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2004 North Dakota Agricultural Outlook: Representative Farms, 2004-2013

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Abstract

Net farm income for all representative farms in 2013 will be lower than in 2004. Low-profit farms, which comprise 25% of the farms in the study, may not have financial resiliency to survive without off-farm income. Costs are projected to increase faster than yields, which will pressure net farm income downward. 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 2004 than the 2001-2003 average, because lower yields across the state in 2002 are expected to return to trend line levels in 2004. The higher prices received in 2003 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 $144 to $119 thousand for the 2004-2013 period. The net farm income is predicted to decrease from $57 to $38 thousand for the medium-size farm and from $24 to $11 thousand for the small-size farm. The level of net farm income will not be maintained because production expenses are rising faster than yields.

Net farm income also decreases for farms in the different profit categories. During the 2004-2013 period, net farm income is predicted to decrease from $156 to $124 thousand for the high-profit farm and from $59 to $36 thousand for the average-profit farm. The low-profit farm is expected to show a net loss for the period.

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 33% for the large-size, 40% for the medium-size, and 53% for the small-size representative farms in 2013. The ratios are also projected to increase to 40%, 46%, and 64% for high, average, and low-profit representative farms in 2013, respectively.

For the average-profit representative farm, state average cropland prices will increase 2.1%, from $485 per acre in 2004 to $495 per acre in 2013. Cash rents will increase 2.1%, from $39.78 per acre in 2004 to $40.61 per acre in 2013.

2004 North Dakota Agricultural Outlook: Representative Farms, 2004-2013

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INTRODUCTION

North Dakota represents a major agricultural area with distinctive climate and crop mix. 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 2004 to 2013 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.

The North Dakota agricultural outlook for the 2004-2013 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.

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 provides between 5% and 10% of the state economy. The average farm size in North Dakota is 1,313 acres including pasture. 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 but only 3% of total farmland.

The North Dakota Representative Farm Model is a stochastic 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

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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 1). 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.

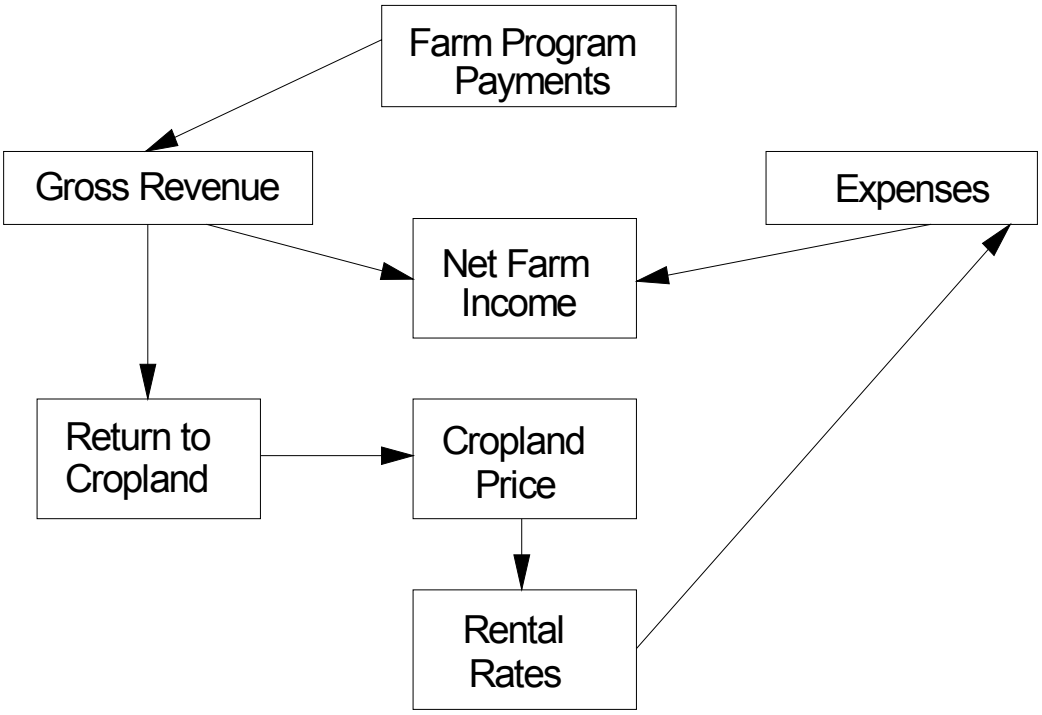
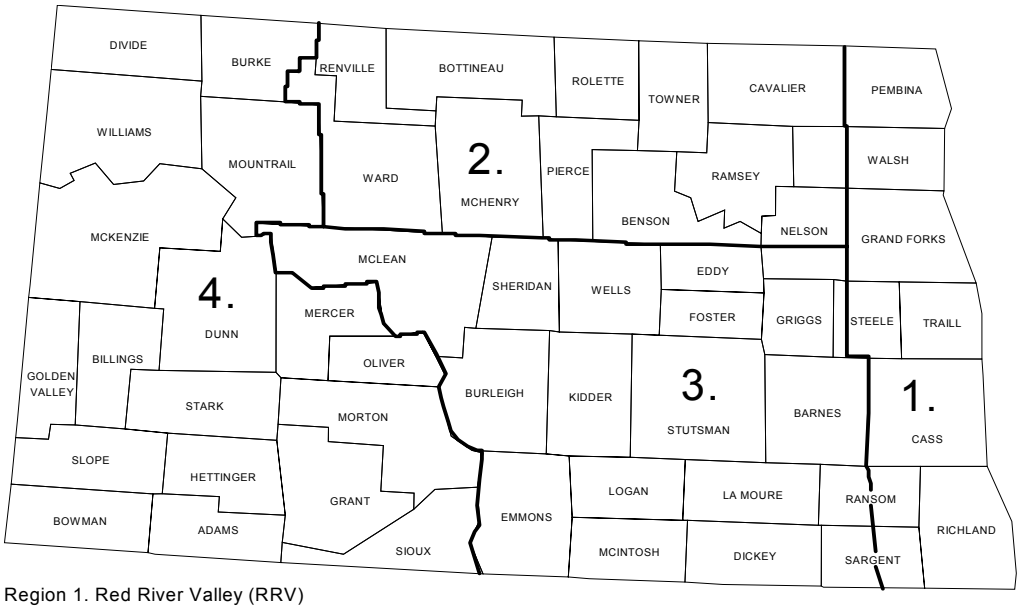


Figure 1. Structure of the North Dakota Representative Farm Model

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 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.



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

The representative farms average 1,741 acres of cropland and 414 acres of pasture. The farms in the study are about 64% 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 all 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 bottom 20% of farm profitability in each production region. Average farm sizes are 3,093 cropland acres for the high-profit farms, 1,741 cropland acres for the average-profit farms, and 1,052 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 3,318 cropland acres for the large-size farms, 1,443 cropland acres for the medium-size farms, and 543 cropland acres for the small-size farms (Table 1).

