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Analysis of the 2002 Farm Bill and New Farm Bill Alternatives

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Abstract

This report evaluates the 2002 farm bill and the effects of the individual programs within the bill on North Dakota net farm income. A stochastic simulation model was developed, using @Risk by Palisade. @Risk replaces the mean values for price and yield with a distribution of values for the eight major commodities grown in North Dakota.

The counter-cyclical (target price) program, marketing loan program, and federal crop insurance benefits were separated and analyzed to determine which components were the most important to North Dakota producers.

The U.S. Trade Representative offered to decrease the country's trade distorting subsidies by 60% if the European Union would lower its export subsidies 75%. The study estimates the impact of that plan. Two additional scenarios, a revenue insurance plan and an income insurance plan, were evaluated. Both plans were compared to the scenarios of no government support and the current legislation. The insurance plans support either revenue or income at the 70% level, as suggested by the World Trade Organization.

Keywords: net farm income, risk, farm bill, North Dakota, forecast, domestic subsidies

Highlights

Government support is critical for North Dakota farmers. The average net farm income for all farms in the study was $77,597 with a standard deviation of $21,908. Without the provisions of the farm bill, net farm income would average $13,354 with a standard deviation of $41,190. In addition to increasing the average net farm income by $64,243, the 2002 farm bill decreases the income variability by 47%.

The counter-cyclical program (CCP) decreases the impact of the price variability on net farm income. The average CCP payment is $11,941 with a standard deviation of $7,209. The marketing loan provides a price floor under the market which supports market price and the loan rate. The average marketing loan payment is $27,372 with a standard deviation of $55,549. The average for the marketing loan is larger than the CCP. Federal crop insurance payments average $34,096 with a standard deviation of $22,249. Federal crop insurance payments are larger than the marketing loan payments, but the variation in payments is much smaller. Direct payments average $18,206 per farm.

Average net farm income for the 60% reduction scenario was $39,051, compared to $77,597 under the current farm bill. Net farm income for the large-size representative farm fell from $149,551 to $70,456 under the 60% reduction scenario. For the medium- and small-size representative farms, net farm income fell from $66 thousand and $28 thousand to $35 thousand and $16 thousand, respectively. In addition, the reduction increases income variation by one-third.

Two different insurance proposals, revenue and income insurance, were estimated. Average gross crop revenue was $224 thousand without government payments. With a revenue insurance program, gross crop revenue would be $232 thousand and the variation in revenue would decrease by 25%. The income insurance proposal would provide more support. Average net farm income under the income insurance proposal was $25 thousand, compared to $13 thousand with no government support. The income variation would decrease by 27% under the income insurance proposal. Either insurance proposal would require direct payments in order to raise income to current levels.

Government costs vary substantially, depending on the program. Under the current farm bill, government costs average $38 per acre: $11 per acre for direct payments, $7 per acre CCP, and $15 per acre for the marketing loan program. Under the 60% reduction scenario, the government cost is $18 per acre. The two insurance scenarios cost the government $5 per acre for the revenue insurance, and $7 per acre for income insurance. Neither insurance proposal provides income support; they only reduce the variation in income levels.

Analysis of 2002 Farm Bill and New Farm Bill Alternatives

Richard Taylor and Won W. Koo*

INTRODUCTION

After years of supply control, the U.S. Congress changed direction with the 1996 farm bill to a more market-directed program. In the past, producers faced planting restrictions for each of the program crops, with payments tied to those production restraints. The 1996 Farm Bill allowed producers, with some minor restrictions, to plant crops which they wanted to produce based on market and production conditions. Direct payments in order to eliminate the former commodity payment system, or transition payments, as they were called at that time, were designed to slowly decrease. The payments, which were known in advance, were based on historical production and had no bearing on current plantings. They were intended to eventually cease by the end of the 1996 farm bill. This farm bill was widely accepted by producers because, at that time, market prices were well above loan or target prices for most crops. Spring wheat prices in North Dakota averaged $4.71 for the 1995/96 marketing year. However, average prices dropped in each of the next three years. The spring wheat prices fell to $4.05 in 1996/97, $3.48 in 1997/98, and $3.04 in 1998/99. Beginning in 1998, various emergency funding bills were passed by Congress to support farm income. These annual emergency funding bills continued each year as the market prices continued to fall. The current farm bill was written by incorporating a safety net for market price fluctuations. A new farm bill should be completed before 2007, when the current bill will expire.

