Agricultural Economics Report No. 343 February 1996

IMPACTS OF ALTERNATIVE FARM PROGRAMS ON THE NORTH DAKOTA AGRICULTURAL ECONOMY

Won W. Koo
Marvin R. Duncan
Richard D. Taylor
Dwight G. Aakre

Department of Agricultural Economics • Agricultural Experiment Station
North Dakota State University • Fargo, ND 58105-5636

Acknowledgments

The authors extend appreciation to Dr. Roger Johnson, Dr. William Nelson, and Mr. David Saxowsky for their constructive comments and suggestions. Special thanks go to Ms. Charlene Lucken, who provided editorial comments, and Ms. Carol Jensen, who helped to prepare the manuscript.

This research was conducted under the Northern Plains International Trade Research Program funded by USDA-CSREES special research grand (Grant No. 92-34192-7193).

Table of Contents

List of Tables

List of Tables (Cont.)

List of Figures

Highlights

This analysis is based on the North Dakota Representative Farm Model. The farms in each region are representative of the average, high, and low profit farms enrolled in the North Dakota Farm and Ranch Business Management Association. The representative farms are developed from the North Dakota Vocational Agriculture Department farm record system data provided by cooperating North Dakota farmers.

The objective of this study was to evaluate changes in the average net farm income, debt-to-asset ratio, cash rent, and cropland prices for the representative farms under the alternative farm programs. This study focused on five major crops: wheat, barley, corn, soybeans, and sunflowers under an assumption that farming activities associated with other commodities remained constant.

Average Net Farm Income

*Net farm income fell under all programs including the **Base** program. The **30% Normal Flex** program maintained the highest net income of $54,632 IN 2003 while the **No Farm** program had the lowest net income of $43,246 in 2003. Average net farm income for 1996-2000 is $56,964 under the **Base** program, $30,309 under the **No Farm** program, $40,617 under the **Marketing Loan** program, $43,400 under the **Revenue Assurance** program, $50,067 under the **30% Normal Flex** program, and $56,265 under the **Freedom to Farm** program.*

Average Prices of Cropland

*The average price of cropland fell under all programs including the **Base** program. For the **Base** program, cropland fell $46 to $396 per acre by 2003. The **No Farm** program had the lowest ending price of $190 per acre. The price of cropland for the **30% Normal Flex** and **Freedom to Farm** programs were $351 and $355, respectively.*

Debt-to-Asset Ratio

*The debt-to-asset ratio for the average profit representative farm under the **Base** program increased from 0.40 in 1995 to 0.43 in 2003 under the **Base** program. The debt-to-asset ratio for the low profit representative under the **Base** program increased from 0.55 in 1995 to 0.59 in 2003. Under the **No Farm** program, the debt-to-asset ratio for the average profit representative farm increased from 0.40 in 1995 to 0.53 in 2003. The debt-to-asset ratio for the low profit representative farm under the **No Farm** program increased from 0.55 in 1995 to 0.70 in 2003. The increase in debt-to-asset ratios for the **30% Normal Flex** and **Freedom to Farm** programs were the same. For the low profit representative farm, the ratios increased from 0.55 in 1995 to 0.61 in 2003.*

Rental Income for Farmland

Cash rent fell from $37 per acre to $35 per acre under the ***Base*** *program for the years 1995 to 2003. Under the* ***No Farm*** *program, cash rent fell from $37 per acre to $16 per acre. Under the* ***Marketing Loan*** *and* ***Revenue Assurance*** *programs, cash rent fell to $20 and $22 per acre, respectively, in 2003. Under the* ***30% Normal Flex*** *and* ***Freedom to Farm*** *programs, cash rent fell to $29 and $30 per acre, respectively, in 2003.*

Impacts of Alternative Farm Programs on the North Dakota Agricultural Economy

Won W. Koo, Marvin R. Duncan, Richard D. Taylor, Dwight G. Aakre*

Introduction

The United States Congress has debated numerous farm program alternatives in recent months. Options ranged from the complete elimination of all farm subsidies (about $10 billion in 1994) to the administration proposal of a $4.2 billion reduction in direct payments to agriculture spread over seven years.

The objective of this study was to evaluate the impact of these alternative farm programs on the North Dakota agricultural economy. Special attention was given to changes in net farm income, land prices, farm debt-to-asset ratios, and cash rental rates for representative farms in North Dakota under the alternative farm programs. Five different alternatives were studied. These alternative farm programs are summarized as follows:

1. No Farm program - This option eliminates all federal programs that involve direct spending to support agricultural sector income. Some of these are a target price and deficiency payment program for crop commodities, export enhancement program, sunflower and cottonseed oil assistance programs, a dairy export incentive program, and dairy price support and marketing order programs. The option also eliminates all authority for acreage reduction programs.

2. Marketing Loan program - This option eliminates the target price and deficiency payment programs for commodities, commodity loan programs, and all acreage reduction authority and replaces them with a new recourse marketing loan with loan rates set as a proportion of the current crop commodity target prices. The export enhancement program (EEP) is eliminated. The dairy price support and marketing order programs and other farm programs continue to operate under current law.

3. Revenue Assurance program - This option eliminates target price and deficiency payments programs, commodity loan programs, and all acreage reduction programs and replaces them with a program that ensures producer revenues at 70% of gross revenue calculated by multiplying the 5-year moving average posted county commodity price (or equivalent) by a producer's 5-year average yields. In addition, producers are provided with decoupled transition payments of 80% of historical deficiency payments based on the 1990

---

*Koo and Duncan are professors, Taylor is a research associate, and Aakre is an extension specialist, all in the Department of Agricultural Economics at North Dakota State University, Fargo.

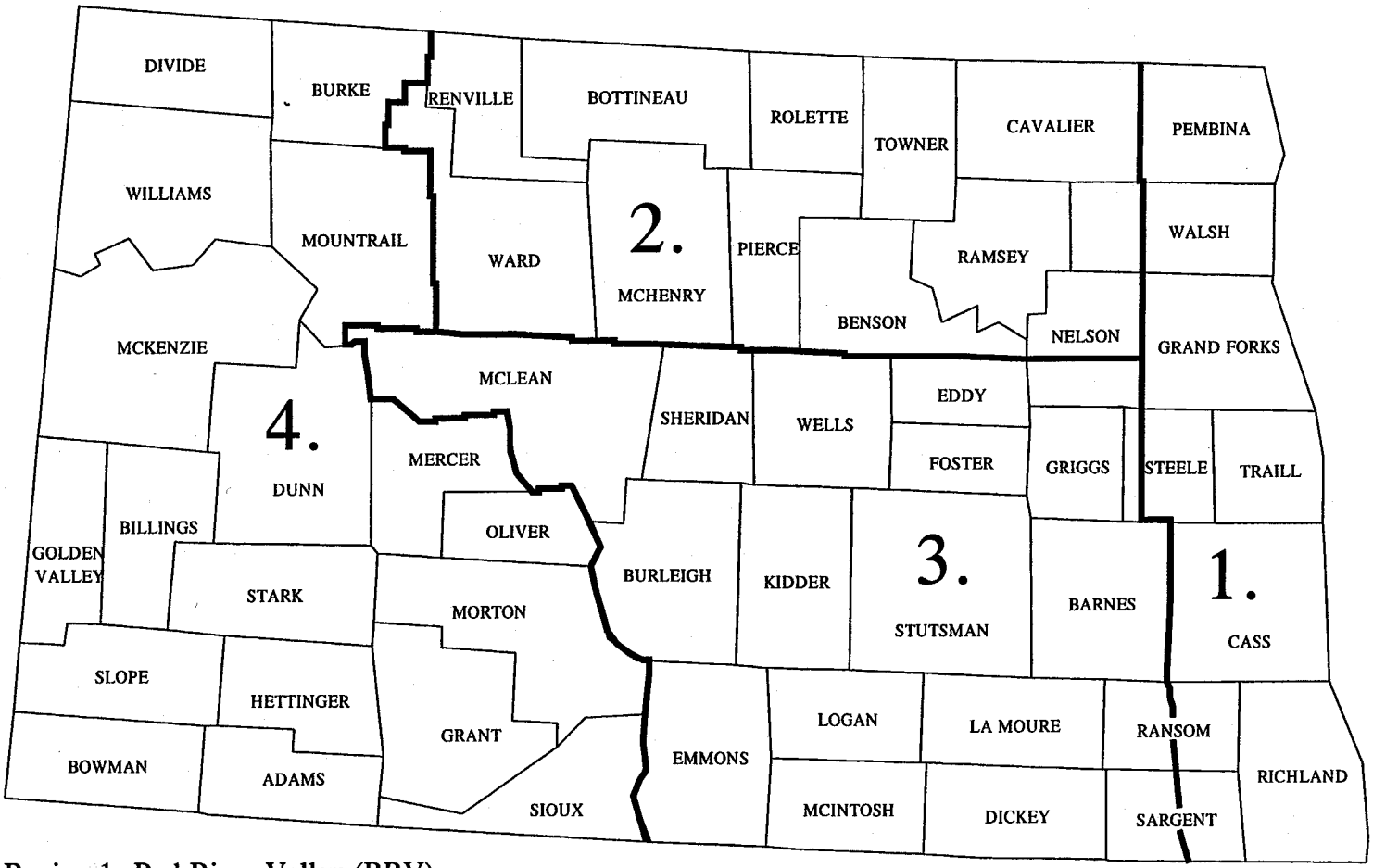
farm program in 1996, 60% in 1997, 40% in 1998, 20% in 1999, and 0% in 2000. This program maintains EEP. Dairy price support and marketing order programs and other farm programs are the same as under current law.

