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2003 North Dakota Agricultural Outlook: Representative Farms, 2003-2012

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Abstract

Net farm income for all representative farms in 2012 will be lower than in 2003. Low profit farms, which comprise of 25% of the farms in the study, may not have financial resiliency to survive. Costs are projected to increase faster than yields. The new farm bill removes much of the price risk that producers face while placing it on the federal government. Cropland prices and cash rental rates are projected to increase slightly in all regions. Debt-to-asset ratios for most farms will increase slightly 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.

Keywords: net farm income, debt-to-asset ratios, cropland prices, land rental rates, farm operating expenses, capitalization rate

Highlights

Net farm income is projected to be higher in 2003 than in 2002, because lower yields across the state in 2002 are expected to return to trend line levels in 2003. The higher prices received in 2002 were partially offset by lower government payments to producers. Currently, the most important component of net farm income seems to be production volume. The government provides adequate price support, but production support through crop insurance is substantially less adequate.

Net farm income for the large-size farm is predicted to decrease from $148 to $111 thousand for the 2003-2012 period, and the net farm income for the medium-size farm will decrease from $84 to $64 thousand. Net farm income for the small-size farm will decrease from $42 to $31 thousand for the same period. The level of net farm income will not be maintained because production expenses are rising faster than yields. The income levels during the latter forecast period are similar to the 2000-02 net farm income averages.

Net farm income also differs among farms in the different profit categories and decreases for the period. Net farm income is predicted to decrease during the 2003-2012 period from $167 to $128 thousand for the high-profit farm, and from $74 to $44 thousand for the average-profit farm, and will decrease from $33 to $12 thousand for the low-profit farm.

Under the current farm bill, price risk is transferred from the producer to the federal government. The transfer of price risk to the federal government is not a new measure. Previous farm bills had target prices and marketing loans. If prices are 10% lower than forecasted prices, net farm income will fall about 3.6%; however, government spending will increase about 26.5%. If prices are 10% higher than forecasted prices, net farm income will increase about 4.3% and government spending will decrease 25.2%. The counter-cyclical features of the farm bill insulate producers from both price increases and decreases.

Debt-to-asset ratios for all representative farms are predicted to increase slightly throughout the forecast period. Debt-to-asset ratios are projected to increase to 34% for the large-size, 37% for the medium-size, and 50% for the small-size representative farms in 2012. The ratios are also projected to increase to 41%, 47%, and 61% for high, average, and low-profit representative farms in 2012, respectively.

For the average-profit representative farm, state average cropland prices will increase 4.7% from $483 per acre in 2003 to $506 per acre in 2012. Cash rents will increase 4.4% from $40 per acre in 2003 to $41 per acre in 2012.

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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 recent farm bills and the Uruguay Round Agreement (URA) have affected the region's economy.

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 and are forecasted over the 2003 to 2012 period under the Farm Security and Rural Investment Act (FSRIA) of 2002, the URA, and the Canada - United States Free Trade Agreement (CUSTA). Secondary objectives are to evaluate the reaction of cropland prices and cash rental rates to the farm income estimates over the same time horizon and to estimate changes in net farm income under various commodity price scenarios.

The North Dakota agricultural outlook for the 2003-2012 period is based on the baseline results produced by the Food and Agricultural Policy Research Institute (FAPRI) global model and the North Dakota Global Wheat Policy Simulation Model.

U.S. agriculture has been influenced by major changes in agricultural and trade policies. Trade agreements, such as CUSTA, the North American Free Trade Agreement (NAFTA), and the URA, have liberalized agricultural trade and will continue to do so for the next decade.

The new farm bill, the Farm Security and Rural Investment Act of 2002, became effective last year. It increases government spending by $73 billion over the life of the bill. Figure 1 shows the FAPRI forecasts for national government spending from 2000 through 2012. Projected government spending will be lower than in 2000 and 2001. CCC payments were $32.3 billion in 2000 and $22.1 billion in 2001. Due to higher prices in 2002, payments fell to $15.7 billion and are projected to be $14.7 billion for 2003. Payments are expected to rise to $17.9 billion by 2005 before falling to $12.6 billion in 2012. Mandatory spending includes all conservation and crop insurance payments.

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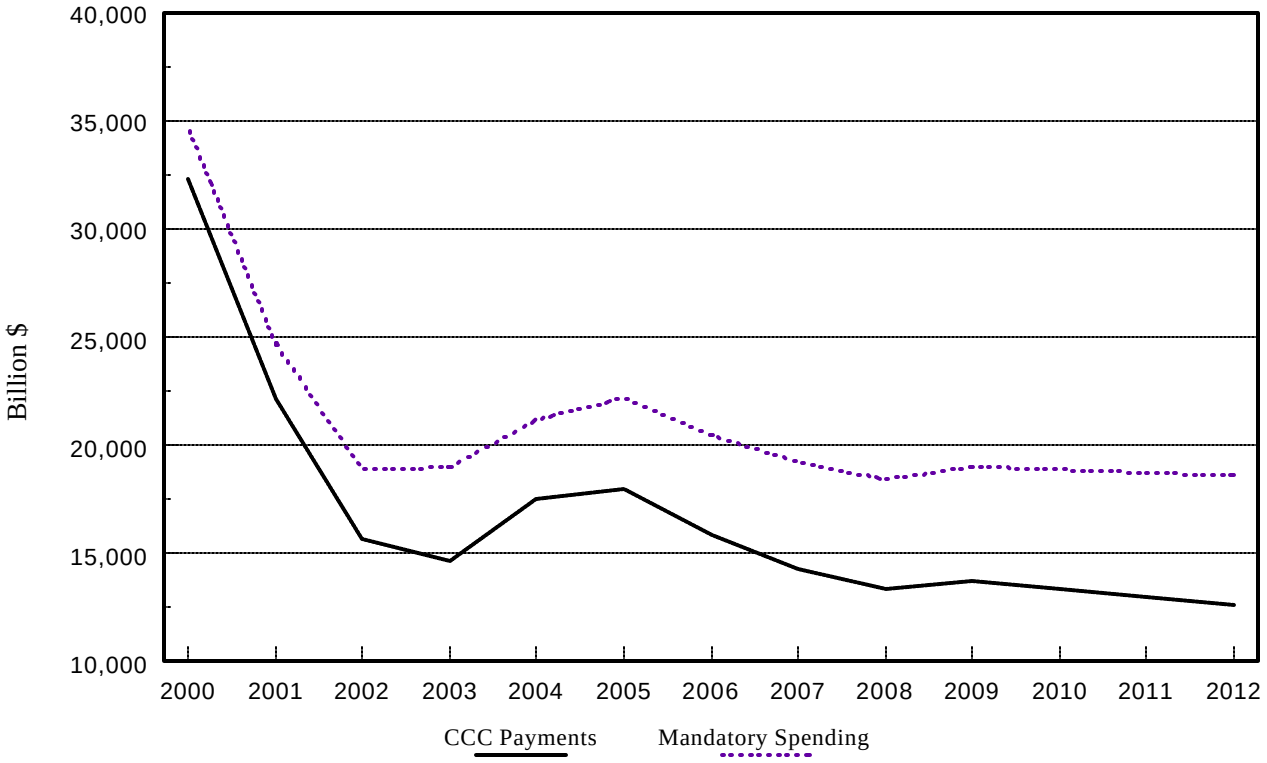


Figure 1. FAPRI's Forecast of Government Agricultural Spending

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 dry edible beans, sugarbeets, and potatoes. The agricultural sector contributes the second largest share to the state economy following federal transfers. The average farm size in North Dakota is 1,300 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 producing five major crops: wheat, barley, corn, soybeans, and sunflowers. The model is linked to the FAPRI and North Dakota econometric simulation models, and it uses the prices of the crops generated from these models (Figure 2). The base 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. In addition, macro policies and assumptions, trade policies, and agricultural policies are incorporated into the model directly or indirectly by the assumptions made by the FAPRI in their price series.