Table 1. Characteristics of Representative North Dakota Farms, 2003

	Size			Profit		
	Large	Medium	Small	High	Average	Low
Number of Farms	128	256	128	126	629	126
Total Cropland (ac)	3,318	1,443	543	3,093	1,741	1,052
Spring Wheat (ac)	993	350	102	651	486	244
Durum Wheat (ac)	168	39	20	211	154	114
Barley (ac)	337	120	25	413	213	106
Corn (ac)	182	83	19	235	131	75
Sunflower (ac)	151	73	12	338	211	123
Soybeans (ac)	519	218	88	318	161	110

Figure 3 shows the historical average farm expense and profit for the farms in the North Dakota Farm and Ranch Management Program located in the North Central, South Central, and West regions of the state during the past 10 years, excluding the RRV. In 1994, the farms averaged $171,713 gross income with a profit of $46,289. In 2003, the farms averaged $279,879 gross with a profit of $58,182. In 1994, the farms generated $1.37 gross output for every $1 inputs; by 2003, that had fallen to $1.26 gross output for every $1 in inputs. Figure 4 shows the average size of the farms. In 1994, the average size was 1,262 acres. In 2003, the average size was 1,667 acres. This is an increase of 32% over the 10-year period. Net return per acre fell from $36.67 per acre in 1994 to $34.91 per acre in 2003.

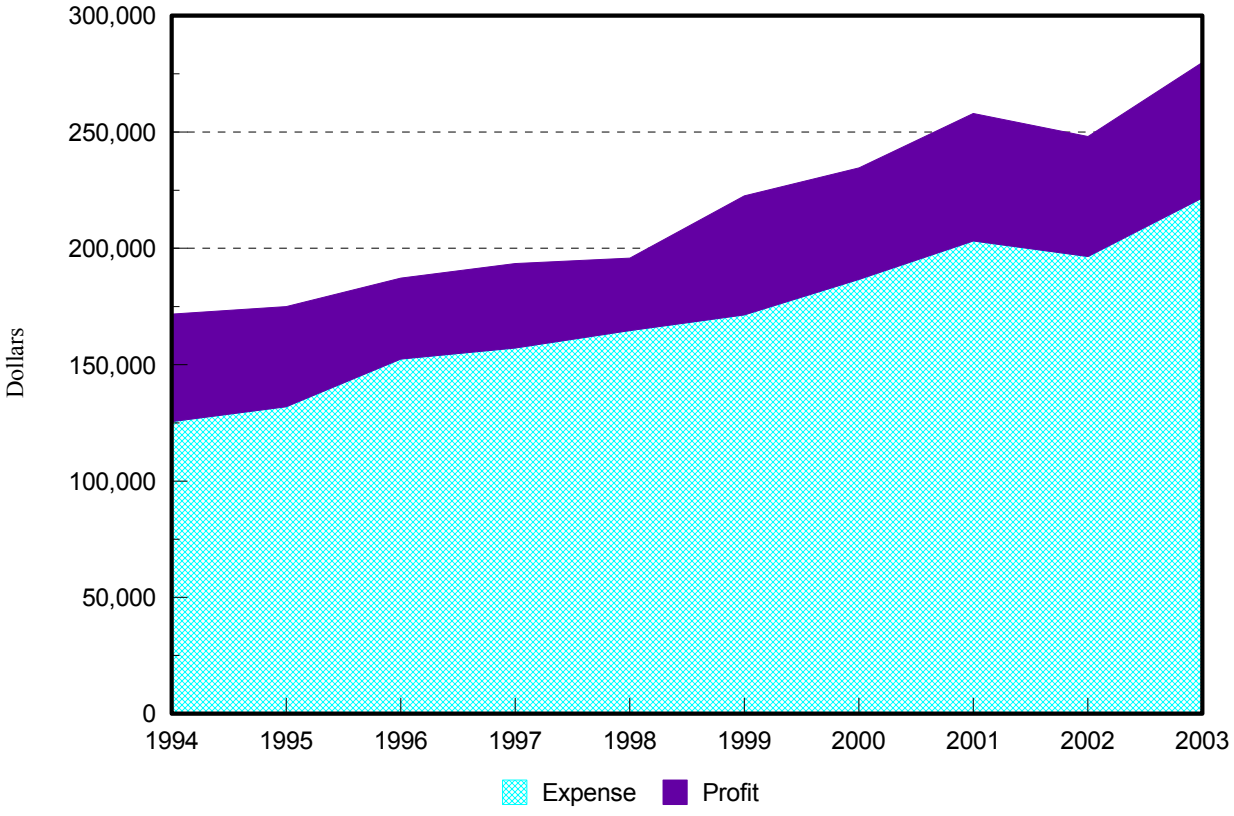


Figure 3. Average Expense and Profit for Farms in the North Dakota Farm and Ranch Business Management Program

