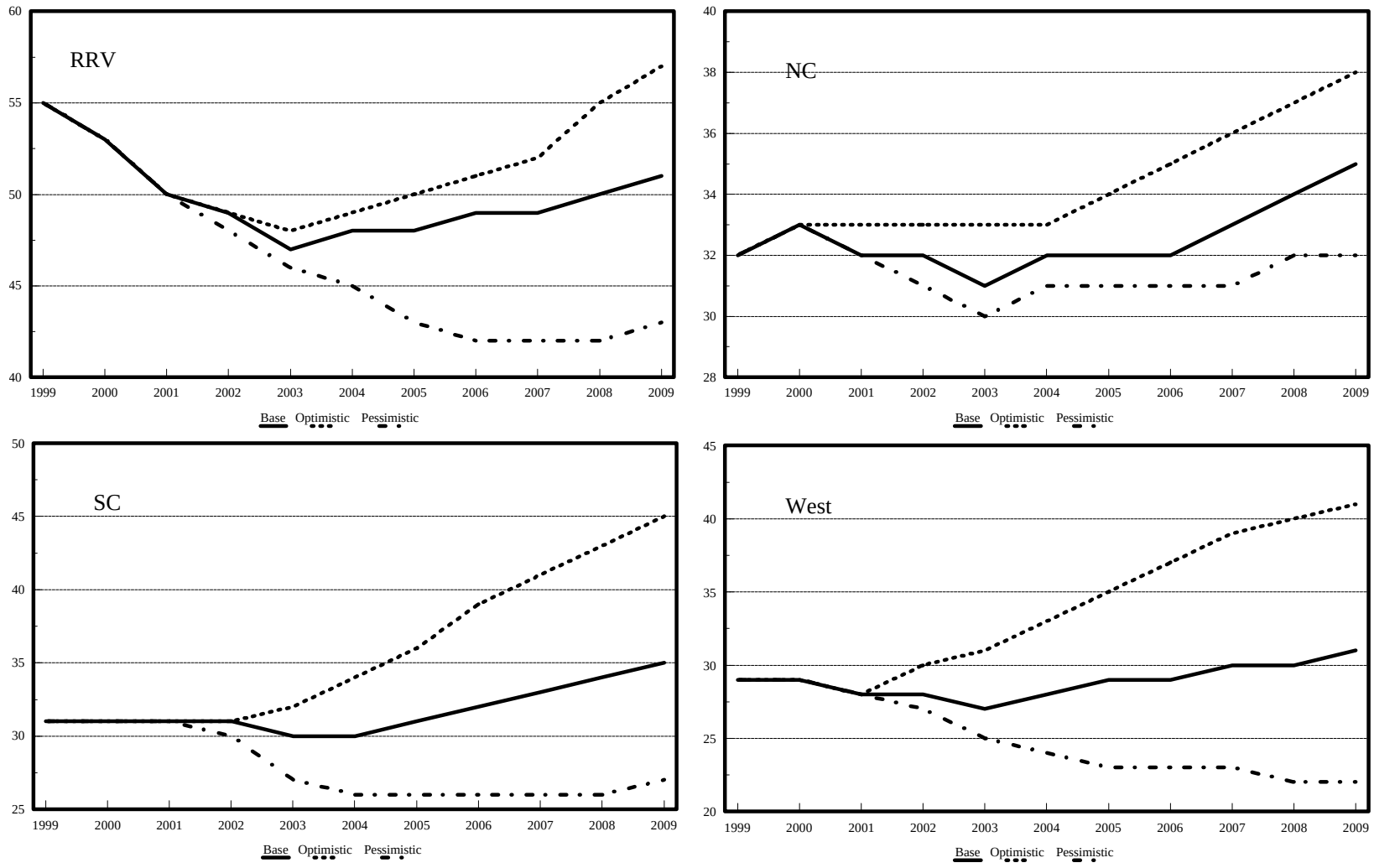


Figure 14. North Dakota Cash Rents under the Optimistic and Pessimistic Scenarios

The optimistic and pessimistic scenarios present totally different pictures for North Dakota agriculture. All farms perform well under the optimistic scenario except for the low profit and small size farms, while only the high profit and large size farms perform well under the pessimistic scenario.

Under the base scenario, land prices are predicted to fall through the middle of the forecast period and then increase modestly. Under the optimistic scenario, land prices rise substantially, but fall substantially under the pessimistic scenario.

Cash rent levels follow a pattern similar to land prices. Under the optimistic scenario, cash rents are predicted to rise but they are predicted to fall under the pessimistic scenario.

Debt-to-asset ratios are predicted to remain relatively constant throughout the forecast period. The debt-to-asset ratios for the small size and low profit farms, when coupled with their low net farm income, suggest problems in sustaining the farm business unless substantial off farm income is earned.

It is important to recognize the degree to which North Dakota farmers' fortunes have been integrated into a world marketplace. North Dakota farmers compete with producers of the same commodities in other parts of the world, such as Brazil, the EU, Argentina, and Eastern Europe. The optimistic and the pessimistic scenarios show how sensitive North Dakota agriculture is to small changes in commodity prices. Under the pessimistic scenario, all farms in North Dakota, except for high profit and large farms, may face significant financial problems. Under the given macroeconomic conditions in the rest of the world, the optimistic scenario may prevail for the near future.

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