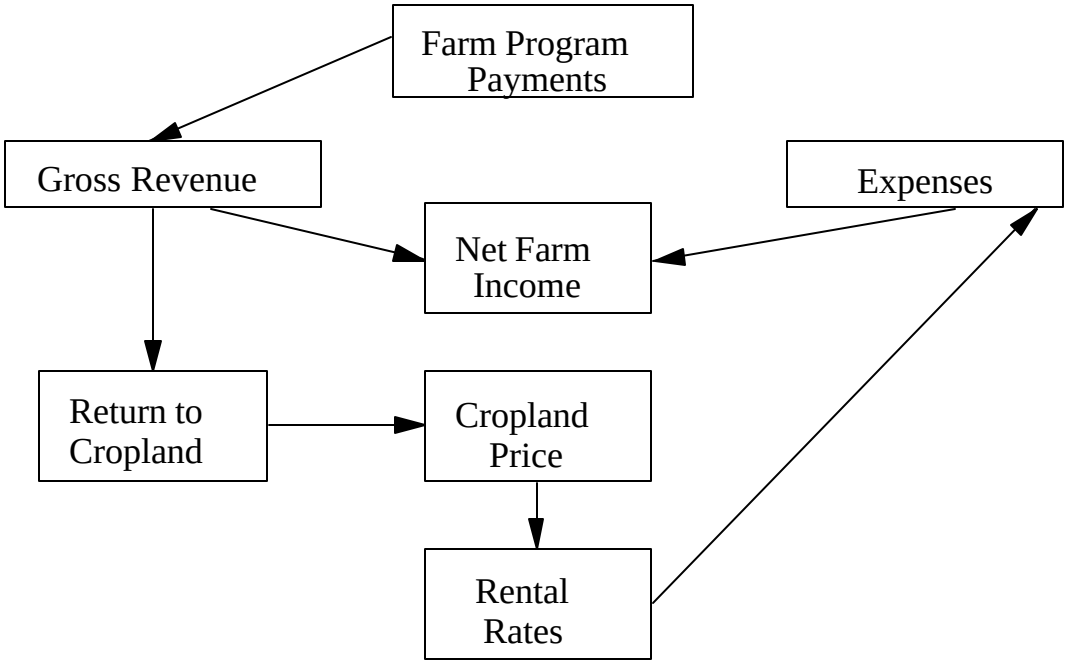


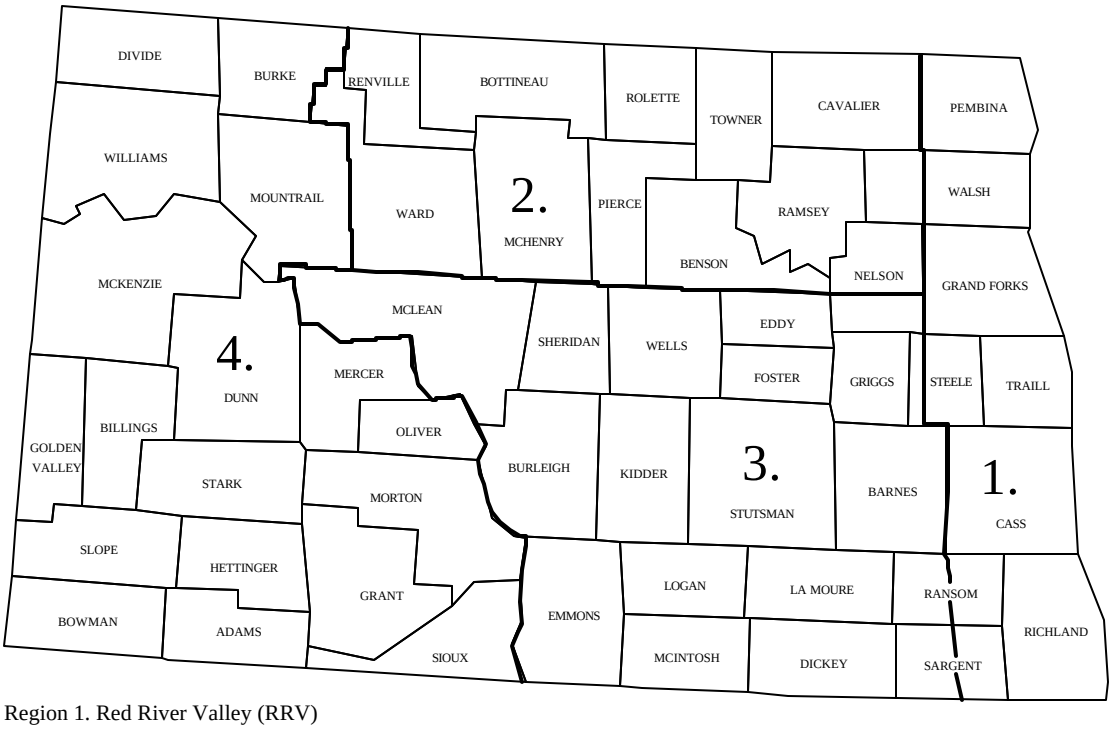
Figure 2. Structure of the North Dakota Representative Farm Model

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 the four regions of North Dakota. These regions are the Red River Valley (RRV), North Central (NC), South Central (SC), and Western (West) (Figure 3). 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.

The representative farms average 1,697 acres of cropland and 414 acres of pasture. The farms in the study are about 70% larger than the state average reported by the North Dakota Agricultural Statistics Service. A reason for this difference is that the state average 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.



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

Figure 3. North Dakota Farm and Ranch Business Management Regions

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 in each production region. Average farm sizes are 2,740 cropland acres for the high-profit farm, 1,697 cropland acres for the average-profit farms, and 1,186 cropland acres for the low-profit farms.

The large representative 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 3,191 cropland acres for the large-size farms, 1,497 cropland acres for the medium-size farms, and 547 cropland acres for the small-size farms (Table 1).

Table 1. Characteristics of Representative North Dakota Farms, 2002

	Size			Profit		
	Large	Medium	Small	High	Average	Low
Number of Farms	144	298	144	120	596	120
Total Cropland (ac)	3,191	1,497	547	2,740	1,697	1,186
Spring Wheat (ac)	899	364	103	614	475	381
Durum Wheat (ac)	195	52	29	301	152	86
Barley	247	95	31	308	198	140
(ac)	114	67	32	244	134	92
Corn	218	73	14	347	211	135
(ac)	385	205	86	262	161	115
Sunflower (ac)						
Soybeans						
(ac)						

Summary of the 2002 Farm Bill

The legislation provides a continuation of planting flexibility, fixed payments, and commodity marketing loan programs. In addition, FSRIA includes a counter-cyclical feature that is tied to market prices but not to current production. This feature provides additional support during years of low prices instead of relying on the emergency federal funding which occurred during 1998 through 2001.

The bill allows producers to retain their current base acres and add oilseed acres up to maximum crop acres, or it allows them to update base acres using the 1998-2001 acreage planted and prevented planted acres for all covered commodities. Payment yields may be partially updated for the counter-cyclical payments only if a producer decides to update base acres. The updated yield is the higher of the current Agricultural Market Transition Act (AMTA) yield plus 70% of the difference between the current AMTA yield and the 1998-2001 acreage yields on planted acreage or 93.5% of the 1998-2001 acreage yields on planted acreage. The bill provides for a “plug” of 75% of the county average yield for years in which the actual farm yield is less than the county average yield.

Table 2 shows the national loan rates, direct payments, and target prices for the major commodities grown in North Dakota. The national loan rate for corn increased from $1.89 to $1.98 under the FSRIA. National wheat loan rates increased $0.22, from $2.58 to $2.80. Loan rates for barley and minor oilseed were also increased. The national loan rate for soybeans was lowered from $5.26 to $5.00. Loan rates for all crops except soybeans are slightly less during the last four years, 2004-07, than the first two years, 2002-03, of the 2002 farm bill. Conversely, target prices are slightly higher, except for soybeans, during the last four years of the farm bill.