4. The Freedom to Farm program - This option reduces spending for government farm programs from its 1995 approved outlay level of $14 billion to levels that would achieve a savings of $13.4 billion over a seven-year period beginning in 1996. A total of $2.4 billion in budget savings are assumed to be obtained from the Dairy, Peanuts, and EEP programs (FAPRI). The **Freedom to Farm** program decouples farm program payments from production by establishing a decreasing payment based on historical deficiency payments and marketing loan gains. Marketing loans at 70 percent of the preceding 5-year national average cash price will be available. Producers have complete planting flexibility within their total acreage base. All acreage reduction programs are eliminated, and conservation compliance is continued. Conservation Reserve Program (CRP) funding is maintained, but renewals of contracts will be at rental rates no higher than 75% of current rates.

5. The 30% Normal Flex program - This program reduces spending for government farm programs from the 1995 approved outlay level of $14 billion to levels that would achieve a savings of $13.4 billion over a 7-year period beginning in 1996. A total of $2.4 billion in budget savings is assumed to be obtained from the dairy price support, peanuts, and EEP programs (FAPRI). The **30% Normal Flex** program increases non-paid flex acres to 30%. It allows production of alternative crops on total acreage base. Crop commodity price support loans will be established under the 1990 Farm Act formulas. The EEP is reduced by 20% per year, and CRP acreage will decline over the forecast period to around 17 million acres in 2003, as a result of fixed outlay caps on the program. The basic structure of the current farm program is the foundation for the **30% Normal Flex** program. Individual year deficiency payments will be subject to caps.

Methodology

This analysis is based on the North Dakota Representative Farm Model which uses the Food and Agricultural Policy Research Institute (FAPRI) projections as an input. Table 1 shows the FAPRI commodity price projections under the **Base** program. The prices for the other programs are similar. The model has 12 representative farms, three farms in each of four regions: the Red River Valley (RRV), North Central (NC), South Central (SC), and Western (West) (Figure 1). The farms in each region are representative of the average, high, and low profit farms enrolled in the North Dakota Farm and Ranch Business Management Association. The representative farms are developed from the North Dakota Vocational Agriculture Department farm record system data provided by cooperating North Dakota farmers.



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

Figure 1. North Dakota Farm and Ranch Business Management Regions

Table 1. FAPRI Estimated Commodity Prices

	Wheat	Barley	Soybeans	Corn	Sugar
	----------dollars/bu----------				cents/lb
1993	3.26	1.99	6.40	2.50	21.49
1994	3.47	2.02	5.35	2.15	22.05
1995	3.35	2.21	5.48	2.31	21.77
1996	3.14	2.19	5.67	2.24	21.77
1997	2.99	2.03	5.63	2.11	21.77
1998	3.01	2.03	5.59	2.21	21.77
1999	3.15	2.04	5.67	2.22	21.77
2000	3.33	2.06	5.75	2.25	21.77
2001	3.39	2.11	5.89	2.32	21.77
2002	3.46	2.13	6.06	2.29	21.77
2003	3.57	2.20	6.12	2.38	21.77

This study focuses on the effects of alternative farm programs on average net farm income, debt-to-asset ratio, cash rent, and cropland prices for representative farms for producing five major crops: wheat, barley, corn, soybeans, and sunflowers on the representative farms. The representative farms average 1200 acres of cropland and 410 acres of pasture. Physical characteristics of the individual representative farms in each region are shown in Table 2. The farms in the study are about 50 percent larger than the state average reported by National Agricultural Statistical Service (NASS). A reason for this difference is the state average farm includes all farms with $1,000 or more sales; therefore all hobby farms, farms operated as part of a combined larger farm, semi retired farms, and commercial farms, while the farms used in this study represent mainly commercial farms. Table 3 shows the distribution of farms in North Dakota by size (NASS). The average farm size in North Dakota is 796 crop acres. About 43 percent of total farms in North Dakota has a farm size less than 1000 crop acres, while the balance has more than 1000 cropland acres. In addition, small farms (less than 200 acres) account for 25 percent of total farms in North Dakota and only 3% of total land farmed.

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 percent of farm profitability for each production region. The low profit representative farm is an average of farms in the low 20 percent of farm profitability for the state or for each production region.

Table 2. Characteristics of Average Representative Farms in North Dakota

	State Ave[1]	RRV	NC	SC	WEST
	acres				
Cropland	798	1234	1181	1369	1017
Owned land		217	385	504	489
Wheat	355	550	733	706	625
Barley	88	162	217	142	90
Sunflower	40	66	61	136	0
Corn	24	77	0	43	0
Soybeans	34	244	0	37	0
Sugar beet		55	0	0	0
Pasture		23	340	351	927

Source: North Dakota Farm and Ranch Business Management, 1993
[1]North Dakota Agricultural Statistics

Table 3. Size Distribution and Number of North Dakota Farms in Each Size Category

Size	Number of Farms	Total Acres	Percent of Total Number	Percent of Total Acres
< 100	3,664	166,535	13.18	0.87
< 200	3,244	465,523	11.67	2.42
< 500	7,304	2,442,104	26.27	12.71
< 1000	7,202	5,163,337	25.90	26.87
Greater 1000	6,390	10,977,948	22.98	57.13
Total	27,804	19,215,447	100.00	100.00

Source: 1992 Census of Agriculture

The basic structure of the model is shown in Figure 2. Alternative farm policy affects 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 land prices affect cash rental rates 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.

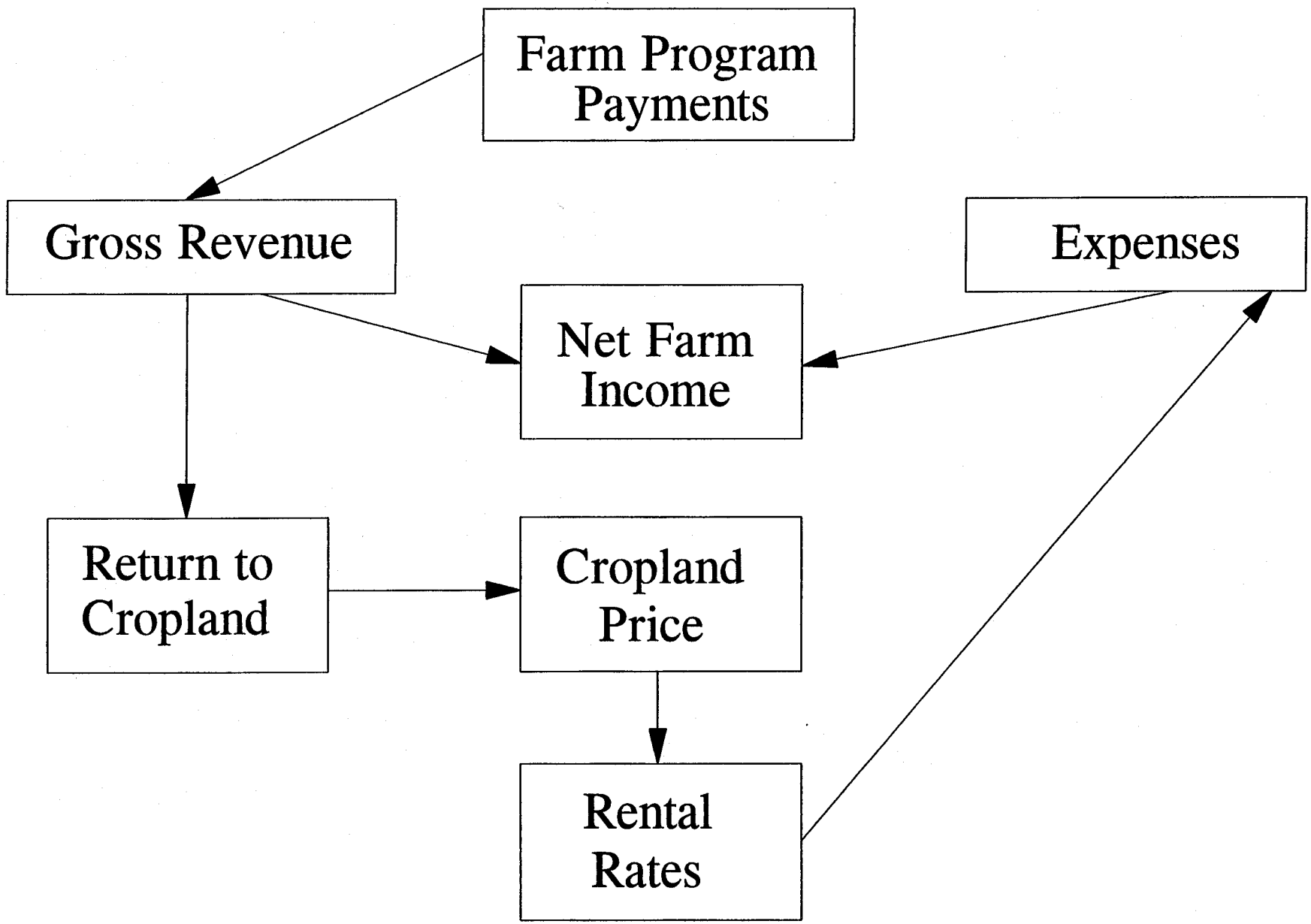


Figure 2. Structure of the North Dakota Representative Farm Model

Structure of the Representative Farm Model

The model consists of two components: revenues and costs. The revenue component represents the total income from the farm operation including farm program payments from the federal government. The cost components include all expenses incurred in producing the crop and livestock.