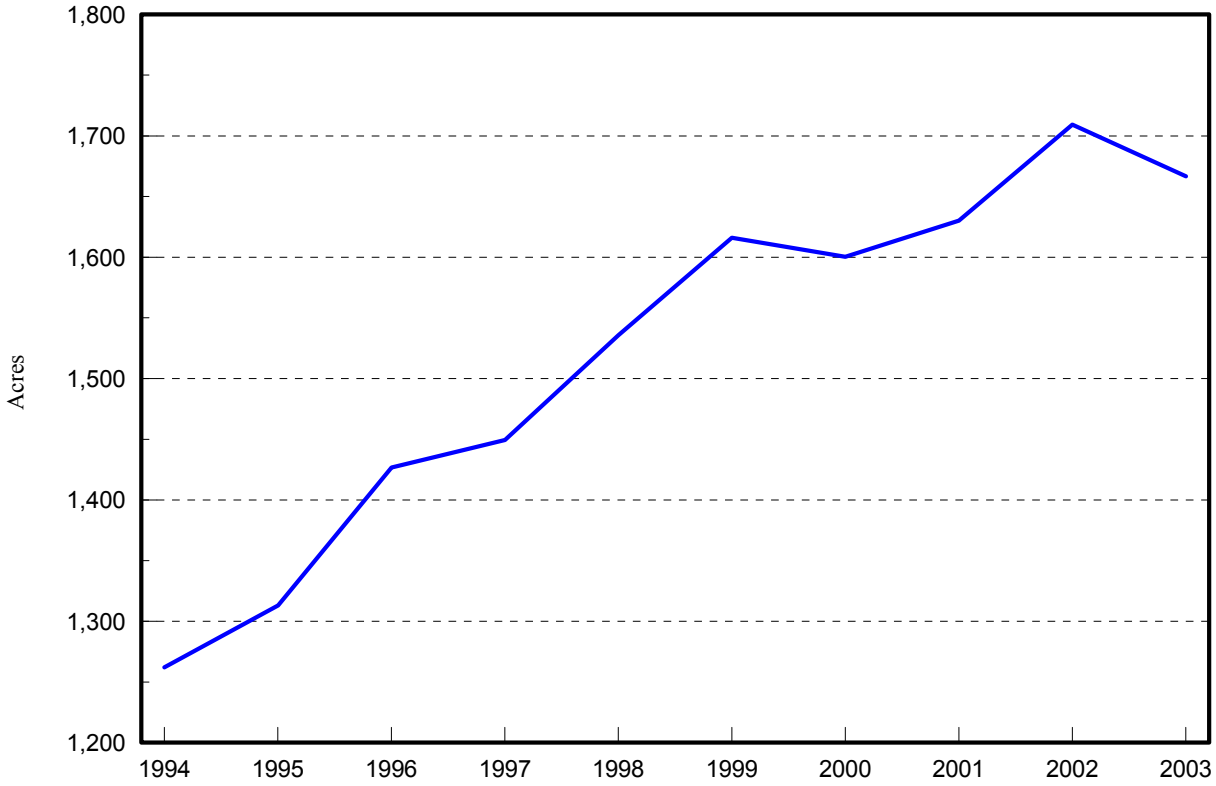


Figure 4. Average Size of Farms in the North Dakota Farm and Ranch Business Management Program

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 that include seed, fertilizer, fuel, repairs, feed, supplies, feeder livestock purchases, and 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

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

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 2002 were used to estimate price equations. The price equations were used to estimate cash prices received by North Dakota farmers for the 2004-2013 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 2002. 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

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

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

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

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.

Probability of the Forecasted Income. Yields and commodity prices vary each year. The model is based on assumptions that yields will follow a trend line and prices will follow FAPRI's price forecast. Since actual future prices and yields are unknown, the model's forecast will not be accurate. The probabilities for the forecasted income are estimated under the assumption that future prices and yields vary similar to the past.

To calculate the probability that the projected income will be within 15% of the actual income, the historical mean and standard deviation were determined for each representative farm. The distribution of the forecasted net farm income was normalized to a standard normal distribution with a mean of 0 and a standard deviation of 1. Equation 5 shows the standard normal distribution of X, which has a mean of m and a standard error of S.

$$Z= (X-m)/s \quad (5)$$

Where X is the forecasted net farm income, m is the sample mean and s is the standard deviation. Z is a standard normal distribution of X. P_1 is the probability for a 15% lower income and P_2 is the probability for a 15% higher income in Figure 5. The difference between the two areas is the probability that the forecasted net farm income is within 15% of the actual net farm income.

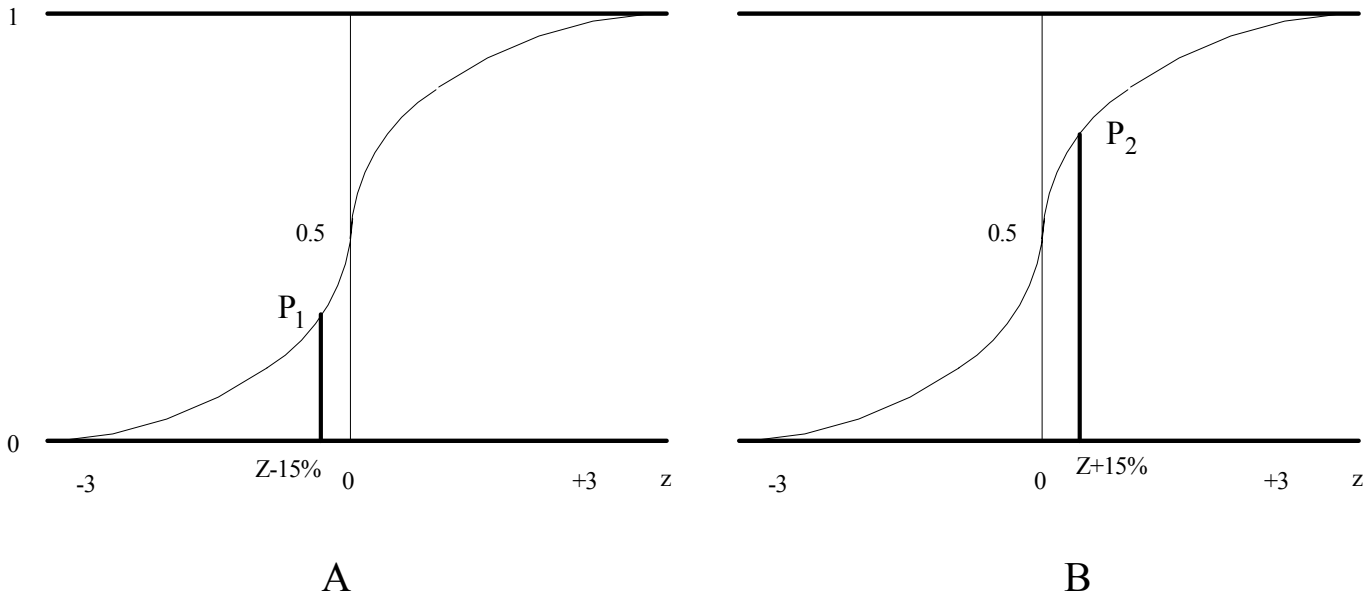


Figure 5. Area Under the Standard Normal Cumulation Distribution Functions

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:

$$P_{it} = a_0 + a_1 P_t + a_2 P_{it-1} + e_{it} \quad (6)$$

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 2002. 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 2.

Table 2. 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-
2003	3.56	3.87	2.72	1.93	11.25	6.41	2.21	10.95
2004	3.50	3.82	1.84	1.53	10.40	5.19	1.97	9.63
2005	3.23	3.49	1.69	1.43	9.63	4.72	1.95	8.77
2006	3.19	3.43	1.75	1.47	9.83	4.81	1.95	8.94
2007	3.19	3.43	1.81	1.51	9.59	4.84	1.97	8.98
2008	3.19	3.43	1.84	1.53	9.34	4.86	1.99	9.03
2009	3.22	3.47	1.90	1.57	8.99	4.84	1.99	8.98
2010	3.24	3.51	1.93	1.59	9.05	4.81	2.02	8.94
2011	3.29	3.58	1.99	1.63	9.07	4.77	2.02	8.85
2012	3.32	3.63	2.02	1.65	9.17	4.77	2.04	8.85
2013	3.35	3.66	2.05	1.67	9.22	4.74	2.04	8.81

Crop yields in each region also are predicted 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:

$$y_{it} = b_0 + b_1 \text{ trend} + b_2 y_{it-1} + e_{it} \quad (7)$$

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 6 shows the estimated spring and durum wheat yields. Wheat yields, especially for spring wheat, are expected to return to trend line levels in 2004 after higher yields in 2003. The yields show a slight upward trend throughout the forecast period. Figure 7 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.