Table 2. National Loan Rates, Direct Payments, and Target Prices for Covered Commodities

	Loan Rate		Direct Payment	Target Price	
	2002-2003	2004-2007	2002-2007	2002-2003	2004-2007
	----------$----------				
Corn (bu)	1.98	1.95	0.28	2.60	2.63
Barley (bu)	1.88	1.85	0.24	2.21	2.24
Wheat (bu)	2.80	2.75	0.52	3.86	3.92
Soybeans (bu)	5.00	5.00	0.44	5.80	5.80
Minor Oilseeds (cwt)	9.60	9.30	0.80	9.80	10.10

Direct payments for each crop are calculated as base acres times 0.85 times payment yields times the direct payment rate for each crop. Direct payment rates increased from $0.46 per bushel for wheat under the last year of the FAIR Act to $0.52 per bushel under FSRIA. The direct payment rate for corn increased from $0.26 to $0.28. The direct payment rate for barley increased from $0.22 to $0.24. Oilseeds are included in the direct payment program for the first time. Oilseed base acres became eligible for direct payment in the 2002 farm bill. The payment levels are $0.44 per bushel for soybeans and $0.80 per cwt for minor oilseeds. One-half of the direct payments can be received December 1 prior to the year that the crop is harvested, with the balance paid in October of the harvest year.

Counter-cyclical payment rates are calculated by subtracting direct payment rates and the higher of the loan rate or the national average marketing year price from the target price. The payment rate is multiplied by the payment crop yield times base acres times 0.85. For example, in 2002, if wheat price is equal to the loan rate, the counter-cyclical payment rate would be $3.86 -0.52 - $2.80 = $0.54. The payment rate would be multiplied by the payment crop yield times base acres times 0.85. A producer would receive 35% of the counter cyclical payments in October of the harvest year, 35% in February of the following year, and the balance after the end of the 12-month marketing year for the specific crop.

Total payment limits increased 57% from the FAIR Act because of the addition of the counter-cyclical payment with a limit of $65,000. Limits for direct payments remain at $40,000 and limits for loan deficiency payments and marketing loan gains remain at $75,000. The current rules on spouses, 3-entities, actively engaged requirements, and generic commodity certificates, which allow unlimited benefits from the marketing loan program, remain the same. Total dollar limitation is set at $180,000 per entity or $360,000 per married couple where each spouse is a farming entity.

Conservation spending increased to $17.1 billion under the new farm bill. Conservation Reserve Program acres increased from 36.4 million acres to 39.2 million acres. Wetland Reserve Program acres increased to 2.275 million acres. A new program to enroll up to 2 million acres of virgin and improved pastureland was established. The Grasslands Reserve Program would provide payments for 10, 15, or 20 year rental agreements or 30 year agreements or easements for the protection of grasslands. The Environmental Quality Incentives Program was increased and priority areas were eliminated. The

Conservation Security Program, a new national incentive payment program for maintaining and increasing farm and ranch stewardship practices, was legislated.

Programs directed toward increasing trade were enlarged with a total of $1.144 billion budgeted for trade programs.

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 them.

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, and hired labor; expenses also include 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

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

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 based on national price projection by FAPRI, adjusted to North Dakota. The adjustments 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 2001 were used to estimate price equations. The price equations were used to estimate cash prices received by North Dakota farmers for the 2003-2012 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 the North Dakota Agricultural Statistics Service from 1974 to 2001. 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, 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:

$$R_g = \frac{M_g}{PL_g} \tag{2}$$

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

$$PL_{gT} = \frac{1}{R_{gt-T-n}} \sum^{T} W_t M_{tg} + T_r \tag{3}$$

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,
T_r = Trend.

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.

Cash Rent. 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

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

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 the FAPRI and ND Global Wheat Policy simulation models. 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 Nerlove's partial adjustment hypothesis as follows:

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

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 2001. 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 are shown in Table 3.

Table 3. North Dakota Baseline Price Estimates from Projected FAPRI Baseline

	Spring Wheat	Durum Wheat	Malting Barley	Feed Barley	Sunflower	Soybeans	Corn	Canola
	----------$/bu----------				-$/cwt-	-------$/bu-------		-$/cwt-
2002	3.61	3.78	2.25	1.93	12.33	4.78	2.14	8.96
2003	2.97	2.93	1.98	1.56	8.88	4.36	1.78	8.20
2004	3.00	2.98	1.92	1.52	8.99	4.36	1.78	8.20
2005	3.03	3.02	1.97	1.55	9.36	4.51	1.82	8.47
2006	3.05	3.05	2.00	1.58	9.57	4.61	1.86	8.65
2007	3.12	3.15	2.00	1.58	9.36	4.64	1.87	8.72
2008	3.13	3.17	2.02	1.59	9.05	4.63	1.90	8.70
2009	3.17	3.22	2.02	1.59	8.70	4.61	1.90	8.65
2010	3.22	3.30	2.03	1.60	8.75	4.58	1.92	8.60
2011	3.26	3.36	2.04	1.61	8.81	4.56	1.92	8.57
2012	3.30	3.41	2.05	1.61	8.88	4.54	1.93	8.53

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:

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

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 1974 to 2001. The estimated equations are used to predict crop yields in each region. Figure 4 shows the estimated spring and durum wheat yields. The yields show a slight upward trend throughout the forecast period. Figure 5 shows the estimated yields for corn and soybeans. Corn yields are expected to increase slightly over the forecast period, while soybean yields are expected to increase at a faster rate.

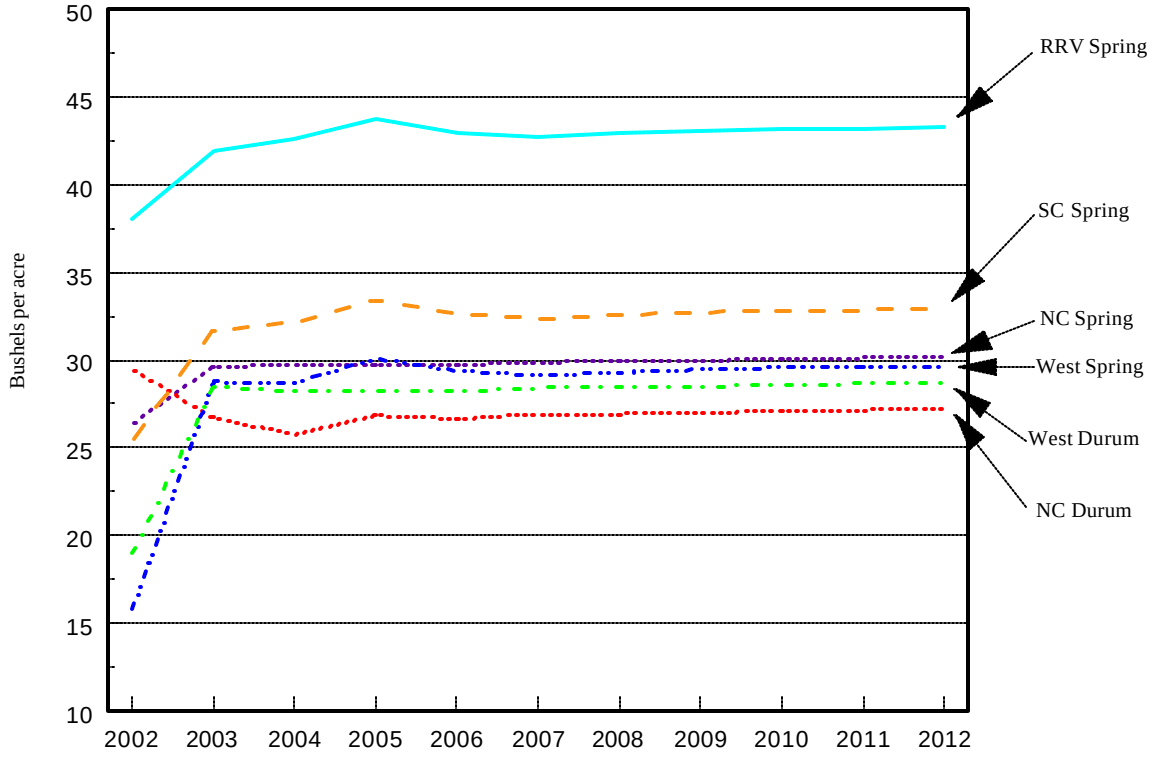


Figure 4. North Dakota Estimated Wheat Yields used in the Representative Farm Model