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, including 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:

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

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 1993 were used to estimate price equations. The estimated coefficients are shown in Table 4. Those equations were used to estimate cash prices received by North Dakota farmers. 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 1993. 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.

Table 4. Estimated Regression Coefficients for North Dakota Farm Prices and R^2 for Price Equations

North Dakota Price	Intercept	FAPRI Price	Trend[1]	Dummy[3]	R^2
Spring Wheat	0.094	0.997			0.830
	(0.806)	(0.0001)			
Durum Wheat	-1.072	1.458			0.655
	(0.207)	(0.0001)			
Malt barley	-0.647	1.249			0.783
	(0.080)	(0.0001)			
Feed barley	-0.158	0.863			0.944
	(0.179)	(0.0001)			
Sunflower	-2.148	1.070	0.136		0.702
	(0.350)	(0.0001)	(0.389)		
Soybeans	0.361	0.906			0.899
	(0.456)	(0.0001)			
Corn	0.062	0.924			0.933
	(0.650)	(0.0001)			
Sugar beets	6.340	1.064	0.880	-12.982	0.894
	(0.119)	(0.0002)	(0.0002)	(0.002)	

[1]Trend is from 1 to 16.
[3]Dummy=1 if year = 1981 otherwise Dummy = 0.
t-values in paraphrase.

Cropland 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 return allocated to each acre of cropland in 1994 is divided by the average cropland price to determine the capitalization rate used by farmers as follows:

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

where

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

In subsequent model forecast years, this capitalization rate is applied to income per acre allocated to cropland to determine cropland value for land utilized to produce wheat, corn, soybeans, barley, and sunflowers. Changes in income allocated to cropland results in changes in cropland prices based on a 4-year weighted average of income changes. Calculation of cropland prices is summarized as:

$$(3) \qquad PL_g = \frac{1}{R_g} \frac{1}{4} \sum_{t=1}^{4} W_t M_{tg}$$

where

PL_g = cropland price in region g
W_t = weighting factor for year t; weights are 0.4, 0.3, 0.2, and 0.1 for year 1, 2, 3, and 4, respectively
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.

Debt-to-asset Ratio. Debt-to-asset ratio is calculated by dividing total outstanding farm debt by total farm assets. Total debt includes debt on land, intermediate debt, and short-term debt. Total assets include price of farmland times acres of farmland, depreciated value of farm equipment and supplies, livestock, and liquid assets. Value of farm equipment, supplies, and livestock is assumed to be constant.

Cash Rent. Cash rent for cropland is based on a 3-year moving average of farmland price using 1993 as the base year. Calculation of cash rent is summarized by

$$(4) \qquad CR_g = \frac{1}{3} \sum_{t=1}^{3} VL_{gt} R_g + TX$$

where

CR_g = cropland cash rent in region g
VL_{gt} = net return to cropland in region g and year t
TX = taxes on land

Assumptions

This analysis is based of the following assumptions:

1. Net farm income from livestock operation and production of other crops, including potatoes and canola, 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. All farms within a region have the same crop mix.
6. All farms within a region receive the same price for commodities.
7. Yield differentials that existed in 1993 continue throughout the forecast period for high, average, and low profit farms.

Results

The results were divided into four parts: first, impacts of alternative farm programs on North Dakota net farm income; second, impacts of alternative farm programs on cropland prices; third, impacts of alternative farm programs on cropland rents; and fourth impacts of alternative farm programs, debt-to-asset ratios.

Average Net Farm Income

Table 5 shows average net farm income in North Dakota for the forecast period under alternative farm programs. For the **Base** program, average net farm income for the 1996 to 2000 for a representative farm is $56,694 per year, and that for 1996 - 2003 is $55,975 per year. Average net farm income declines 4.8 percent for 1996 - 2000 and 6.2 percent by 2003. This is mainly because the increase in crop yields, and FAPRI's price forecasts do not increase gross income fast enough to keep in line with increases in crop expenses.

Under the **No Farm** program, net farm income declines 56.7 percent for 1995-97 and increases gradually over the remaining period. This recovery in net farm income is due, first, to an increase in FAPRI's price forecast in the latter years of the forecast period and second, to cash rent changes at a lagged rate as net farm income changes. Therefore, cash rent expenses decrease initially as income attributed to land decreases. Conversely, as net income attributable to land increases, cash rents begin to rise. Net farm income in 2003 is 25.3 percent lower than the 1995 level.

Table 5. Net Farm Income Under the Base and Alternative Farm Programs

	Base	No Farm Program	Marketing Loan	Revenue Assurance	Flex	Free
	----------	----------	dollars	----------	----------	----------
1995	57,946	57,930	58,033	58,004	57,946	58,021
1996	58,383	27,271	40,353	50,782	52,841	54,270
1997	58,065	25,090	40,190	43,103	48,725	50,110
1998	56,591	28,340	40,001	41,004	47,440	49,185
1999	55,269	32,734	40,456	40,041	48,746	49,814
2000	55,163	38,100	42,086	42,071	52,583	52,943
2001	55,374	41,415	44,049	45,485	54,572	54,132
2002	54,605	41,688	43,757	47,611	54,494	54,098
2003	54,355	43,246	43,746	51,128	54,800	54,632
Average (1996-2000)	56,694	30,307	40,617	43,400	50,067	51,265
% Change from base	0	46.5	28.4	23.4	11.7	9.6
Average (1996-2003)	55,975	34,735	41,830	45,153	51,775	52,398
% Change from base	0	37.9	25.3	19.3	11.1	6.4

Average net farm income for 1996-2000 is $30,307 per year under the **No Farm** program, which is 46.5 percent lower than that under the **Base** farm program. Average net farm income for 1996-2003 is $34,735 which is 37.9 percent lower than that under the current program.

The **Marketing Loan** program reduces net farm income, but the rate of income reduction is smaller than that under the no farm program. Net farm income declines 31.1 percent for 1995-1998 and increases throughout the balance of the forecast period ending in 2003, mainly due to downward adjustment in farm operating expenses from lower cash rent. Net farm income in 2003 is 25.3 percent lower than the 1995 level. Average net farm income for 1996-2000 is $40,617, and that for 1996-2003 is $41,830 under the **Marketing Loan** program. The average net farm incomes are 28.4 percent and 25.3 percent lower, respectively, than those under the current farm program. The **Marketing Loan** program provides farmers with higher net farm income than under the **No Farm** program.

The **Revenue Assurance** program provides farmers with higher net farm income than the **Marketing Loan** program. But average net farm income is 23.4 percent lower than that under the **Base** program for 1996-2000 and 19.3 percent lower for 1996-2003. Like both the **No Farm** and **Marketing Loan** programs, net farm income under this program declines to the lowest level in 1999 and increases gradually throughout 2003 mainly because FAPRI's price forecasts increase towards the end of the forecast period and general reductions in cash rent.

Under the **30% Normal Flex** program, the average net farm income falls to $47,440 in 1998, but rises to $54,800 by 2003. Under the **Freedom to Farm** program, average net farm income falls to a low of $49,185 in 1998, but recovers in 2003 to $54,632. Both farm program alternatives result in a drop in net income just after implementation of the program, but both recover to levels higher than the **Base** in 2003. Reasons for recovery are because FAPRI's price forecasts increase towards the end of the forecast period and because of declines in cash rent that lower operating expenses. The average reduction in net farm income for 1996-2000 is $4,200 from the **Base** under the **30% Normal Flex** and $3,577 under the **Freedom to Farm** programs.

Figure 3 shows changes in net farm income under alternative farm programs during the forecast period. In all the alternative programs, net farm income declines substantially within 2 to 3 years and increases gradually over the remainder of the forecast period. Net farm income under the **Revenue Assurance** program declines more slowly than under the **Base** and **Marketing Loan** programs and recovers faster than under other programs.

Average Prices of Cropland

Table 6 presents average prices of cropland used to produce wheat, barley, corn, soybeans, and sunflowers in North Dakota under alternative farm programs during the forecast period. Under the **Base**, average prices of cropland decline gradually during the entire period. Decreases in cropland prices over the 1996-2000 forecast period are 11.9 percent under the current farm programs, 56 percent under the **No Farm** program, 51.3 percent under the **Marketing Loan** program, 41.4 percent under the **Revenue Assurance** program, 21.0 percent under the **Freedom to Farm** program, and 21.9 percent under the **30% Flex** Program.

Decreases in cropland prices for 1996-2003 are greater than for 1996-2000. Comparing cropland prices in the base model with those in alternative models in 1996-2003, cropland prices decline 35.9% under the **No Farm** program scenario, 22.9% under the **Marketing Loan** program, 16.3% under the **Revenue Assurance** program, 9.8% under the **30% Normal Flex**, program and 8.0% under the **Freedom to Farm** program.