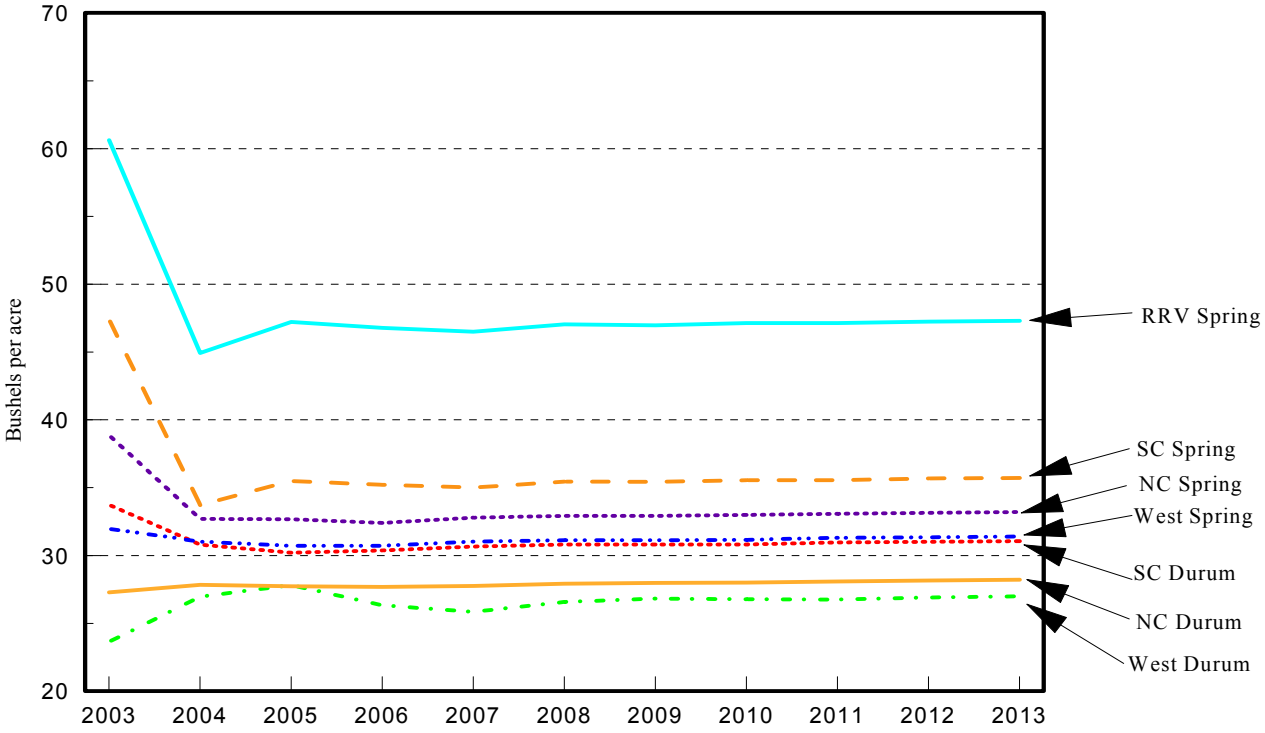


Figure 6. North Dakota Estimated Wheat Yields Used in the Representative Farm Model

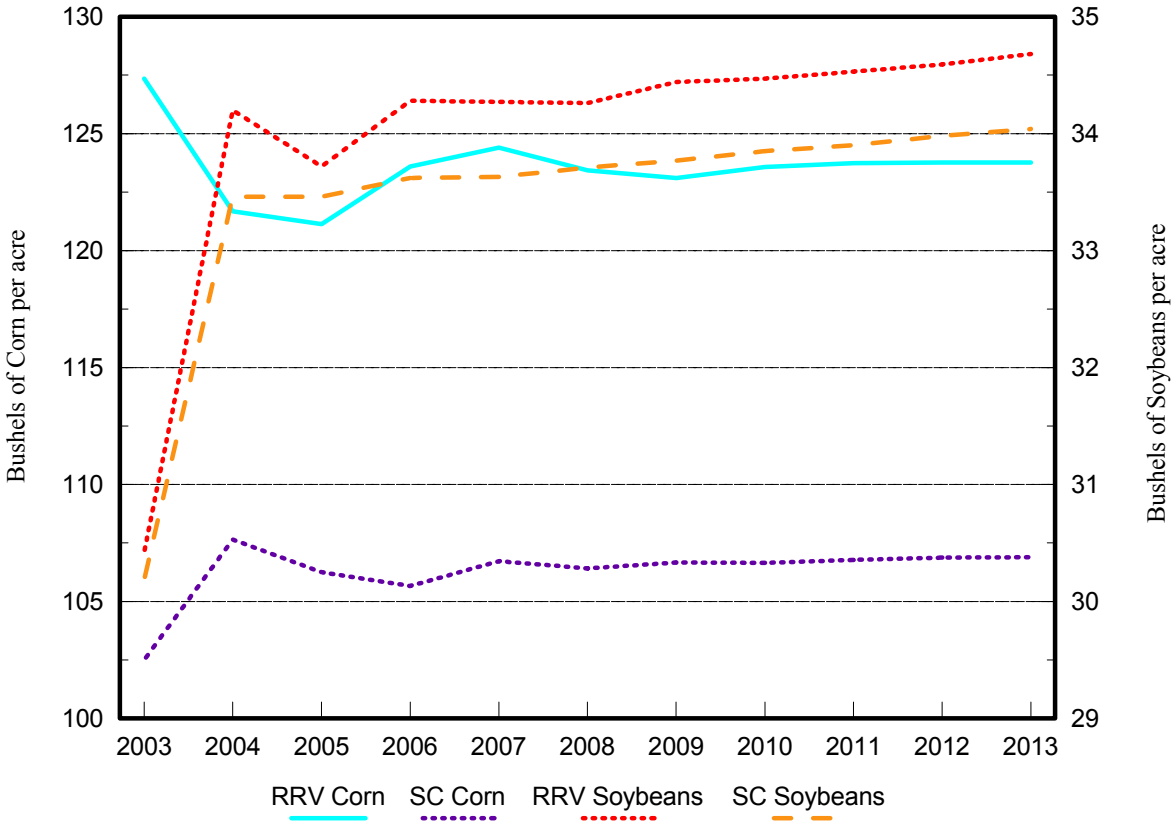


Figure 7. North Dakota Estimated Row-crop Yields Used in the Representative Farm Model

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:

$$A_{jit}=c_o+\sum_{j=1}^{n} c_j P_{jit}+c_{n+1}A_{jit-1}+c_{n+2}G_{jt}+e_{jit} \quad (8)$$

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_{jt} = 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 6 are used in the acreage equations. The jth crop share in region i in time t is then calculated as follows:

$$S_{jit}=A_{jit}/\sum_{j=1}^{i} A_{jit} \quad (9)$$

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, 2004-2013

The North Dakota Representative Farm Model was used to estimate net farm income, debt-to-asset ratios, land prices, and rental rates for 2004-2013.