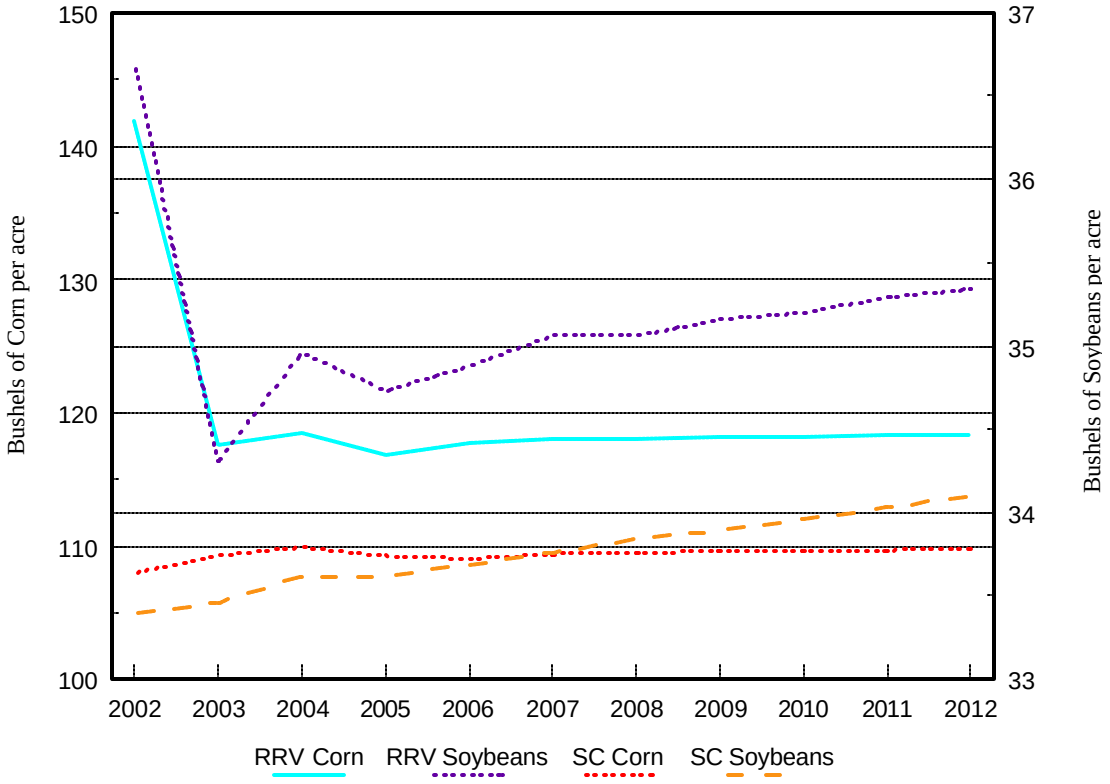


Figure 5. North Dakota Estimated Row-crop Yields used in the Representative Farm Model

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:

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

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.

The equations are estimated using time series data from 1976 to 2001. 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:

$$S_{jit} = A_{jit} / \sum_{j=1}^{t} A_{jit} \quad (8)$$

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, 2003-2012

The North Dakota Representative Farm Model was used to estimate net farm income, debt-to-asset ratios, land prices, and rental rates under the 2002 FSRIA for 2003-2012.

Additional assumptions used in this study are:

1. Net farm income from livestock operation and production of other crops, including potatoes 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.

Net Income for North Dakota Representative Farms

Table 4 presents net farm income for farms by size and profitability under the FSRIA. 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 increase from $116 thousand for the 2000-02 average to $148 thousand in 2003 (Figure 6) and then fall slowly to $111 thousand by 2012. The net income in 2012 will be 4% lower than that the three year average. Net farm income for the medium-size farm averaged $61 thousand for 2000 to 2002, increasing to $84 thousand in 2003 and then decreasing to $64 thousand in 2012. Net farm income for the small-size farm averaged $30 thousand for 2000 to 2002 and will increase to $42 thousand in 2003 before decreasing to $31 thousand in 2012. State average net farm income over the 10-year, 2003-2012 period is $128 thousand for the large-size farm, $73 thousand for the medium-size farm, and $36 thousand for the small-size farm. This result implies that most farms in North Dakota will have enough net income to survive under the new farm bill and the current international market conditions.

Table 4. State Average Net Farm Income for Different Size and Profit Representative Farms

	Size			Profit		
	Large	Medium	Small	High	Average	Low
	dollars					
2000-02 avg	116,488	61,270	30,468	147,566	55,309	7,547
2003	147,706	83,916	42,036	167,025	74,298	32,718
2004	143,727	82,786	41,066	170,194	75,509	33,237
2005	136,581	77,517	38,390	168,865	73,884	31,306
2006	130,040	74,614	37,149	160,558	67,312	27,367
2007	127,669	73,005	36,058	153,374	64,543	25,469
2008	124,748	71,707	35,186	150,092	61,700	23,553
2009	121,425	70,008	34,196	145,442	58,568	21,958
2010	118,080	68,278	33,165	140,885	53,882	21,332
2011	115,301	66,761	32,194	133,636	47 ,767	15,579
2012	110,634	64,407	30,737	128,346	43,983	12,109

The decreases in net farm income from 2003 to 2012 are mainly due to the nature of the counter-cyclical payments. Counter-cyclical payments are de-coupled from production; however, any price increase up to the target price level less direct payment, based on program acres and base yields, is offset by decreases in government spending. Increases in future yields do not make up for increases in

expenses. 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. However, price levels will not rise above target price levels in the United States.

Net farm income for the high-profit farm is $167 thousand in 2003 and will decrease to $128 thousand in 2012 (Figure 6). The income in 2012 is 23% lower than that in 2003. Net farm income for the average-profit farms is $74 thousand in 2003 and will decrease to $44 thousand in 2012. Net farm income for the low-profit farm is $33 thousand in 2003 and will decrease to $12 thousand by 2012. The low-profit farm may not have the financial resiliency to survive without outside income. State average net farm income over the 2003-2012 period is $152 thousand for the high-profit farm, $62 thousand for the average-profit farm, and $24 thousand for the low-profit farm.