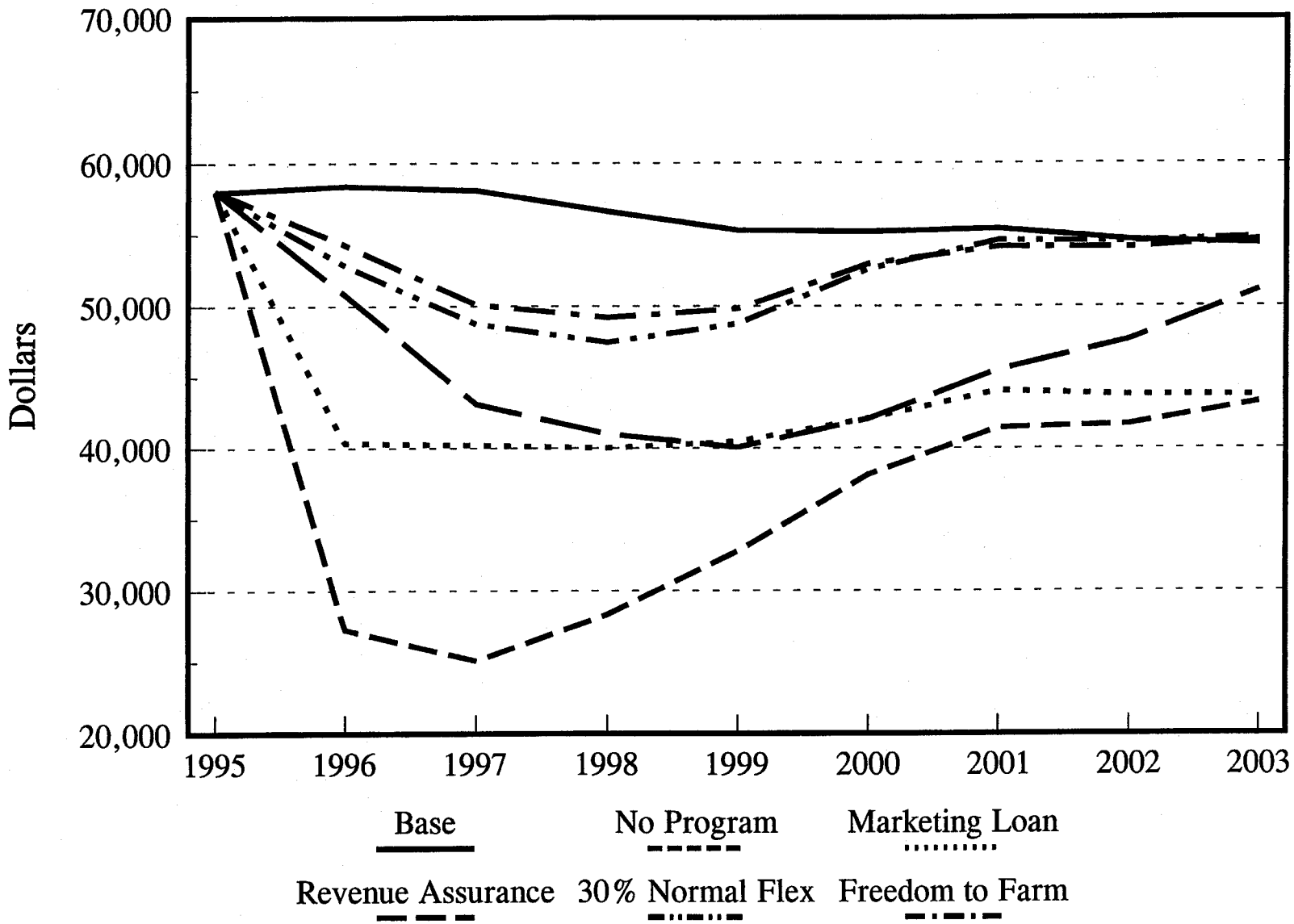


Figure 3. Net Farm Income for North Dakota Average Representative Farm Under the Base and Alternative Farm Programs

Table 6. Cropland Prices Under the Base and Alternative Farm Programs

	Base	No Farm Program	Marketing Loan	Revenue Assurance	Flex	Free
	$/acre					
1995	442	442	442	442	442	442
1996	449	449	450	450	449	450
1997	455	341	388	426	434	440
1998	457	250	340	380	407	416
1999	452	210	302	335	380	393
2000	438	192	259	293	360	373
2001	422	189	244	255	354	365
2002	410	191	232	246	355	362
2003	396	190	219	241	351	355
Average (1996-2000)	450	289	348	377	406	414
% Change from base	0	35.9	22.7	16.3	9.8	8.0
Average (1996-2003)	436	272	320	341	386	394
% Change from base	0	37.4	26.7	21.8	11.4	10.5

Figure 4 shows changes in cropland prices under alternative farm programs during the forecast period. Cropland prices under all alternative farm programs decline during the forecast period. Cropland prices in the **Freedom to Farm** program are the highest among alternative farm programs. Under the **Base** program, the representative farm, on average, would be willing to pay about $46 less per acre at the end of the forecast period in 2003. This is mainly because net farm income, on average, fell over the period for the average representative farm, leaving it with less profit to annually allocate to farmland.

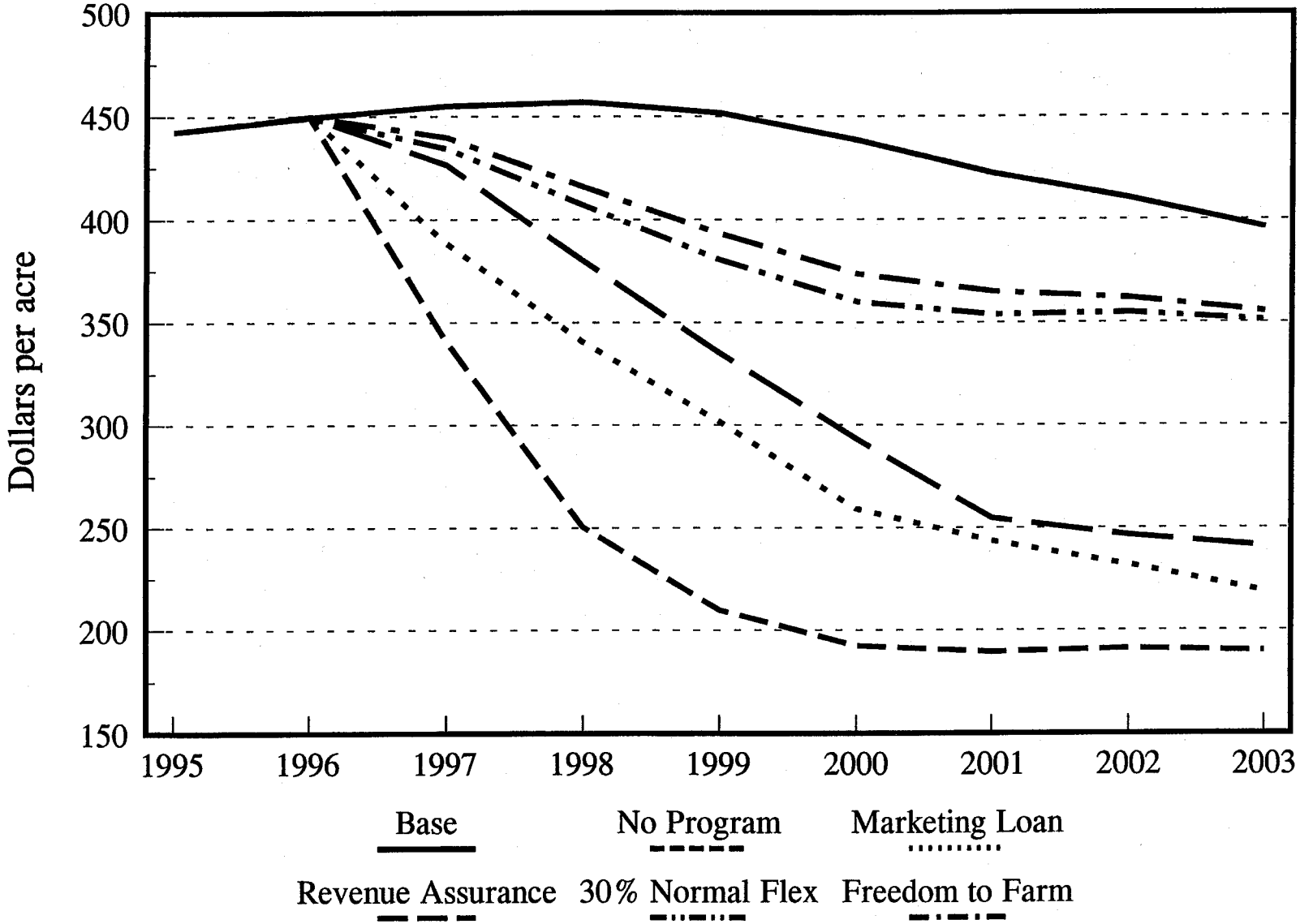


Figure 4. Average Prices of Cropland Paid by North Dakota Average Representative Farm Under Base and Alternative Farm Programs

Debt-to-Asset Ratios

Table 7 shows the change in representative farm debt-to-asset ratios under the **Base** program for the average farms, the high profit farms, and the low profit farms in each region and for the state as a whole. For the average profit farm in the state, the ratio is 0.43 in 2003, which is 3 points higher than in 1995. The ratio is highest in the Red River Valley Region at 0.47 in 2003. The ratio rises during the forecast period in each of the regions. For the high profit farm in the state, the ratio is 0.31 in 2003. The ratio rises in all regions of the state. For the low profit farm in the state, the ratio is 0.59 in 2003. The ratio rises in all regions of the state during the forecast period. In each region, except the North Central Region, the ratio increases to or above 0.60, a level that places the credit worthiness of the representative farm in some jeopardy.

Table 8 shows the change in the debt-to-asset ratios under the **No Farm** program. For the average profit representative farm in the state, the ratio rises by 15.4 points during the forecast period to 0.53 percent in 2003. The ratio rises during the forecast period in each of the production regions. For the high profit farm in the state, the ratio is 0.38 in 2003. The ratio rises in each of the production regions. In the South Central Region, the ratio reaches as high as 0.43 in 2003. The ratio rises during the forecast period in each of the production regions. For the low profit farm in the state, the ratio is 0.70 in 2003. The ratio is 0.62 in the North Central region at the end of the forecast period and 0.76 in the West and 0.75 in the South Central. The credit worthiness of these farms is very doubtful at the end of the forecast period.