Additional assumptions 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 remain constant in size and operation 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 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 increase from $131 thousand for the 2001-2003 average to $145 thousand in 2004 and then fall slowly to $119 thousand by 2013, which is 9% lower that the 2001-2003 average (Figure 8). Net farm income for the medium-size farm, which averaged $65 thousand for 2001-2003, decreases to $58 thousand in 2004 and then again to $38 thousand in 2013. Net farm income for the small-size farm averaged $33 thousand for 2001-2003 and will decrease to $24 thousand in 2004 before decreasing to $11 thousand in 2013. State average net farm income over the 10-year period is $130 thousand for the large-size farm, $47 thousand for the medium-size farm, and $17 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, although the small-size farm may need off-farm income to supplement family living.

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

	Size			Profit		
	Large	Medium	Small	High	Average	Low
	---dollars---					
2001-2003 avg	131,362	65,294	32,996	175,458	68,694	4,297
2004	144,704	57,530	23,876	155,644	59,333	-9,585
2005	140,595	53,313	21,416	155,953	58,967	-9,427
2006	137,125	51,124	20,106	149,664	53,737	-11,786
2007	132,972	48,414	18,517	141,078	50,357	-13,249
2008	130,966	46,914	17,190	139,425	48,210	-14,513
2009	128,198	44,948	15,913	136,232	45,947	-15,343
2010	126,578	43,462	14,736	134,232	42,704	-15,244
2011	122,695	40,978	13,270	128,647	39,360	-18,532
2012	120,754	39,379	12,019	126,110	37,523	-19,683
2013	118,620	37,655	10,712	123,515	36,291	-20,976

The decreases in net farm income from 2004 to 2013 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 slowly, limiting upward pressure on prices.

Net farm income for the high-profit farm is projected at $154 thousand in 2004 and is expected to decrease 20% to $124 thousand in 2013 (Figure 8). Net farm income for the average-profit farms is $59 thousand in 2004 and is projected to decrease to $36 thousand in 2012. The low-profit farm is expected to show a net operating loss in 2004 and will continue to show losses throughout the forecast period. The low-profit farm may not have the financial resiliency to survive without outside income. State average net farm income over the 2004-2013 period is $138 thousand for the high-profit farm, $47 thousand for the average-profit farm, and -$15 thousand for the low-profit farm.

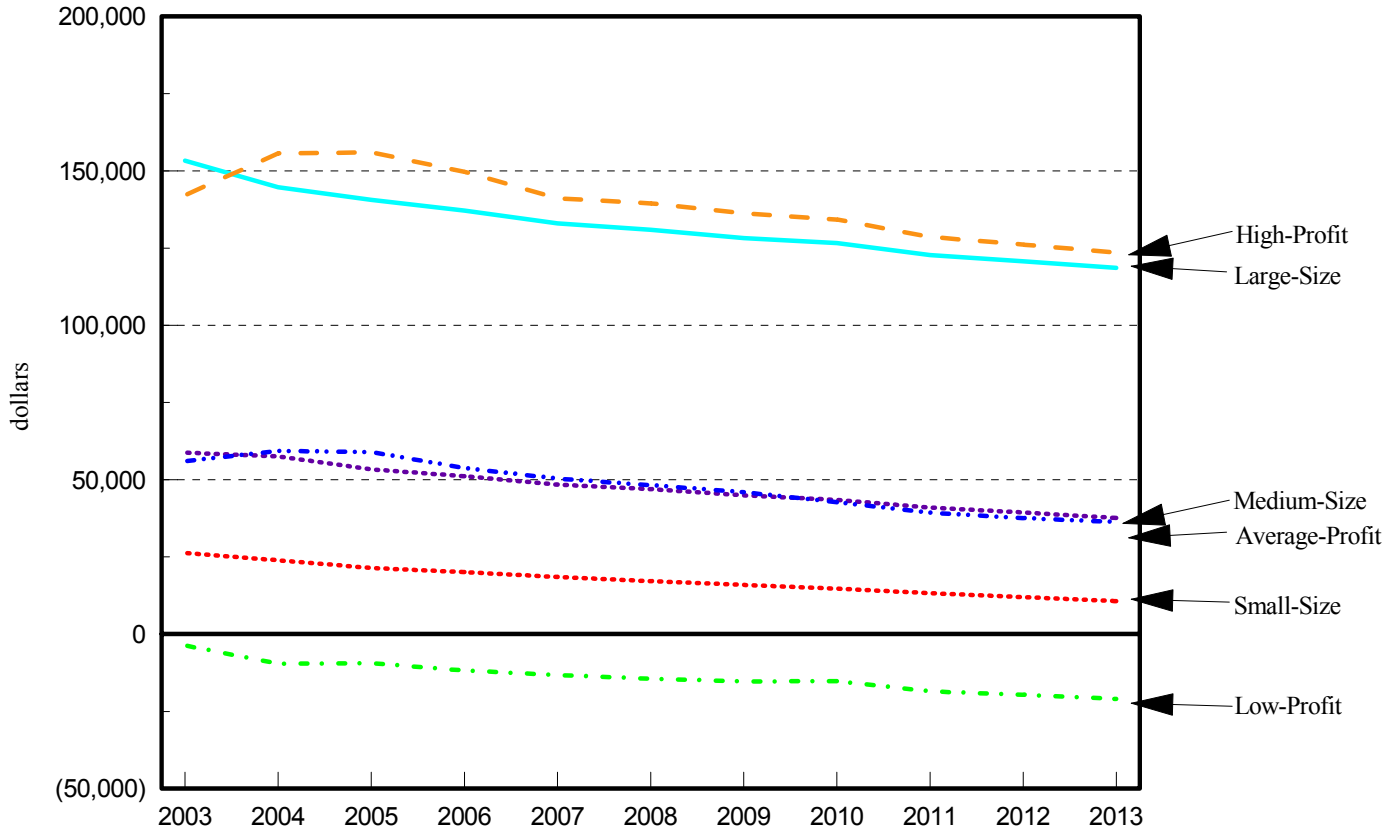


Figure 8. Net Farm Income for Size and Profit North Dakota Representative Farms

Net farm income for 2004 is expected to be lower than in 2003 because crop yields for spring and durum wheat, barley, and canola were substantially higher in 2003 than in most regions of the state. It is expected that crop yields return to normal in 2004. The higher prices received in 2003 were partially offset by lower government payments.