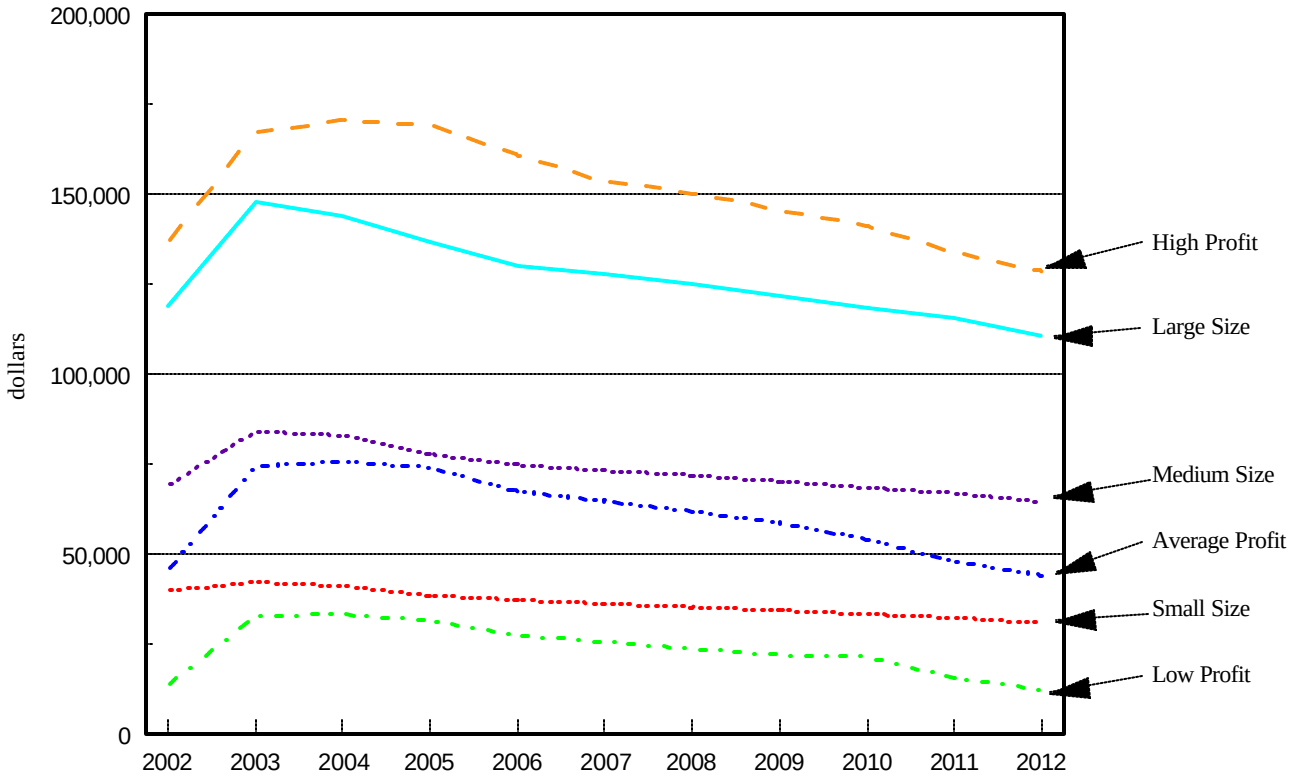


Figure 6. Net Farm Income for Size and Profit North Dakota Representative Farms

Net farm income for 2003 is expected to be higher than in 2002 because crop yields for spring and durum wheat, barley, and canola were substantially lower in 2002 than average. It is expected that crop yields return to normal in 2003. The higher prices received in 2002 were partially offset by lower government payments.

Table 5 shows the net farm income under various price scenarios. The optimistic scenario represents a 10% increase in the prices of all commodities except sugar. Likewise, the pessimistic scenario represents a 10% decrease in all prices. Both scenarios are well within one standard deviation of the price fluctuations during the past few years. With 10% higher prices, net farm income is 4.9% higher for the large-size farm, 2.7% higher for the medium-size farm, and 1.0% higher for the small-size

farm (Figure 7). With 10% lower prices, net farm income is 3.7% lower for the large-size farm, 2.0% lower for the medium-size farm, and almost unchanged for the small-size farm.

Table 5. North Dakota Net Farm Income for Size Representative Farms under Various Scenarios

	Base			Optimistic			Pessimistic		
	Large	Medium	Small	Large	Medium	Small	Large	Medium	Small
	thousand $								
2002	118.7	68.8	39.7	118.7	68.8	39.7	118.7	68.8	39.7
2003	147.7	83.9	42.0	152.0	85.2	42.2	144.1	82.9	41.9
2004	143.7	82.8	41.1	147.5	83.9	41.3	140.1	81.7	40.9
2005	136.6	77.5	38.4	142.0	79.2	38.7	132.5	76.3	38.2
2006	130.0	74.6	37.1	136.3	76.6	37.5	125.8	73.3	36.9
2007	127.7	73.0	36.1	134.4	75.1	36.4	123.4	71.7	35.8
2008	124.7	71.7	35.2	131.9	73.9	35.6	120.4	70.4	35.0
2009	121.4	70.0	34.2	128.8	72.3	34.6	117.0	68.7	34.0
2010	118.1	68.3	33.2	125.7	70.7	33.6	113.6	66.9	32.9
2011	115.3	66.8	32.2	122.4	69.0	32.6	108.1	64.5	31.8
2012	110.6	64.4	30.7	117.9	66.7	31.2	103.4	62.1	30.3

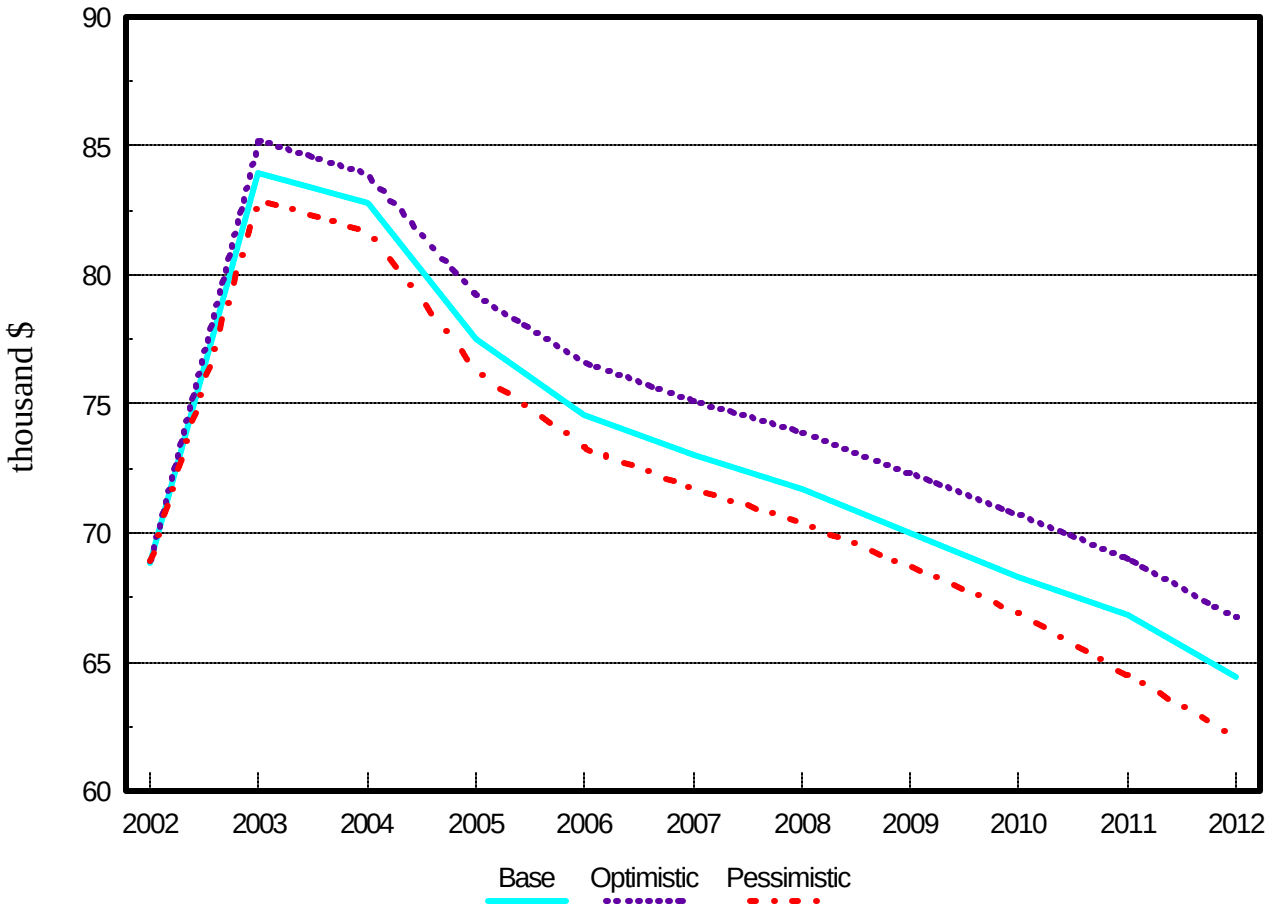


Figure 7. Average North Dakota Net Farm Income for Size Representative Farms under Various Price Forecast Scenarios

Table 6 shows the net farm income under various price scenarios for the profit representative farms. Under the optimistic scenario, net farm income is 4.2% higher for the high-profit farm, 4.3% higher for the average-profit farm, and 0.9% higher for the low-profit farm (Figure 8). Under the pessimistic scenario, net farm income is 3.7% lower for the high-profit farm, 3.6% lower for the average-profit farm, and almost unchanged for the low-profit farm.

Table 7 shows the changes in average net farm income and changes in total government payments for a profit representative farm under the two price scenarios. If prices increase 10%, average net farm income would increase 4.3%, while government spending would decrease 25.2%. If prices decrease 10%, average net farm income would decrease 3.6%, while government spending would increase 26.5%. The new farm bill removes most of the market price risk from the producers and transfers it to the federal government.