The 2002 farm bill was designed to implement payments, in the case of low prices, to replace emergency funding. The bill was passed during a time of federal budget surpluses which made funding for the farm bill easier for Congress to accept. The payments, now called Production Flexibility Contracts (PFC), were retained at a constant level. A counter-cyclical program was designed to provide additional price protection at the target price level less the direct payment rate, and the traditional loan program was retained. The counter-cyclical payment was applied to historic production, but loan program benefits were based on actual production.

The new farm bill will face two major constraints: the WTO negotiations and the federal budget deficit. The permitted level of domestic subsidies is being targeted for reduction under the Doha Round of WTO negotiations. Some progress was made in the WTO negotiations at the Hong Kong ministerial meeting in December 2005. The reductions in the level of domestic subsidies permitted in the green, blue, and amber boxes are still unknown, but a significant reduction is expected in the upcoming negotiations. The reduction in the level of domestic subsidies allowed under the WTO could be a major constraint in formulating the new farm bill. Furthermore, the federal budget deficit is expected to be about $400 billion by the end of 2006. This also will constrain funding for the new farm bill.

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The current U.S. presidential administration has initiated work on the new farm bill by asking six questions designed to start discussion and negotiations. The six points are: (1) How do we prepare farm policy to provide a future for new entries into the agricultural community? (2) How do we remain competitive in domestic and global markets? (3) Is the current distribution system the most effective way of distributing benefits? (4) How do we plan our conservation policies in a way that provides for cooperative conservation? (5) How can federal rural and farm programs provide effective assistance in rural areas? and (6) How do we direct funding of research dollars for the maximum expansion of agricultural markets and products. Secretary of Agriculture Mike Johanns has been attending a number of fact-finding meetings around the country and obtaining input from agri-business leaders and other concerned citizens.

The climate in which this farm bill will be designed differs radically from the climate during the 2002 farm bill negotiations. In 2000-01, the federal government had a surplus in the budget. Government spending for agriculture was at an all-time high, including the emergency spending bills, and the new administration was willing to increase spending for the farm bill. Today, faced with historically high budget deficits, an expensive undeclared war, and recovery from a major natural disaster, funding for a new farm bill will be extremely difficult. The objective of this study is to separate the contribution to net farm income from various portions of the 2002 farm bill, estimate the impact of the reduction in trade distorting payments proposed by the administration, and calculate the effectiveness of two different insurance programs on net farm income. The direct payments of the 2002 farm bill increase net farm income directly, and the counter-cyclical payments and marketing loan program protect producers from low prices. Yields are protected by an all-risk Federal Crop Insurance program which, although not directly included in the farm bill, is an integral part of the producer risk management program and is partially subsidized by the federal government.

HISTORICAL IMPACT OF FARM BILLS ON NORTH DAKOTA

Historically, the farm bill has been extremely important to producers in North Dakota. The portion of government payments in net farm income has been increasing over time. In 1970, 79% of net farm income consisted of government payments. The level of farm payments fell during the early 1970s because of higher commodity prices and averaged 18% of net farm income for the decade (Figure 1). By the early 1980s, government payments were higher than net farm income. Payment levels decreased throughout the 1980s, except for 1988, and averaged 97% of net farm income for the decade. From 1990 through 1996, payments decreased until they reached 27% of net farm income in 1996. Payments averaged 65% of net farm income in the decade of the 1990s. In 1997, and in 1999 through 2001, government payments were larger than net farm income in North Dakota, which indicates that the entire farm sector would have shown a loss during these years, if not for the government program. The share fell to 50% in 2003 and 48% in 2004, and it has averaged 78% over the first half-decade of the 2000s.