Table 4 shows the forecasted net farm income for the profit representative farms by region and the probabilities that these projections are within a plus/minus 15% of the actual net farm income. The probability is higher than 40% for the high and average-profit farms in the RRV and South Central regions, and the high-profit farm in the North Central and West regions. The probability that the actual net farm income will be between $102,657 and $138,889 in 2004 for the high-profit farm in the North Central region is 41%. The probabilities for the average-profit farm in the North Central region and the average and low-profit farm in the West region are between 20% and 30%. The probability for the low-profit farms in the RRV, North Central, and South Central regions is below 10% in most cases. The main reason for the low probabilities in the case of low-profit farms is that the standard deviations are large compared to the mean of the net farm income, indicating that net farm income for low-profit farms fluctuates greatly.

Table 4. Net Farm Income for North Dakota Profit Representative Farms by Region and Probability of Forecasted Income Being within 15% of Actual Income

	RRV			NC		
	High	Medium	Low	High	Medium	Low
2004	200,794	89,196	9,376	122,857	54,934	(865)
	0.42	0.40	0.04	0.41	0.31	0.00
2005	201,660	89,903	8,841	126,762	57,109	1,793
	0.42	0.40	0.04	0.43	0.32	0.02
2006	189,026	80,165	6,030	123,975	53,752	(499)
	0.41	0.36	0.06	0.42	0.30	0.00
2007	163,574	73,758	2,886	121,605	52,975	(666)
	0.36	0.34	0.05	0.41	0.30	0.00
2008	163,482	72,933	1,963	120,716	51,567	(1,625)
	0.36	0.33	0.05	0.41	0.29	0.01
2009	160,440	70,214	57	118,756	49,638	163
	0.36	0.32	0.00	0.40	0.28	0.00
2010	159,059	68,568	4,651	118,743	45,690	(363)
	0.35	0.31	0.06	0.40	0.26	0.00
2011	148,278	61,708	(2,895)	118,113	44,395	(1,033)
	0.33	0.28	0.06	0.40	0.25	0.01
2012	142,542	57,503	(5,599)	116,858	42,691	(2,018)
	0.31	0.26	0.06	0.40	0.24	0.02
2013	135,595	52,672	(8,633)	115,316	43,805	(3,127)
	0.30	0.23	0.08	0.39	0.25	0.02

	SC			West		
	High	Medium	Low	High	Medium	Low
2004	191,740	59,213	(15,595)	107,187	33,990	(31,255)
	0.58	0.42	0.09	0.44	0.30	0.27
2005	188,266	55,977	(17,138)	107,123	32,878	(31,205)
	0.47	0.32	0.12	0.44	0.29	0.27
2006	179,072	48,624	(20,431)	106,583	32,407	(32,246)
	0.47	0.30	0.14	0.43	0.29	0.27
2007	172,766	42,760	(23,015)	106,366	31,936	(32,201)
	0.45	0.26	0.16	0.43	0.28	0.27
2008	167,270	37,201	(25,453)	106,233	31,139	(32,937)
	0.43	0.23	0.18	0.43	0.27	0.27
2009	159,945	32,803	(28,232)	105,785	31,106	(33,361)
	0.42	0.20	0.19	0.42	0.26	0.28
2010	153,814	25,819	(31,002)	105,311	31,740	(34,264)
	0.41	0.18	0.21	0.41	0.27	0.29
2011	143,161	20,586	(35,614)	105,037	30,754	(34,587)
	0.39	0.17	0.23	0.41	0.26	0.30
2012	141,729	19,413	(36,384)	104,311	30,483	(34,732)
	0.36	0.16	0.25	0.41	0.25	0.30
2013	139,302	18,707	(36,484)	103,849	29,979	(35,659)
	0.36	0.15	0.26	0.40	0.24	0.30

Debt-to-asset Ratios for North Dakota Representative Farms

Debt-to-asset ratios for all representative farms remain relatively constant or increase slightly throughout the forecast period (Table 5 and Figure 9). The debt-to-asset ratio for the low-profit farm is higher than those for other farms, but it may not reach a critical level that would impair access to new bank credit.

Table 5. State Average Debt-to-asset Ratios for Different Size and Profit Representative Farms

	Size			Profit		
	Large	Med	Small	High	Avg	Low
2003	0.32	0.39	0.50	0.36	0.42	0.61
2004	0.32	0.39	0.50	0.38	0.44	0.62
2005	0.33	0.39	0.51	0.39	0.45	0.63
2006	0.33	0.39	0.51	0.39	0.46	0.64
2007	0.33	0.39	0.51	0.39	0.46	0.64
2008	0.32	0.39	0.52	0.40	0.47	0.64
2009	0.33	0.39	0.52	0.40	0.47	0.65
2010	0.33	0.39	0.52	0.40	0.47	0.65
2011	0.33	0.39	0.53	0.40	0.47	0.64
2012	0.33	0.39	0.53	0.40	0.46	0.65
2013	0.33	0.40	0.53	0.40	0.46	0.64
Average	0.33	0.39	0.52	0.39	0.46	0.64