Table 6. North Dakota Net Farm Income for Profit Representative Farms under Various Scenarios

	Base			Optimistic			Pessimistic		
	High	Average	Low	High	Average	Low	High	Average	Low
	thousand $								
2002	136.6	45.2	13.6	136.6	45.2	13.6	136.6	45.2	13.6
2003	167.0	74.3	32.7	176.3	78.7	34.0	157.8	69.9	31.4
2004	170.2	75.5	33.2	174.2	76.9	32.7	166.4	74.3	33.9
2005	168.9	73.9	31.3	175.1	76.6	31.6	164.6	72.4	31.8
2006	160.6	67.3	27.4	167.8	70.6	27.9	156.3	65.9	28.0
2007	153.4	64.5	25.5	159.7	67.2	25.6	149.1	63.1	26.1
2008	150.1	61.7	23.6	155.0	63.5	23.1	145.7	60.2	24.2
2009	145.4	58.6	22.0	149.8	60.1	21.3	141.1	57.1	22.6
2010	140.9	53.9	21.3	145.3	55.4	20.7	136.4	52.3	21.9
2011	133.6	47.8	15.6	141.8	51.6	16.6	125.5	43.9	14.6
2012	128.3	44.0	12.1	136.6	47.8	13.1	120.1	40.1	11.1

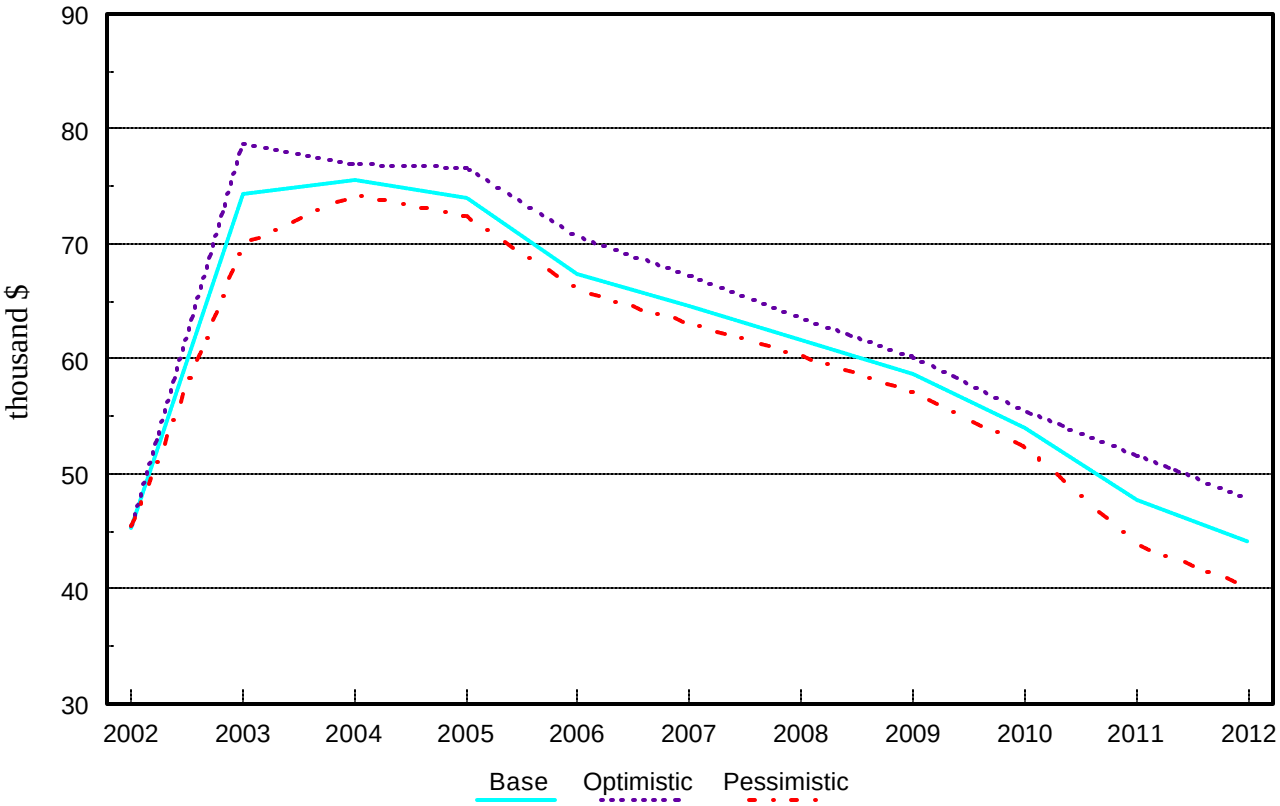


Figure 8. Average North Dakota Net Farm Income for Profit Representative Farms under Various Price Forecast Scenarios

Table 7. Changes in North Dakota Average Net Farm Income and Government Payments under Various Price Forecast Scenarios

	Net Farm Income		Government Payments	
Price Levels	Average	Percent Change	Average	Percent Change
Base	62,145		39,111	
Optimistic	64,844	4.34	29,268	-25.17
Pessimistic	59,913	-3.59	49,467	26.48

Debt-to-asset Ratios for North Dakota Representative Farms

Debt-to-asset ratios for all representative farms remain relatively constant throughout the forecast period (Table 8). For the 2003-2012 period, the debt-to-asset ratio increases slightly for the high-profit farms and remains relatively flat for the others (Figure 9). The debt-to-asset ratios for the low-profit farm are higher than those for other farms, but may not reach a critical level that would impair access to new bank credit.

Table 8. State Average Debt-to-asset Ratio for Different Size and Profit Representative Farms

	Size			Profit		
	Large	Med	Small	High	Ave	Low
2002	0.34	0.37	0.49	0.39	0.47	0.61
2003	0.33	0.36	0.48	0.38	0.44	0.59
2004	0.33	0.36	0.48	0.39	0.45	0.59
2005	0.33	0.36	0.49	0.39	0.46	0.60
2006	0.34	0.36	0.49	0.40	0.47	0.61
2007	0.34	0.36	0.49	0.40	0.47	0.61
2008	0.33	0.36	0.49	0.40	0.48	0.62
2009	0.33	0.36	0.49	0.41	0.48	0.62
2010	0.34	0.36	0.50	0.41	0.48	0.62
2011	0.34	0.36	0.50	0.41	0.49	0.63
2012	0.34	0.37	0.50	0.41	0.47	0.61
Average	0.34	0.36	0.49	0.40	0.47	0.61