Table 9 shows the change in the debt-to-asset ratios under the **Market Loan** program. For the average profit representative farm in the state, the ratio rises from 0.40 in 1995 to 0.52 in 2003. The ratio rises during the forecast period in each of the production regions. For the high profit farm in the state, the ratio is 0.37 in 2003. The ratio rises during the forecast period in each of the production regions. In both the South Central Region and the West, the ratio rises to 0.43 by 2003; in the North Central Region, the ratio rises only to 0.30.

For the low profit farm in the state, the ratio is 0.69 in 2003. The ratio rises during the forecast period in each of the production regions. In the North Central Region, the ratio rises to 0.58, the low among the regions. The ratio tops 0.70 in the South Central and West Regions. In those two regions, the credit worthiness of this farm is very doubtful at the end of the forecast period.

Table 7. North Dakota Representative Farms Debt-to-Asset Ratios Under the Base Program

	RRV	NC	SC	WEST	State
Average profit farms					
1995	0.44	0.35	0.39	0.42	0.40
1996	0.44	0.35	0.39	0.43	0.40
1997	0.44	0.35	0.39	0.43	0.40
1998	0.44	0.35	0.40	0.43	0.41
1999	0.45	0.36	0.41	0.44	0.41
2000	0.46	0.36	0.41	0.45	0.42
2001	0.46	0.36	0.42	0.45	0.42
2002	0.47	0.36	0.43	0.46	0.43
2003	0.47	0.36	0.44	0.46	0.43
5 yr (1996-2000)	0.45	0.35	0.40	0.43	0.41
High profit farms					
1995	0.29	0.25	0.28	0.34	0.29
1996	0.28	0.26	0.28	0.35	0.29
1997	0.28	0.25	0.28	0.35	0.29
1998	0.28	0.26	0.28	0.35	0.29
1999	0.29	0.26	0.29	0.36	0.30
2000	0.29	0.26	0.30	0.36	0.30
2001	0.29	0.26	0.30	0.37	0.30
2002	0.30	0.26	0.31	0.37	0.31
2003	0.30	0.26	0.31	0.37	0.31
5 yr (1996-2000)	0.29	0.26	0.28	0.35	0.29
Low profit farms					
1995	0.61	0.46	0.54	0.59	0.55
1996	0.61	0.46	0.54	0.59	0.55
1997	0.61	0.46	0.54	0.60	0.55
1998	0.62	0.47	0.55	0.61	0.56
1999	0.62	0.47	0.56	0.62	0.57
2000	0.63	0.47	0.57	0.63	0.57
2001	0.64	0.47	0.58	0.64	0.58
2002	0.64	0.48	0.59	0.65	0.59
2003	0.64	0.48	0.60	0.65	0.59
5 yr (1996-2000)	0.62	0.47	0.55	0.61	0.56

Table 8. North Dakota Representative Farms Debt-to-Asset Ratios Under the No Farm Program

	RRV	NC	SC	WEST	State
Average profit farms					
1995	0.44	0.35	0.39	0.42	0.40
1996	0.50	0.41	0.49	0.48	0.47
1997	0.54	0.45	0.57	0.51	0.52
1998	0.55	0.47	0.58	0.53	0.53
1999	0.56	0.48	0.59	0.53	0.54
2000	0.56	0.47	0.59	0.53	0.54
2001	0.55	0.47	0.59	0.53	0.53
2002	0.55	0.46	0.59	0.54	0.54
2003	0.55	0.46	0.58	0.54	0.53
5 yr (1996-2000)	0.54	0.45	0.56	0.52	0.52
High profit farms					
1995	0.29	0.25	0.28	0.34	0.29
1996	0.32	0.29	0.35	0.39	0.34
1997	0.34	0.31	0.42	0.42	0.37
1998	0.35	0.32	0.43	0.43	0.38
1999	0.35	0.32	0.43	0.43	0.38
2000	0.35	0.32	0.43	0.43	0.38
2001	0.34	0.31	0.43	0.43	0.38
2002	0.34	0.31	0.43	0.43	0.38
2003	0.34	0.31	0.43	0.43	0.38
5 yr (1996-2000)	0.34	0.31	0.41	0.42	0.37
Low profit farms					
1995	0.61	0.46	0.54	0.59	0.55
1996	0.67	0.54	0.64	0.66	0.63
1997	0.69	0.59	0.72	0.71	0.68
1998	0.70	0.62	0.73	0.73	0.70
1999	0.70	0.64	0.74	0.74	0.70
2000	0.69	0.63	0.74	0.74	0.70
2001	0.68	0.62	0.74	0.75	0.70
2002	0.68	0.62	0.75	0.76	0.70
2003	0.68	0.62	0.75	0.76	0.70
5 yr (1996-2000)	0.69	0.60	0.71	0.72	0.68

Table 9. North Dakota Representative Farms Debt-to-Asset Ratios Under the Marketing Loan Program

	RRV	NC	SC	WEST	State
Average profit farms					
1995	0.44	0.35	0.39	0.42	0.40
1996	0.48	0.38	0.44	0.45	0.44
1997	0.49	0.40	0.47	0.47	0.46
1998	0.51	0.41	0.51	0.48	0.48
1999	0.52	0.42	0.57	0.50	0.50
2000	0.53	0.42	0.57	0.51	0.51
2001	0.53	0.43	0.57	0.52	0.51
2002	0.54	0.43	0.58	0.53	0.52
2003	0.54	0.43	0.58	0.53	0.52
5 yr (1996-2000)	0.51	0.41	0.51	0.48	0.48
High profit farms					
1995	0.29	0.25	0.28	0.34	0.29
1996	0.30	0.27	0.32	0.37	0.32
1997	0.31	0.28	0.34	0.38	0.33
1998	0.32	0.29	0.37	0.39	0.34
1999	0.33	0.29	0.42	0.40	0.36
2000	0.33	0.29	0.42	0.41	0.36
2001	0.33	0.29	0.42	0.42	0.37
2002	0.34	0.30	0.43	0.43	0.37
2003	0.33	0.30	0.43	0.43	0.37
5 yr (1996-2000)	0.32	0.28	0.37	0.39	0.34
Low profit farms					
1995	0.61	0.46	0.54	0.59	0.55
1996	0.65	0.50	0.59	0.63	0.59
1997	0.66	0.52	0.63	0.65	0.61
1998	0.67	0.54	0.66	0.68	0.63
1999	0.67	0.55	0.72	0.70	0.66
2000	0.68	0.56	0.73	0.71	0.67
2001	0.68	0.57	0.73	0.73	0.68
2002	0.68	0.58	0.74	0.75	0.69
2003	0.68	0.58	0.75	0.75	0.69
5 yr (1996-2000)	0.66	0.54	0.66	0.67	0.63

Table 10 shows the change in the debt-to-asset ratios under the **Revenue Assurance** program. For the average profit representative farm in the state, the ratio rises by 0.10 to 0.50 by 2003. The ratio rises during the forecast period in each of the production regions. In the North Central Region, the ratio rises only to 0.41, while in the South Central Region, it reaches a high of 0.57 by 2003. For the high profit farm in the state, the ratio rises 0.5 to 36.0 percent in 2003. In each region, the ratio increases over the period. For the low profit farm in the state, the ratio rises 0.12 to 0.67 by 2003. In the North Central Region, the ratio rises to 0.55 by 2003, the lowest level of the production regions. In both the South Central and West Regions, the ratio reaches 0.73. At those debt-to-asset ratios, credit worthiness is very doubtful for the low profit farms.

The **30% Normal Flex** program results in the smallest rise in debt-to-asset ratios for each representative farm over the forecast period (Table 11). However, in the case of the low profit representative farm, both the **30% Normal Flex** and the **Freedom to Farm** programs result in debt-to-asset ratios of 0.61 at the end of the forecast period (Table 12).

Figure 5 shows the impact of farm program alternatives on debt-to-asset ratios of average representative farms. The debt-to-asset ratios for the **No Farm** program rise the fastest because all farm bill payments are eliminated in 1996. The debt-to-asset ratios for the other programs also rise, but more slowly depending on the amount of farm payments that the farms received. Figure 6 shows the debt-to-asset ratio for the high profit representative farm. The ratio follows the same pattern as the ratio for the average profit representative farm, but it starts at a lower point, 0.29 as opposed to 0.41. Figure 7 shows the debt-to-asset ratio for the low profit representative farm. For the **No Farm** program, the ratio starts at 0.55 and ends at about 0.70 at the end of the analysis. The ratios for the other programs follow the pattern similar to the average and high profit representative farms, but rise higher.

Rental Income for Farmland

Analyses of the impact of farm program changes have thus far focused on the effect on farmers. However, farm program changes also will affect the income earning capacity of farmland rented to operating farmers by investors. Many of these investors are retired persons who depend upon income from this farmland to maintain their retirement lifestyle.

The changes in cash rental rates developed in this analysis are for land rented to produce government program crops (hard red spring wheat, durum, barley, corn, and soybeans). Changes in cash rental rates affect only that land that is cash rented. Owners of share-rented land will experience changes in income as well, but through changes in the amount of net income from their share of the crop produced.