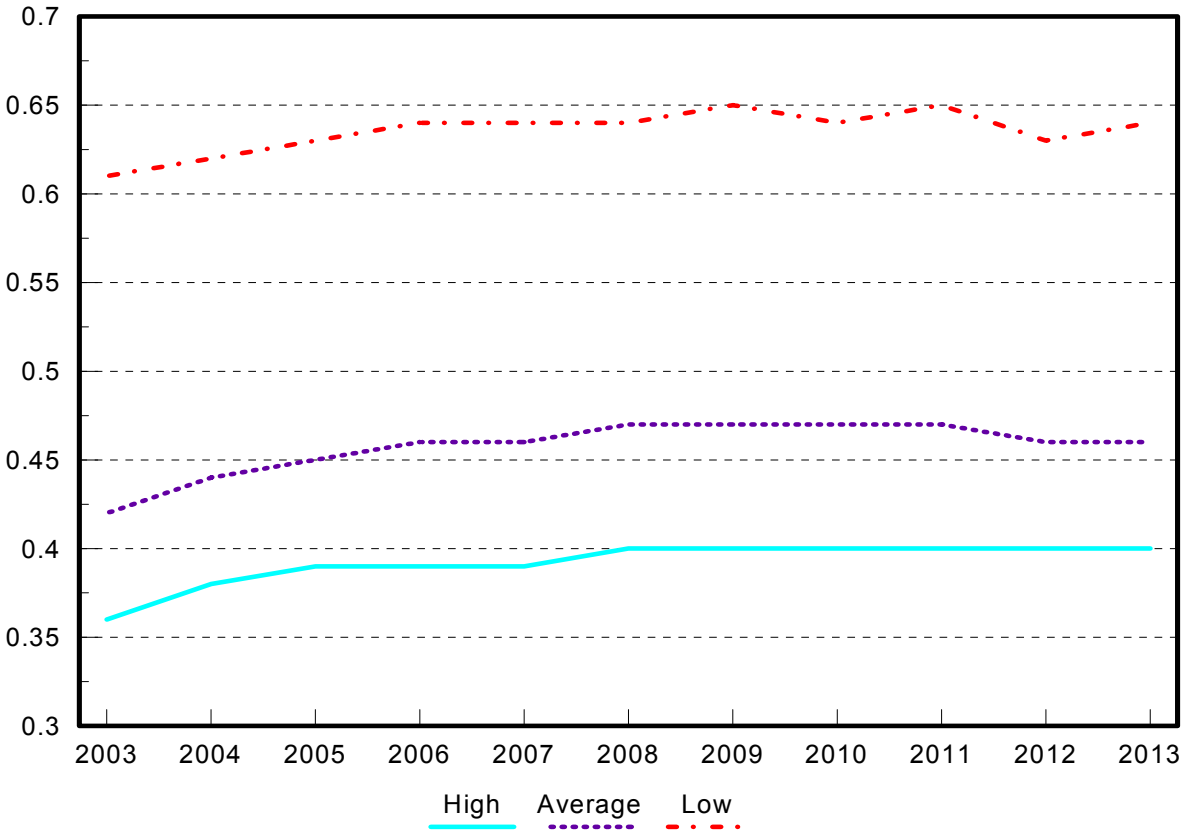


Figure 9. Debt-to-asset Ratio for North Dakota Representative Farms by Profit

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 0.32 in 2004, increases to 0.33 in 2005, and then remains constant; while the ratio for the medium-size farm increases from 0.39 in 2004 to 0.40 in 2013. The debt-to-asset ratio for the small-size farm slowly increases from 0.50 in 2004 to 0.51 in 2005, and then slowly increases to 0.53 by 2011.

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 another investment opportunity with the possibility of higher returns or markedly restructure the farming operation to improve its profitability.

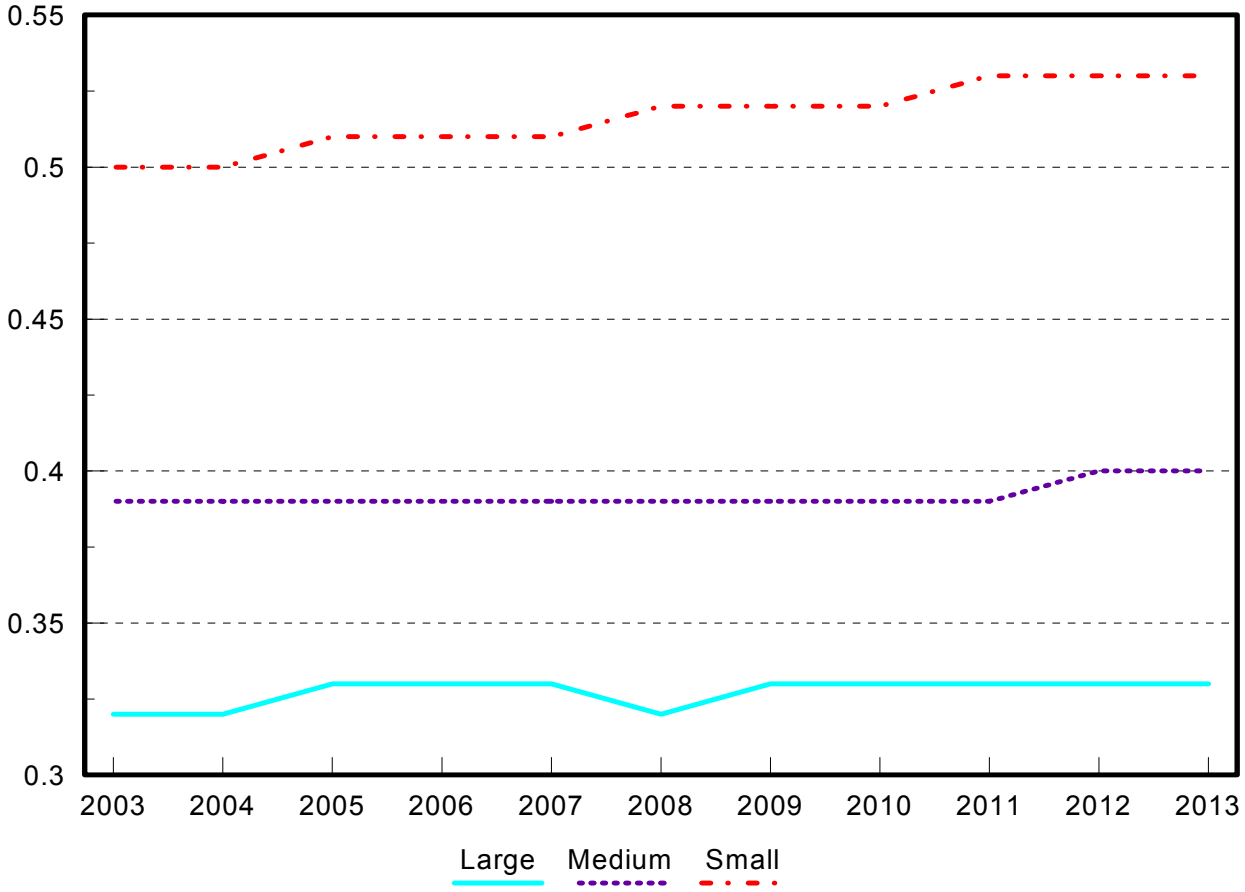


Figure 10. Debt-to-asset Ratio for North Dakota Representative Farms by Size

Land Value and Cash Rents

Table 6 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 only 2.0%.

Table 6. North Dakota Land Prices for Average-Profit Representative Farms

	RRV	NC	SC	West	State
	----------$/acre----------				
2003	815.71	404.09	413.06	298.94	482.95
2004	818.28	405.83	416.56	299.56	485.06
2005	820.86	407.67	419.82	300.11	487.11
2006	822.88	409.32	422.38	300.62	488.80
2007	824.50	410.93	424.39	301.10	490.23
2008	828.09	412.46	425.86	301.52	491.98
2009	829.46	413.88	426.92	301.94	493.05
2010	830.72	415.08	427.30	302.32	493.85
2011	832.14	417.24	426.91	303.03	494.83
2012	832.41	418.63	426.56	303.33	495.23
2013	832.05	419.70	425.40	303.64	495.20
2004-2013 avg	827.14	413.07	424.21	301.72	491.54