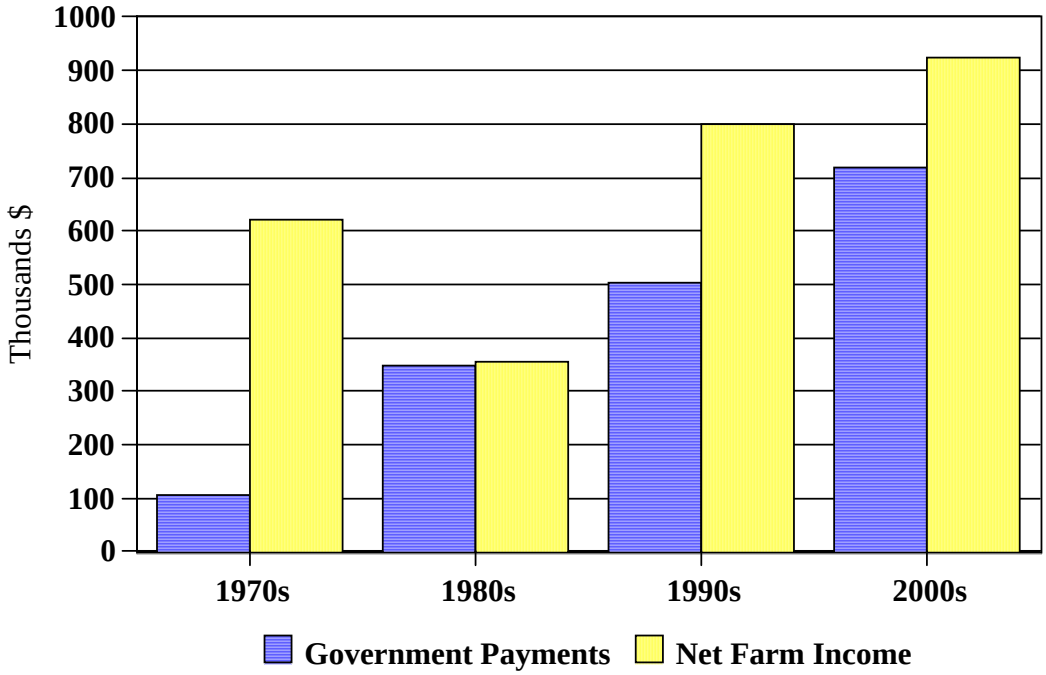

Figure 1. Government Payments and Net Farm Income
for North Dakota, by Decade

METHODOLOGY

The North Dakota Representative Farm Model was used to estimate the individual impacts of the various programs included in the 2002 farm bill. The Model is a stochastic simulation model designed to analyze the impacts of policy changes on farm income. The characteristics of the North Dakota representative farms are shown in Table 1. Other details of the Representative Farm Model may be obtained from the publication, 2005 North Dakota Agricultural Outlook: Representative Farms, 2005-2014.

Table 1. Characteristics of Representative North Dakota Farms, 2004

	Size		
	Large	Medium	Small
Number of Farms	128	256	128
Total Cropland (ac)	3,318	1,443	543
Spring Wheat (ac)	993	350	102
Durum Wheat (ac)	168	39	20
Barley (ac)	337	120	25
Corn (ac)	182	83	19
Sunflower (ac)	151	73	12
Soybeans (ac)	519	218	88

The Model was developed as a stochastic simulation model using @Risk by Palisade. @Risk replaces the mean values for price and yield with a distribution of values for the eight major commodities. The distribution of the variables and correlations between the variables are shown in Tables 2 through 5. To analyze the major components of the 2002 farm bill, counter-cyclical payments, marketing loan payments, direct payments, and the federal crop insurance programs were separated and identified as outputs to determine the individual impact of each program. The model was also revised to evaluate the inputs of a revenue insurance program on farm income and uncertainty.

Table 2. Average Yields and Standard Deviations for Various Commodities in the Four Regions of North Dakota

	S. Wheat	D. Wheat	Barley	Corn	Soybean	Sunflower	Canola
	Bushels per acre					Pounds per acre	
RRV	51.5 (10.20)	NA	65.9 (13.04)	118.7 (23.51)	32.5 (6.43)	1446.9 (268.48)	NA
NC	33.3 (10.89)	31.4 (10.27)	55.6 (18.17)	NA	NA	1376.2 (450.02)	1445.2 (472.58)
SC	40.1 (11.37)	29.0 (8.24)	62.8 (17.82)	103.1 (29.29)	32.4 (9.20)	1342.5 (381.28)	NA
West	27.6 (12.02)	26.5 (11.54)	40.4 (17.55)	NA	NA	NA	NA

Standard Deviation in parentheses
NA not available

Table 3. Estimated Average Price Received by Producers and Standard Deviations in North Dakota, 2005