Table 10. North Dakota Representative Farms Debt-to-Asset Ratios Under the Revenue Assurance Program

	RRV	NC	SC	WEST	State
Average profit farms					
1995	0.44	0.35	0.39	0.42	0.40
1996	0.46	0.36	0.41	0.44	0.42
1997	0.48	0.38	0.45	0.46	0.44
1998	0.50	0.40	0.48	0.47	0.46
1999	0.51	0.41	0.52	0.49	0.48
2000	0.52	0.41	0.57	0.50	0.50
2001	0.52	0.41	0.57	0.51	0.50
2002	0.53	0.41	0.57	0.51	0.51
2003	0.52	0.41	0.57	0.51	0.50
5 yr (1996-2000)	0.49	0.39	0.48	0.47	0.46
High profit farms					
1995	0.29	0.25	0.28	0.34	0.29
1996	0.29	0.26	0.29	0.35	0.30
1997	0.30	0.27	0.32	0.37	0.32
1998	0.31	0.28	0.35	0.39	0.33
1999	0.32	0.29	0.37	0.40	0.35
2000	0.33	0.29	0.42	0.41	0.36
2001	0.33	0.29	0.42	0.41	0.36
2002	0.33	0.29	0.42	0.42	0.36
2003	0.33	0.29	0.42	0.41	0.36
5 yr (1996-2000)	0.31	0.28	0.35	0.38	0.33
Low profit farms					
1995	0.61	0.46	0.54	0.59	0.55
1996	0.63	0.48	0.56	0.61	0.57
1997	0.64	0.50	0.60	0.63	0.59
1998	0.66	0.52	0.63	0.66	0.62
1999	0.67	0.54	0.67	0.69	0.64
2000	0.68	0.55	0.67	0.70	0.65
2001	0.67	0.55	0.73	0.71	0.67
2002	0.68	0.55	0.73	0.72	0.67
2003	0.67	0.55	0.73	0.73	0.67
5 yr (1996-2000)	0.66	0.52	0.65	0.66	0.62

Table 11. North Dakota Representative Farms Debt-to-Asset Ratios Under the 30% Normal Flex Program

	RRV	NC	SC	WEST	State
Average profit farms					
1995	0.44	0.35	0.39	0.42	0.40
1996	0.45	0.36	0.41	0.43	0.41
1997	0.46	0.37	0.43	0.45	0.43
1998	0.47	0.38	0.44	0.46	0.44
1999	0.48	0.38	0.46	0.47	0.45
2000	0.48	0.38	0.46	0.47	0.45
2001	0.48	0.37	0.46	0.47	0.45
2002	0.49	0.37	0.46	0.47	0.45
2003	0.48	0.37	0.46	0.47	0.45
5 yr (1996-2000)	0.47	0.37	0.44	0.45	0.43
High profit farms					
1995	0.29	0.25	0.28	0.34	0.29
1996	0.29	0.26	0.29	0.35	0.30
1997	0.29	0.27	0.30	0.36	0.31
1998	0.30	0.27	0.32	0.37	0.31
1999	0.30	0.27	0.33	0.38	0.32
2000	0.30	0.27	0.33	0.38	0.32
2001	0.30	0.27	0.33	0.38	0.32
2002	0.31	0.27	0.33	0.38	0.32
2003	0.30	0.26	0.33	0.38	0.32
5 yr (1996-2000)	0.30	0.27	0.31	0.37	0.31
Low profit farms					
1995	0.61	0.46	0.54	0.59	0.55
1996	0.62	0.47	0.55	0.60	0.56
1997	0.63	0.49	0.57	0.62	0.58
1998	0.64	0.50	0.60	0.64	0.59
1999	0.65	0.51	0.61	0.65	0.60
2000	0.65	0.50	0.61	0.66	0.60
2001	0.64	0.50	0.61	0.66	0.60
2002	0.65	0.50	0.62	0.67	0.61
2003	0.65	0.49	0.63	0.67	0.61
5 yr (1996-2000)	0.64	0.49	0.59	0.63	0.59

Table 12. North Dakota Representative Farms Debt-to-Asset Ratios Under the Freedom to Farm Program

	RRV	NC	SC	WEST	State
Average profit farms					
1995	0.44	0.35	0.39	0.42	0.40
1996	0.45	0.36	0.40	0.43	0.41
1997	0.46	0.37	0.42	0.44	0.42
1998	0.47	0.37	0.43	0.45	0.43
1999	0.47	0.38	0.45	0.46	0.44
2000	0.48	0.37	0.45	0.46	0.44
2001	0.48	0.37	0.45	0.47	0.44
2002	0.48	0.37	0.46	0.47	0.45
2003	0.48	0.37	0.46	0.47	0.45
5 yr (1996-2000)	0.47	0.37	0.43	0.45	0.43
High profit farms					
1995	0.29	0.25	0.28	0.34	0.29
1996	0.29	0.26	0.29	0.35	0.30
1997	0.29	0.26	0.30	0.36	0.30
1998	0.30	0.27	0.31	0.37	0.31
1999	0.30	0.27	0.32	0.37	0.32
2000	0.30	0.27	0.32	0.38	0.32
2001	0.30	0.26	0.32	0.38	0.32
2002	0.31	0.27	0.33	0.38	0.32
2003	0.30	0.26	0.33	0.38	0.32
5 yr (1996-2000)	0.30	0.26	0.31	0.37	0.31
Low profit farms					
1995	0.61	0.46	0.54	0.59	0.55
1996	0.62	0.47	0.55	0.60	0.56
1997	0.63	0.48	0.57	0.62	0.57
1998	0.64	0.49	0.59	0.63	0.59
1999	0.64	0.50	0.60	0.64	0.60
2000	0.64	0.49	0.61	0.65	0.60
2001	0.64	0.49	0.61	0.66	0.60
2002	0.65	0.49	0.62	0.67	0.61
2003	0.65	0.49	0.62	0.67	0.61
5 yr (1996-2000)	0.63	0.49	0.58	0.63	0.58

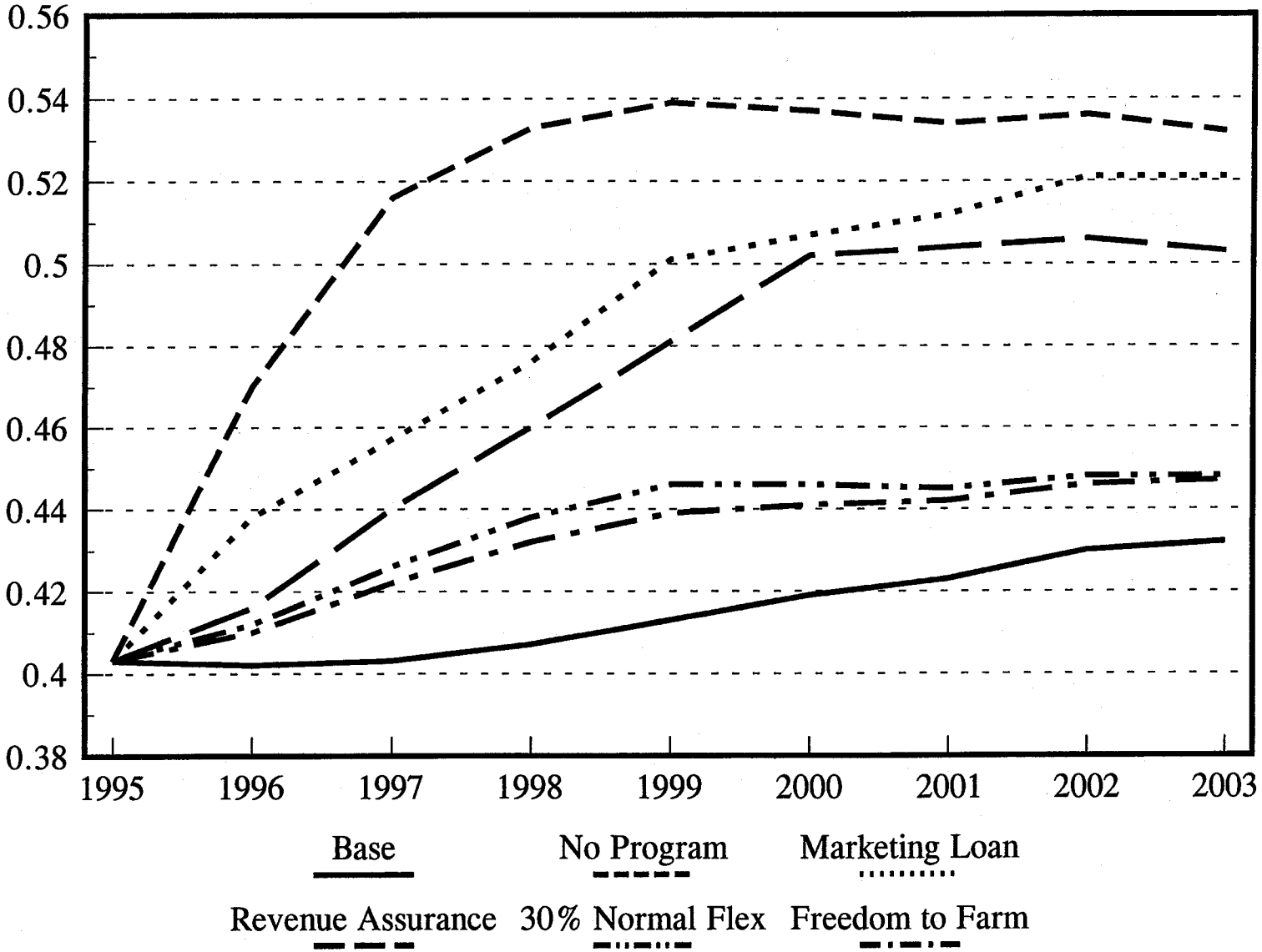


Figure 5. Debt-to-Asset Ratio for North Dakota Average Profit Representative Farm Under Base and Alternative Farm Programs