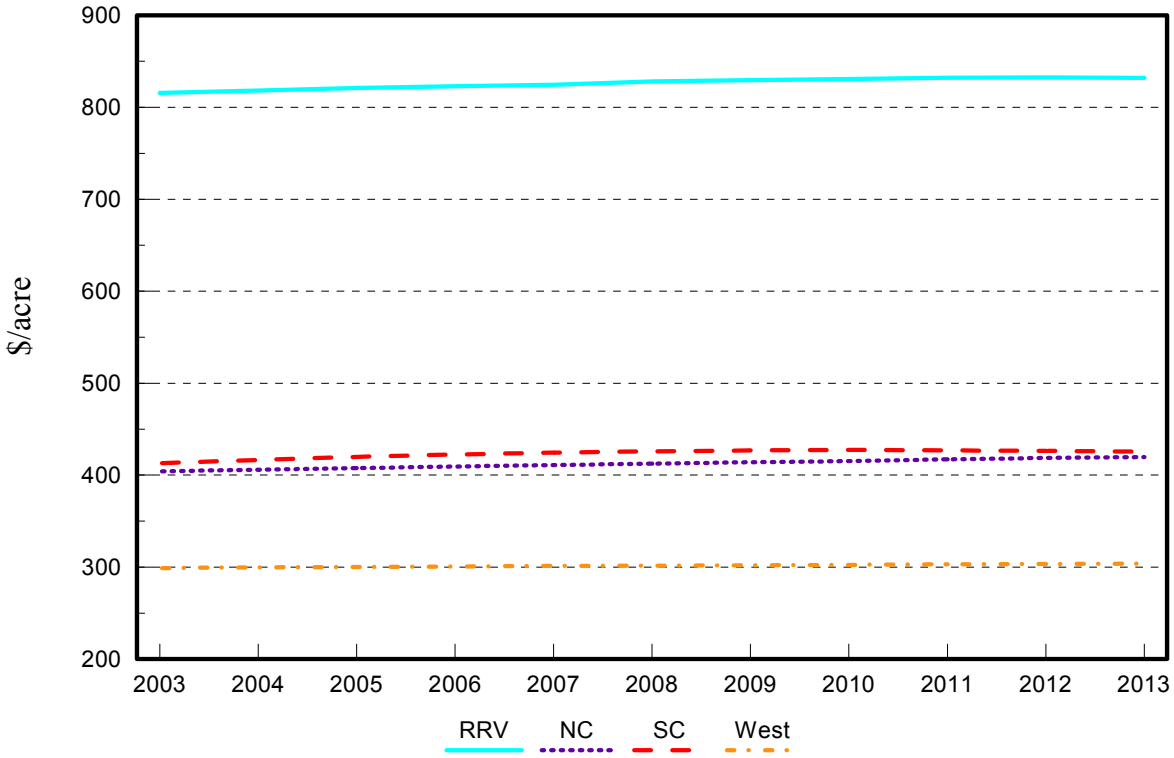


Figure 11. Average Value of Cropland for North Dakota Average-Profit Representative Farms

Cash rents for the average-profit farms slowly increase in all regions (Table 7). Cash rents also differ between regions; the highest are in the RRV, and the lowest are in the West (Figure 12).

Table 7. North Dakota Cash Rent for Average-Profit Representative Farms

	RRV	NC	SC	West	State
	----------$/acre----------				
2003	61.06	33.59	35.57	28.20	39.61
2004	61.25	33.73	35.87	28.26	39.78
2005	61.44	33.89	36.15	28.31	39.95
2006	61.59	34.03	36.37	28.36	40.09
2007	61.71	34.16	36.55	28.41	40.21
2008	61.98	34.29	36.67	28.45	40.35
2009	62.09	34.40	36.77	28.48	40.43
2010	62.18	34.50	36.80	28.52	40.50
2011	62.29	34.68	36.76	28.59	40.58
2012	62.31	34.80	36.73	28.62	40.61
2013	62.28	34.89	36.63	28.65	40.61
2004-2013 avg	61.91	34.34	36.53	28.46	40.31

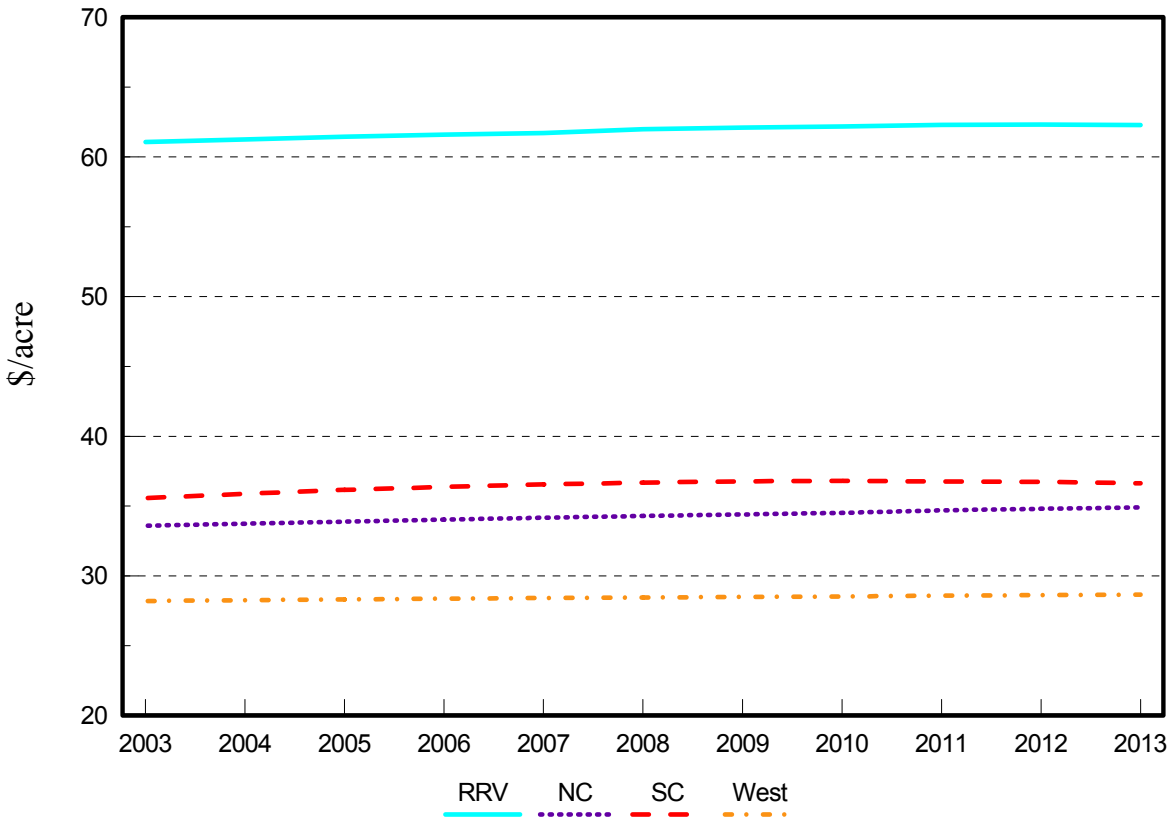


Figure 12. Average Cash Rent of Cropland for North Dakota Average-Profit Representative Farms

CONCLUDING REMARKS

Net farm income in 2013 may be lower than in 2003. The higher prices received in 2003 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.

Probabilities that actual net farm income will be with 15% of the projections were between 30% and 50% for most farms, with the exception of the low-profit farms. The probabilities were calculated based on historical means and standard deviations.

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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