	S. Wheat	D. Wheat	Barley	Corn	Soybean	Sunflower	Canola
			Dollars per bushel			Cents/pound	
Prices Received	3.28 (0.56)	3.56 (0.96)	2.13 (0.45)	1.83 (0.38)	4.65 (0.89)	11.15 (1.95)	11.15 (1.64)

Standard Deviation in parentheses

Table 4. Correlations Between Historical Spring Wheat Yields and Yields of Other Commodities

	Barley	D. Wheat	Corn	Soybean	Sunflower	Canola
RRV	0.85	NA	0.00	0.00	0.00	NA
NC	0.94	0.76	NA	NA	0.00	0.79
SC	0.89	0.74	0.00	0.00	0.00	NA
West	0.91	0.66	NA	NA	NA	NA

Table 5. Correlations Between Historical Spring Wheat Price and Prices of Other Commodities

	Barley	D Wheat	Corn	Soybeans	Sunflowers	Canola
Correlation	0.90	0.92	0.95	0.84	0.70	0.71

DATA

The projected cash prices received by farmers are based on national price projections by the Food and Agricultural Policy Research Institute (FAPRI), adjusted to North Dakota. The adjustments are estimated from North Dakota price equations, which were calculated on the basis of the historical relationships between North Dakota prices and U.S. export prices of the commodities. Regional North Dakota yield trend equations were estimated from historical yield data reported by the North Dakota Agricultural Statistics Service from 1974 to 2002. Standard deviations were estimated from individual farm records from the North Dakota Farm and Ranch Business Management Association. The year which was used for the simulation was 2005.

Future prices and yields are not known with certainty; therefore, a distribution of inputs are utilized to develop a distribution of outputs. The software program @Risk chooses a random value of the independent variable, spring wheat yield. The other yield variables correlated to the spring wheat yield are presented in Table 4. All yield variables are assumed to have a normal distribution with the mean value and standard deviation, as listed in Table 2. Likewise, the price level of spring wheat is chosen first, with a log-normal distribution and a mean and standard

deviation as shown in Table 3. The price levels of the other commodities are then chosen based on their mean, standard deviation, and the correlation between them and spring wheat Table 5. The model is simulated 1,000 times, which allows the output to develop stable means and distribution.

The various programs within the Farm Bill were separated and recorded as individual output variables. Direct payments are fixed and do not change with changes in the price level or yield. The loan program establishes a price floor where producers are paid the difference between market price and loan price, if loan price is higher, times actual production. The Target Price Program pays counter-cyclical payments when market price is lower than the target price (Table 6).

There are a number of different programs within the Federal Crop Insurance program. The program modeled in this study is the 70% yield coverage at base Apparent Production History (APH) price. The APH price is also shown in Table 6.

Table 6. Loan Rate and Target Prices for North Dakota Commodities

	S. Wheat	D. Wheat	Barley	Corn	Soybeans	Sunflowers	Canola
			Dollars per bushel			Cents per pound	
Loan Rate	2.85	3.15	1.63	1.83	4.65	9.45	9.5
Target Price	3.92	3.92	2.24	2.63	5.80	10.1	10.1
APH Price	3.50	3.50	2.00	2.20	5.00	9.3	9.3

RESULTS

The base scenario assumes the current 2002 farm bill levels for the loan program, direct payments, counter-cyclical program, and current federal crop insurance provisions. The results for net farm income are shown in Table 7. The mean net farm income for the large-size representative farm is $150 thousand with a 90% confidence interval of $77 thousand to $231 thousand. The medium-size representative farm has a net farm income of $66 thousand with a 90% confidence interval of $33 thousand to $95 thousand. The small-size representative farm has a net farm income of $28 thousand with a 90% confidence interval of $23 thousand to $39 thousand. The 90% confidence interval means that 90% of the time net farm income will be between the two stated levels. The income variation differs by farm size. The net farm income for the large-size farm can be expected to vary between 47% lower and 59% higher than the average level. The medium-size farm's net farm income can be expected to vary between 50% lower and 44% higher than the average level. The small-size farm's net farm income can be expected to vary between 18% lower and 39% higher than the average level. The reason for the difference is that the small farm relies less on commodity crops and more on livestock.