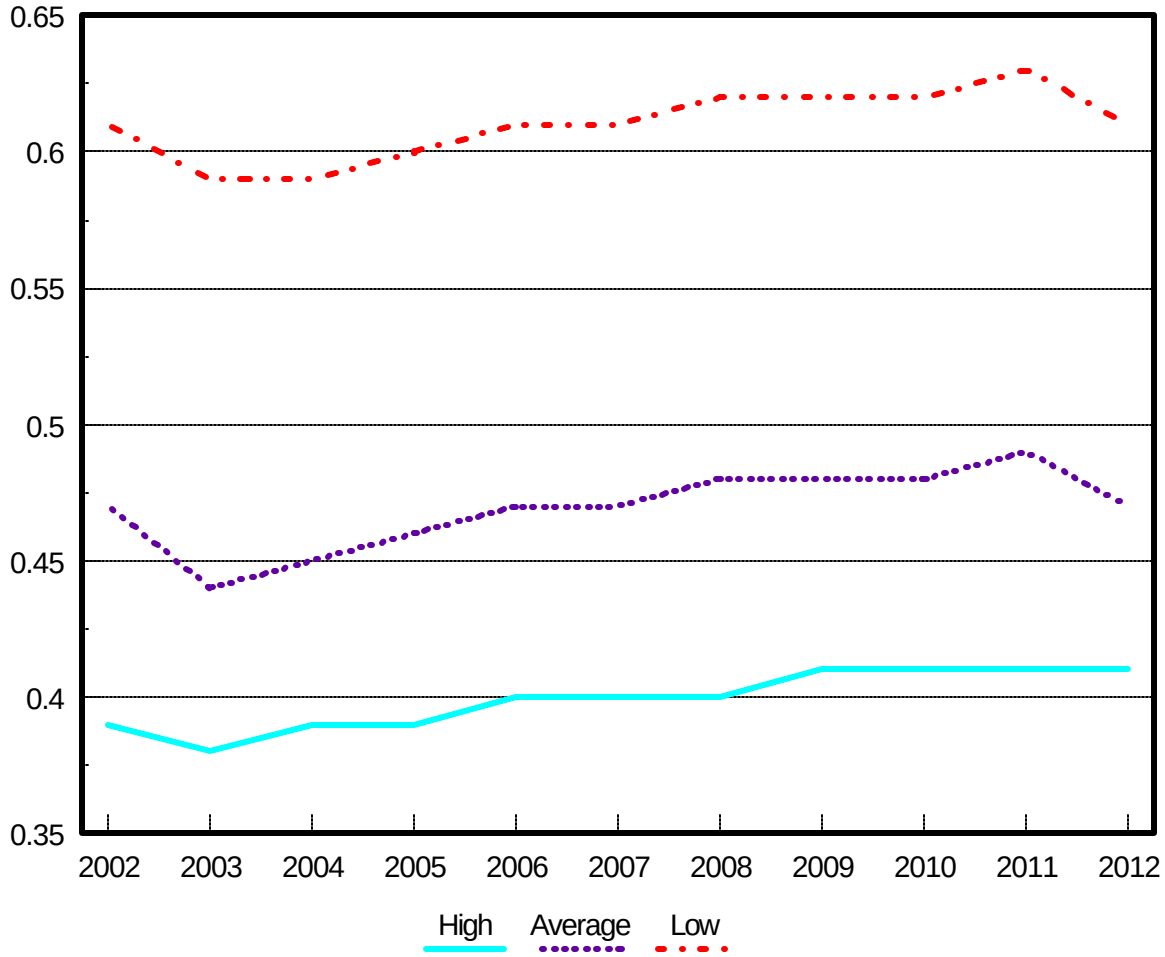


Figure 9. Debt-to-asset Ratio for North Dakota Representative Farms by Profit

Debt-to-asset ratios for large, medium, and small-size farms remain relatively constant throughout the forecast period (Figure 10). The debt-to-asset ratio for the large-size farm is 0.33 in 2003, increases to 0.34 in 2006, and then decreases to 0.33 in 2008. The debt-to-asset ratio for the medium-size farm is 0.36 in 2003 and increases to 0.37 in 2012. The debt-to-asset ratio for the small-size farm is 0.48 in 2003, increases to 0.50 in 2010, and then remains at that level.

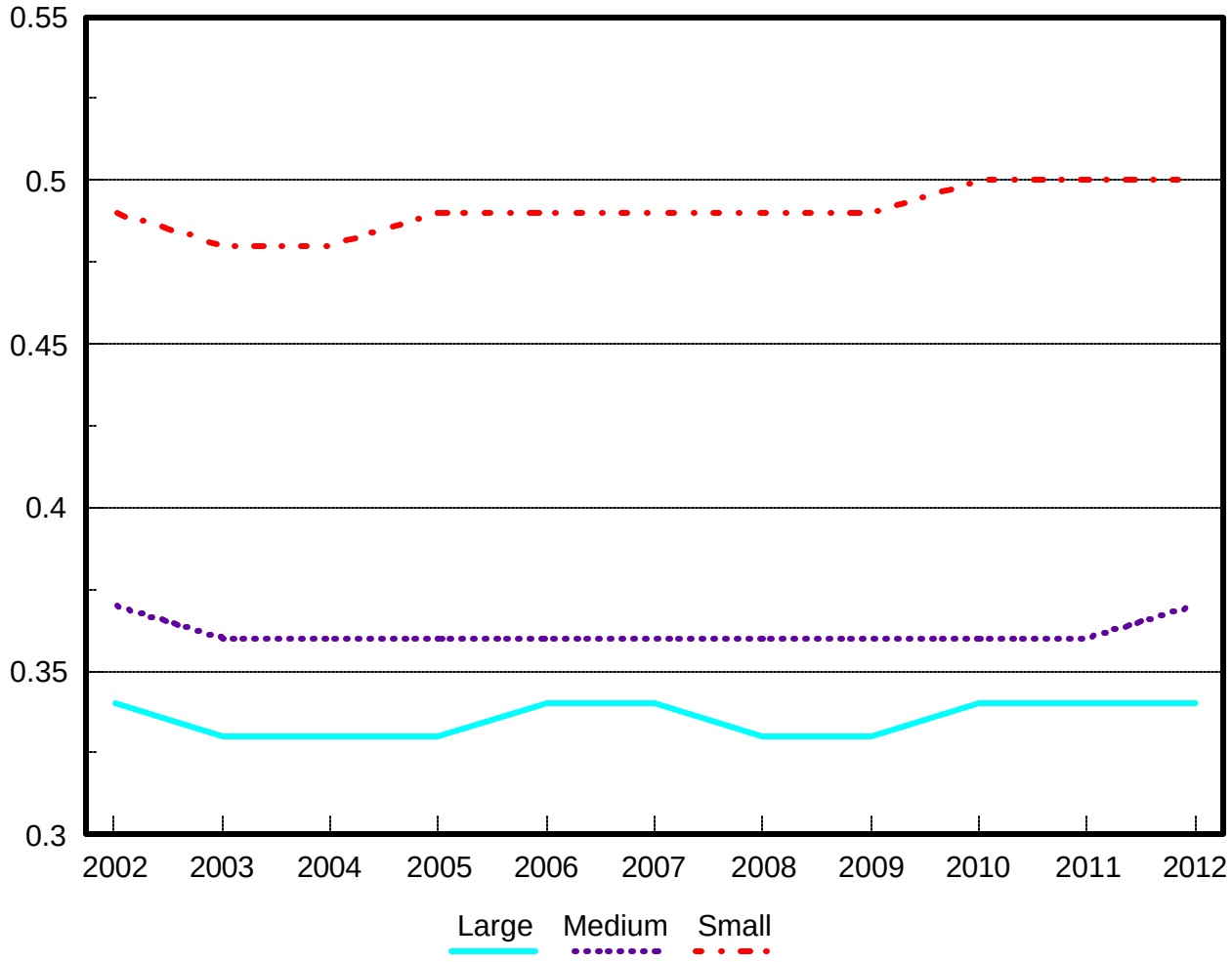


Figure 10. Debt-to-asset Ratio for North Dakota Representative Farms by Size

Higher debt-to-asset ratios for the low-profit farms, when coupled with low net farm income, suggest serious problems in sustaining the farm business unless substantial off-farm income is earned. Without off-farm income to provide family living requirements, it is unlikely that the low-profit farm can survive or be 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.

Land Value and Cash Rents

Table 9 presents land prices for various representative farms in North Dakota. Land values for the average-profit representative farms are shown in Figure 11. Land prices differ between the regions; the highest prices are in the RRV, and the lowest are in the West region. Land prices also change over the forecast period and are expected to increase by 4.7%.

Table 9. North Dakota Land Prices for Average-Profit Representative Farms

	RRV	NC	SC	WEST	State
	----------$/acre----------				
2002	786.90	390.40	385.60	298.30	465.30
2003	815.71	404.09	413.06	298.94	482.95
2004	819.58	405.45	418.93	300.94	486.22
2005	823.18	407.04	424.70	302.95	489.47
2006	826.19	408.46	429.87	304.70	492.30
2007	829.11	409.76	434.40	306.27	494.89
2008	833.98	410.87	438.34	307.68	497.72
2009	836.53	411.83	441.85	308.94	499.79
2010	838.79	412.55	444.71	310.05	501.52
2011	842.87	413.68	448.15	311.73	504.11
2012	843.84	415.09	450.61	313.27	505.70
2003-12 ave	830.98	409.88	434.46	306.55	495.47