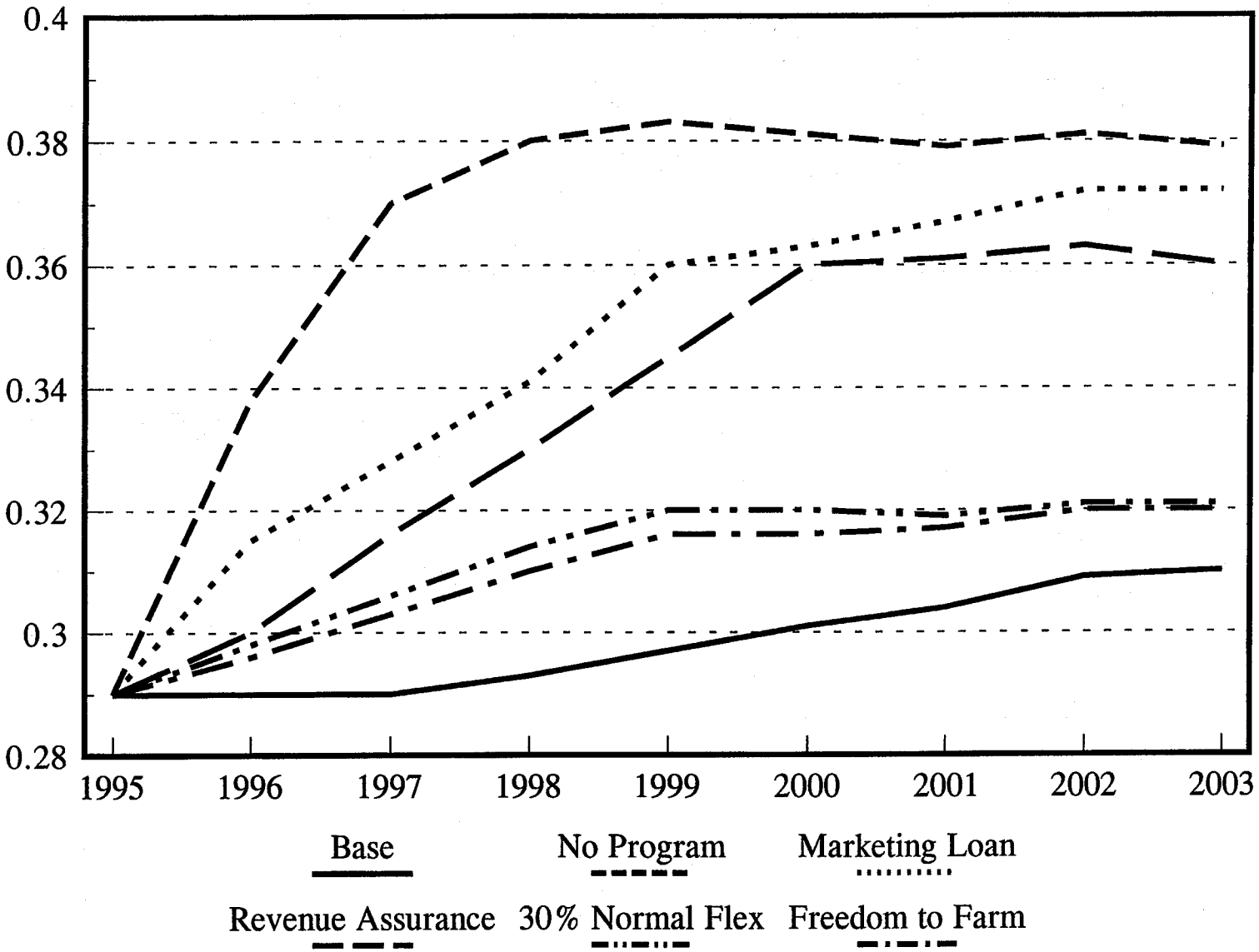


Figure 6. Debt-to-Asset Ratio for North Dakota High Profit Representative Farm Under Base and Alternative Farm Programs

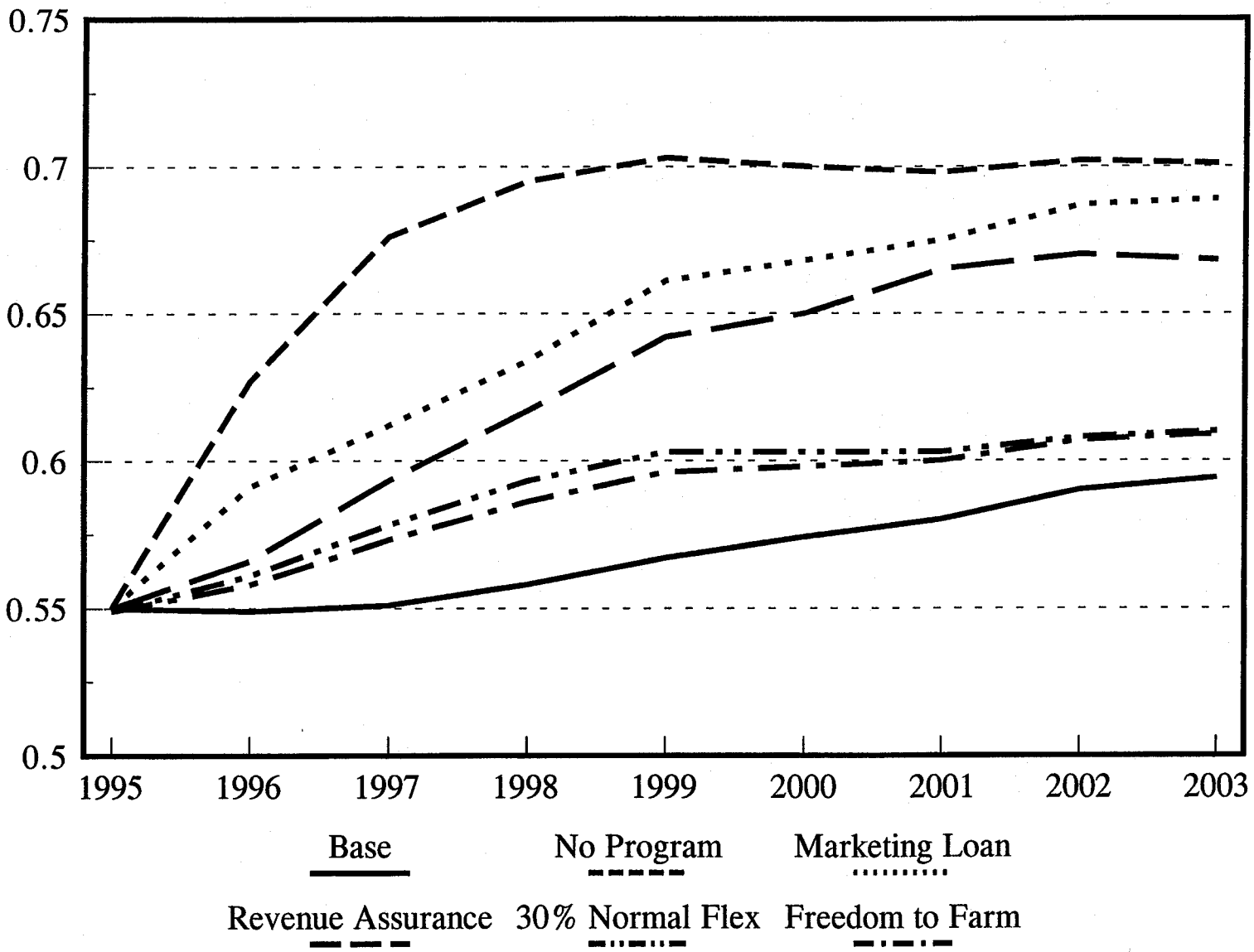


Figure 7. Debt-to-Asset Ratio for North Dakota Low Profit Representative Farm Under Base and Alternative Farm Programs

Table 13 shows changes in representative farm's cash rental rates for North Dakota and for each of the state's four production regions under the **Base** program (essentially a continuation of current farm programs). Rental rates per acre fall $2 per acre from 1995 to 2003.

Under the **No Farm** program, representative farm cash rental rates for the state fall $21 per acre from 1995 to 2003 (Table 14). Reductions in cash rental rates are the highest in the South Central and the lowest in the North Central production regions.

Under the **Marketing Loan** program, cash rental rates for the state fall $17 per acre from 1995 to 2003 (Table 15). Reductions in cash rental rates are the highest in the South Central and the lowest in the North Central production regions.

Under the **Revenue Assurance** program, cash rental rates for the state fall $15 per acre from 1995 to 2003 (Table 16). Reductions in cash rental rates are the highest in the South Central and the lowest in the North Central production regions.

Under the **30% Normal Flex** program, the cash rental rates fall by $8 by the end of the forecast period (Table 17). Under the **Freedom to Farm** program, the cash rental rates fall by $7 by the end of the forecast period (Table 18).

Figure 8 shows the cash rent paid by farmers under alternative farm programs. The pattern is similar to Figure 3 for cropland prices. Cash rent for the **Base** program falls from $37 per acre to about $35 per acre. Cash rent is the lowest for the **No Farm** program. It falls from $37 per acre to about $16 per acre. Cash rent falls under the other programs, as well, based on the amount of farm bill payments received by the representative farms.