Table 7. Results of the Simulation for the Representative Farm Model, Net Farm Income

Region	Size	Mean	Standard Deviation	Maximum	Minimum	90% Confidence Interval
		----------dollars----------				
RRV	Large	162,985	67,235	540,157	8,019	84,569 - 245,269
	Medium	92,512	33,043	276,463	16,434	53,513 - 132,652
	Small	41,359	14,073	124,861	9,487	25,029 - 59,110
NC	Large	136,763	60,799	412,877	22,188	70,052 - 217,672
	Medium	62,125	28,977	199,534	9,386	29,909 - 99,321
	Small	21,937	5,175	45,397	12,267	15,952 - 28,472
SC	Large	146,381	74,303	564,736	-33,716	60,613 - 244,060
	Medium	54,755	19,023	155,737	8,112	32,679 - 79,689
	Small	24,588	5,313	54,166	11,476	18,192 - 31,479
West	Large	152,078	51,400	477,602	53,204	94,130 - 217,681
	Medium	56,191	9,726	116,694	37,906	44,868 - 68,491
	Small	24,289	1,154	29,842	22,102	32,895 - 38,256
State	Large	149,552	47,314	418,831	53,007	77,341 - 231,117
	Medium	66,396	17,659	159,069	32,466	33,492 - 95,038
	Small	28,043	5,000	57,425	16,832	23,017 - 39,329

Table 8 shows the counter-cyclical payments received by the various size representative farms for the current 2002 farm bill. The average large-size farm receives $25 thousand in counter-cyclical payments with a 90% confidence interval of $2 thousand to $56 thousand. The medium-size representative farm receives $10 thousand with a 90% confidence interval of $800 to $17 thousand. The small-size farm receives about $4 thousand with a 90% confidence interval from $400 to $6 thousand.

The loan program provides direct government payments to producers when the market prices fall below the loan rate. Table 9 shows the loan payments received by the various size representative farms for the current 2002 farm bill. The large-size representative farm receives $77 thousand in benefits from the loan program with a 90% confidence interval of zero to $198 thousand. The medium- and small-size representative farms receive an average of $31 thousand and $7 thousand, respectively, with a 90% confidence interval of zero to $83 thousand and

$16 thousand, respectively. The distribution for the loan program is substantially larger than that for the counter-cyclical program. The standard deviation for the large-size farm is $16 thousand for the counter-cyclical program and $159 for the loan program. The main reason for the difference is that the counter-cyclical payment level is bounded by the loan rate on the bottom and the target price on the top. The loan payments are only bounded by the loan rate on the top. There is no lower limit. Also, the counter-cyclical payments are based on historical production while the loan program is based on actual production.

The federal crop insurance program provides benefits similar to the counter-cyclical program. The reported level of the federal crop insurance is probably understated, as there is no prevented planting aspect of the program in the model. It was assumed that all crop acres were planted. Benefits of the insurance program average $73 thousand for the large-size farm, $27 thousand for the medium-size farm, and $9 thousand for the small-size farm (Table 10). The 90% confidence interval ranges from zero to $167 for the large-size farm, zero to $64 thousand for the medium-size farm, and zero to $20 thousand for the small-size farm. The standard deviation is larger than that for the counter-cyclical program but less than that for the loan program.

Table 8. Results of the Simulation for the Representative Farm Model, Counter-cyclical Payments, Base Scenario

Region	Size	Mean	Standard Deviation	Maximum	Minimum	90% Confidence Interval
		----------dollars----------				
RRV	Large	41,690	22,132	63,994	0	4,042 - 63,994
	Medium	22,154	694	33,943	0	2,221 - 33,943
	Small	11,417	718	16,845	0	1,411 - 16,845
NC	Large	8,213	8,776	23,187	0	0 - 23,051
	Medium	4,037	4,254	11,118	0	0 - 11,063
	Small	869	899	2,298	0	0 - 2,292
SC	Large	37,179	20,993	62,333	0	3,203 - 62,310
	Medium	10,036	5,695	16,815	0	895 - 16,863
	Small	3,159	1,746	5,282	0	301 - 5,281
West	Large	11,919	11,251	27,586	0	0 - 27,561
	Medium	2,328	2,402	6,133	0	0 - 6,105
	Small	318	319	776	0	0 - 775
State	Large	24,543	15,739	44,275	0	1,811 - 56,380
	Medium	9,639	5,789	17,017	0	779 - 16,994
	Small	3,941	2,114	6,300	0	428 - 6,298

Table 9. Results of the Simulation for the Representative Farm Model, Loan Program, Base Scenario