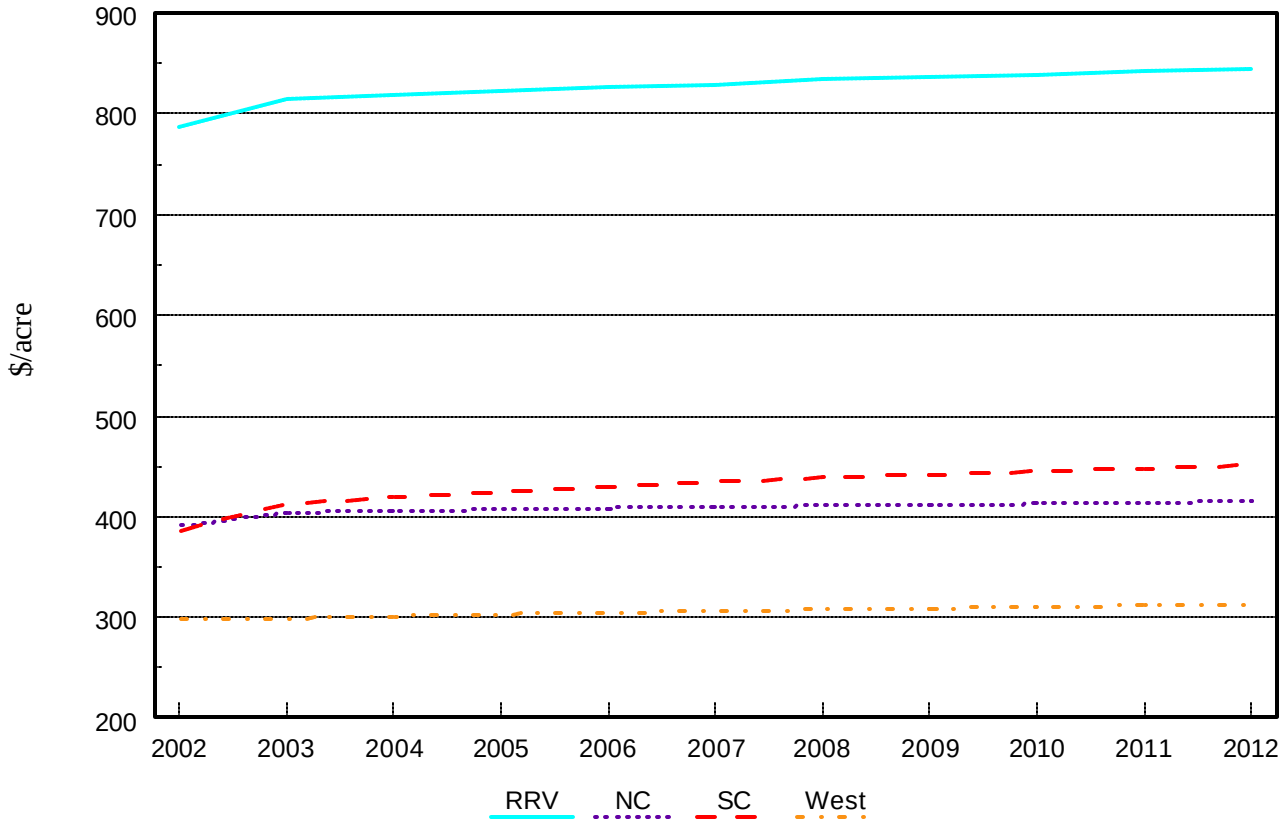


Figure 11. Average Value of Cropland for North Dakota Average Profit Representative Farms

Cash rents for the average-profit farms slowly increase in all regions (Table 10). Cash rents also differ between regions; the highest are in the RRV, and the lowest are in the West (Figure 12).

Table 10. North Dakota Cash Rent for Average-Profit Representative Farms

	RRV	NC	SC	WEST	State
	----------$/acre----------				
2002	58.90	32.45	33.21	28.14	38.18
2003	61.06	33.59	35.57	28.20	39.61
2004	61.35	33.70	36.08	28.39	39.88
2005	61.62	33.84	36.57	28.58	40.15
2006	61.84	33.95	37.02	28.74	40.39
2007	62.06	34.06	37.41	28.89	40.61
2008	62.42	34.15	37.75	29.03	40.84
2009	62.61	34.23	38.05	29.15	41.01
2010	62.78	34.29	38.30	29.25	41.16
2011	63.09	34.39	38.59	29.41	41.37
2003-12 ave	61.77	33.87	36.86	28.78	40.32

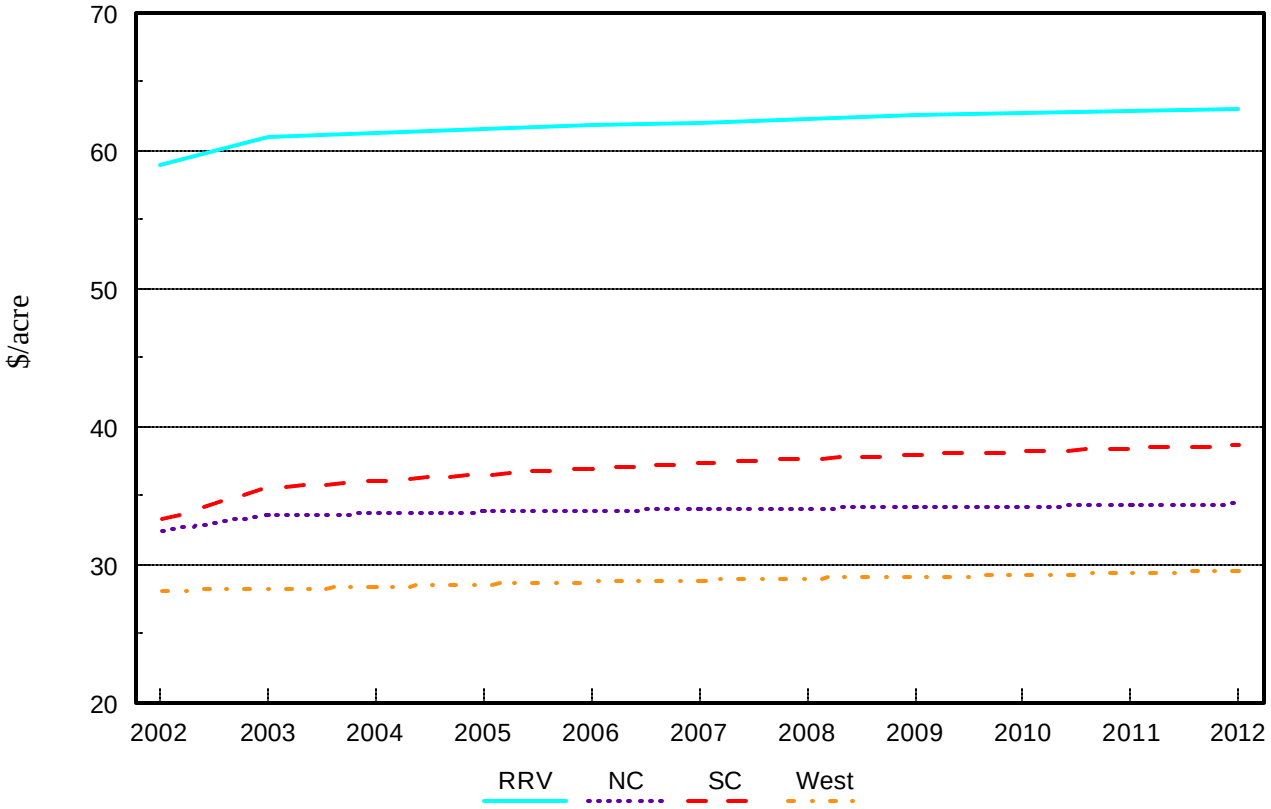


Figure 12. Average Cash Rent of Cropland for North Dakota Average Profit Representative Farms

CONCLUDING REMARKS

Net farm income in 2012 will be lower than in 2002; however, incomes early in the forecast period will be higher than in 2002 as yields are expected to return to normal. The higher prices received in 2002 were partially offset by lower government payments to producers. The most important component in net farm income seems to be production volume. The government provides adequate price support, but production support through crop insurance is substantially less adequate. Net farm income for all representative farms is projected to fall slowly throughout the forecast period. Crop production in the United States and around the world is assumed to be normal with annual trend-line increases. The counter-cyclical payments protect producers from market price decreases if they produce the same crops and yields as their bases. The risk of price changes is transferred to the federal government.

Debt-to-asset ratios are predicted to increase slowly throughout the forecast period. The debt-to-asset ratios for the 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.

Land prices are predicted to increase slightly during the forecast period. Cash rent levels follow a pattern similar to land prices.

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