Table 13. Cash Rent Under the Base Program for North Dakota Representative Farms in the Analysis

	RRV	NC	SC	WEST	State
	dollars/acre				
1995	55	29	33	31	37
1996	54	29	35	31	37
1997	53	30	35	31	37
1998	52	30	35	32	37
1999	53	30	36	32	38
2000	54	30	35	31	37
2001	53	30	34	30	37
2002	52	30	33	29	36
2003	50	29	32	28	35
Average % Change (1996-2000)	-0.9	2.0	0.1	-0.4	0.0
Average % Change (1996-2003)	-8.0	0.1	-9.8	-11.3	-7.5

Table 14. Cash Rent Under the No Farm Program for North Dakota Representative Farms in the Analysis

	RRV	NC	SC	WEST	State
	dollars/acre				
1995	55	29	33	31	37
1996	54	29	35	31	37
1997	53	30	35	31	37
1998	48	28	29	28	33
1999	42	24	19	20	26
2000	33	19	14	16	20
2001	27	16	13	14	18
2002	24	14	13	14	16
2003	22	14	13	14	16
Average % Change (1996-2000)	-38.5	-34.8	-61.6	-49.3	-45.5
Average % Change (1996-2003)	-59.6	-51.3	-63.4	-53.8	-57.7

Table 15. Cash Rent Under the Marketing Loan Program for North Dakota Representative Farms in the Analysis

	RRV	NC	SC	WEST	State
	dollars/acre				
1995	55	29	33	31	37
1996	54	29	35	31	37
1997	53	30	35	31	37
1998	50	28	32	30	35
1999	46	27	36	26	31
2000	41	24	22	23	27
2001	37	22	18	19	24
2002	33	21	16	18	22
2003	30	20	14	17	20
Average % Change (1996-2000)	-24.0	-18.3	-38.4	-27.4	-26.2
Average % Change (1996-2003)	-44.0	-32.0	-53.9	-46.9	-44.4

Table 16. Cash Rent Under the Revenue Assurance Program for North Dakota Representative Farms in the Analysis

	RRV	NC	SC	WEST	State
	dollars/acre				
1995	55	29	33	31	37
1996	54	29	35	31	37
1997	53	30	35	31	37
1998	51	29	34	31	36
1999	49	28	30	28	34
2000	45	26	25	25	30
2001	40	24	21	22	27
2002	36	22	18	19	24
2003	32	21	16	18	22
Average % Change (1996-2000)	-16.6	-10.7	-28.0	-20.2	-18.9
Average % Change (1996-2003)	-40.2	-27.5	-47.8	-42.9	-40.0

Table 17. Cash Rent Under the 30% Normal Flex Program for North Dakota Representative Farms in the Analysis

	RRV	NC	SC	WEST	State
	dollars/acre				
1995	55	29	33	31	37
1996	54	29	35	31	37
1997	53	30	35	31	37
1998	52	29	34	31	37
1999	51	29	32	29	35
2000	49	27	29	27	33
2001	46	26	27	25	31
2002	44	26	26	24	30
2003	42	26	26	24	29
Average % Change (1996-2000)	-10.3	-6.8	-18.0	-13.6	-12.1
Average % Change (1996-2003)	-22.2	-12.2	-27.7	-23.9	-21.9

Table 18. Cash Rent Under the Freedom to Farm Program for North Dakota Representative Farms in the Analysis

	RRV	NC	SC	WEST	State
	dollars/acre				
1995	55	29	33	31	37
1996	54	29	35	31	37
1997	53	30	35	31	37
1998	52	29	35	31	37
1999	51	29	33	30	36
2000	49	28	30	28	34
2001	47	27	28	26	32
2002	45	26	27	25	31
2003	42	26	27	24	30
Average % Change (1996-2000)	-8.9	-4.8	-14.2	-10.6	-12.0
Average % Change (1996-2003)	-20.4	-9.7	-24.9	-21.6	-19.6

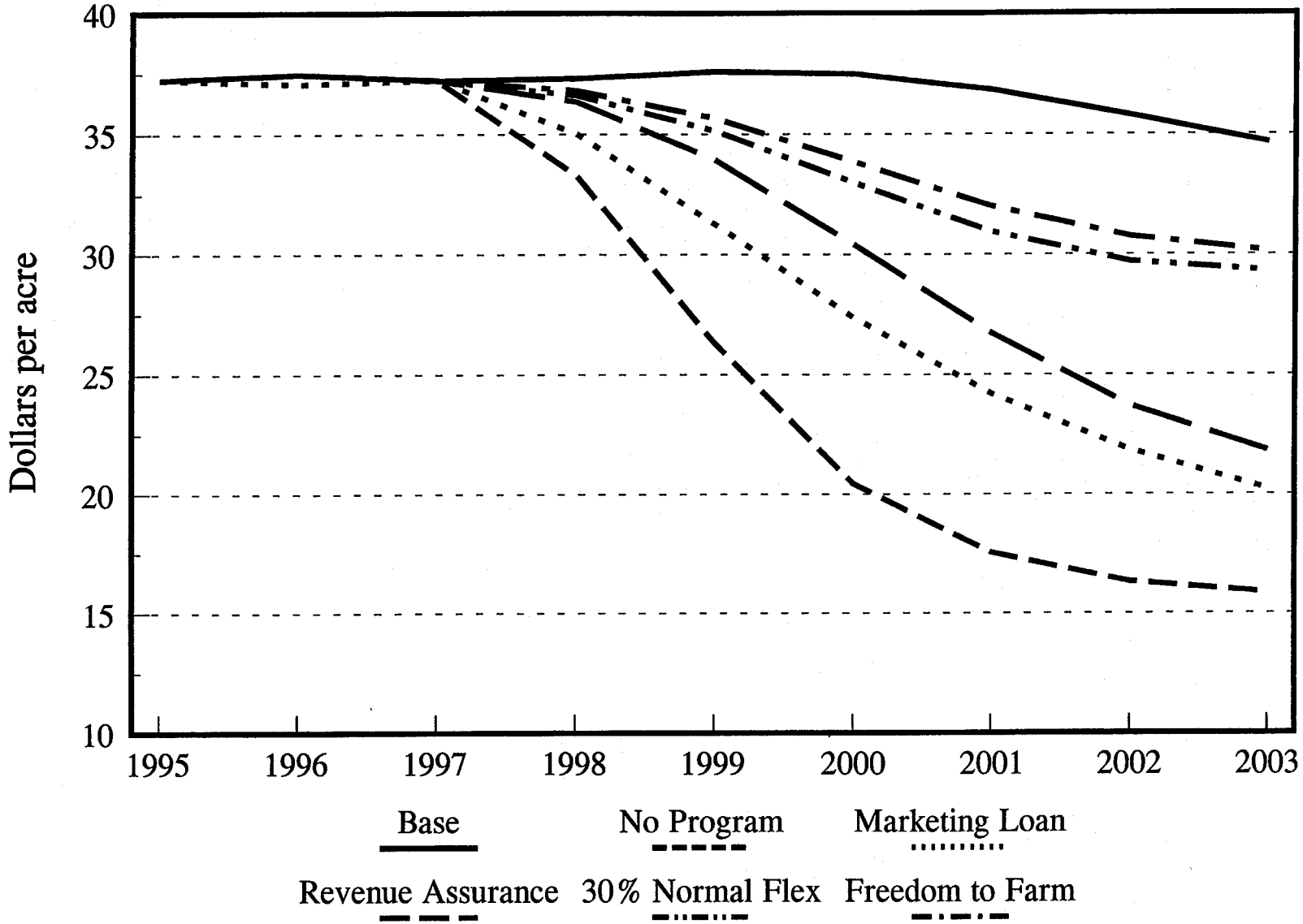


Figure 8. Cash Rent Paid by North Dakota Average Representative Farm Under Base and Alternative Farm Programs

Conclusions

All alternative farm programs result in lower net farm income for representative farms in North Dakota during the forecast period. However net farm income begins to recover before the end of the forecast period under the alternative farm programs. The **30% Normal Flex** program has smaller reductions in net farm income and a faster recovery rate than do the other alternatives. The **Freedom to Farm** program seems to be the second best. However, impacts of these two programs on net farm income depends upon market prices of the commodities produced. If market prices are low such that deficiency payments under the **30% Normal Flex** program are larger than the transition payments under the **Freedom to Farm**, farmers will benefit more under the **30% Normal Flex** program. However, if market prices are high, such that deficiency payments are smaller that the transition payments, farmers will benefit more under the **Freedom to Farm** program.

Average prices of cropland under alternative farm programs are 10 to 35 percent lower than those under the current farm program. Average cropland prices decrease at a decreasing rate, indicating that prices will reach the lowest level in 2003 or 2004 before once again starting to increase. After 2001, reductions in land prices are the smallest under the **Freedom to Farm** program and the second smallest under the **30% Normal Flex** program.

The farm program alternatives have adverse impacts, in most cases, on representative farm debt-to-asset ratios. The rise in debt-to-asset ratios for average and high profit representative farms does not raise credit problems in the alternative scenarios. Most of the low profit representative farms will be severely stressed under the four alternative farm programs, as their debt-to-asset ratios rise to levels that are likely to cut off additional credit unless federal loan guarantees are available.

References

Census of Agriculture, 1992. U.S. Department of Commerce.

FAPRI Baseline Projections May, 1995. Food and Agricultural Policy Research Institute. Columbia, MO.

North Dakota Agricultural Statistics. Various issues. North Dakota Agricultural Statistics Service. Fargo, ND.

North Dakota Farm and Ranch Business Management Annual Report 1993. North Dakota State Board for Vocational Education, Bismarck, North Dakota.

cjj/61/WWK/fpolicy.343