Region	Size	Mean	Standard Deviation	Maximum	Minimum	90% Confidence Interval
		----------dollars----------				
RRV	Large	30,730	42,624	299,384	0	0 - 90,378
	Medium	19,698	30,115	225,230	0	0 - 58,675
	Small	6,677	8,658	51,460	0	0 - 18,963
NC	Large	120,733	288,239	2,286,286	0	0 - 443,994
	Medium	49,011	118,078	952,088	0	0 - 186,250
	Small	7,522	18,066	145,644	0	0 - 28,522
SC	Large	75,224	163,640	1,022,629	0	0 - 243,621
	Medium	24,595	56,568	355,612	0	0 - 83,743
	Small	5,639	11,981	74,310	0	0 - 17,939
West	Large	3,532	8,940	81,119	0	0 - 12,513
	Medium	690	1,767	17,348	0	0 - 2,455
	Small	93	243	2,255	0	0 - 347
State	Large	76,678	159,296	1,146,302	0	0 - 197,626
	Medium	31,332	63,582	447,871	0	0 - 82,781
	Small	6,644	11,536	73,959	0	0 - 16,443

Table 10. Results of the Simulation for the Representative Farm Model, Federal Crop Insurance, Base Scenario

Region	Size	Mean	Standard Deviation	Maximum	Minimum	90% Confidence Interval
		----------dollars----------				
RRV	Large	86,840	70,853	397,033	0	0 - 187,650
	Medium	45,850	37,165	206,484	0	0 - 98,901
	Small	22,236	17,441	94,255	0	0 - 46,808
NC	Large	51,541	52,917	221,982	0	0 - 143,313
	Medium	24,863	26,702	105,877	0	0 - 76,664
	Small	4,951	5,443	20,447	0	0 - 15,658
SC	Large	102,702	78,816	365,696	0	0 - 214,348
	Medium	28,244	21,376	99,933	0	0 - 58,143
	Small	8,420	6,320	29,618	0	0 - 17,277
West	Large	49,320	45,273	163,871	0	0 - 124,308
	Medium	10,096	8,832	34,774	0	0 - 23,852
	Small	1,367	1,393	4,848	0	0 - 3,679
State	Large	72,603	46,680	256,780	0	0 -167,405
	Medium	27,263	18,343	103,271	0	0 - 64,390
	Small	9,253	6,232	34,846	0	0 - 20,085

The direct payment averages $35 thousand for the large-size farm, $16 thousand for the medium-size farm, and $6 thousand for the small-size farm (Table 11). Direct payments are higher than counter-cyclical payments but less than federal crop insurance and loan benefits.

Table 11. Direct Federal Payments to Representative Farms

	Large	Medium	Small
	----------dollars----------		
RRV	45,843	23,973	9,890
NC	24,059	13,764	6,363
SC	34,303	15,874	6,041
West	34,509	9,799	3,471
State	34,678	15,852	6,441

Figure 2 shows the distribution of the average net farm income for all farms in the model, with and without the federal farm bill. It was assumed that no financial or production adjustments were made. The average net farm income with the current farm bill is $78 thousand with a 90% confidence interval from $42 thousand to $115 thousand. Without the farm bill, average net farm income is $13 thousand with a 90% confidence interval of -$52 thousand to $91 thousand. The farm bill raises net farm income in the state as well as protects net farm income from falling below the income support level of the loan program. The farm bill does work, but it is expensive. The farm bill removes the long negative tail for the income distribution, narrows the distribution and increases average income.

Figure 3 shows the distribution of the counter-cyclical payments, under the base scenario, for the 1,000 iterations of the simulation. The average payment is $12 thousand, while the maximum and minimum is $38 thousand and zero, respectively. The distribution with the largest number of occurrences is from $37 to $38 thousand.

Figure 4 shows the distribution for the loan program, which is substantially different than that for the counter-cyclical program even though both are based on price differences. The average is $36 thousand, and the vast majority of the loan benefits are less than $20 thousand per farm per year. The loan program has a long positive tail extending out over $500 thousand.

The distribution for the federal crop insurance program is different from either the loan program or the counter-cyclical program, as presented in Figure 5. The average program benefit is $34 thousand, while the maximum benefit is $124 thousand. The most common benefit level is between $20 thousand and $40 thousand.

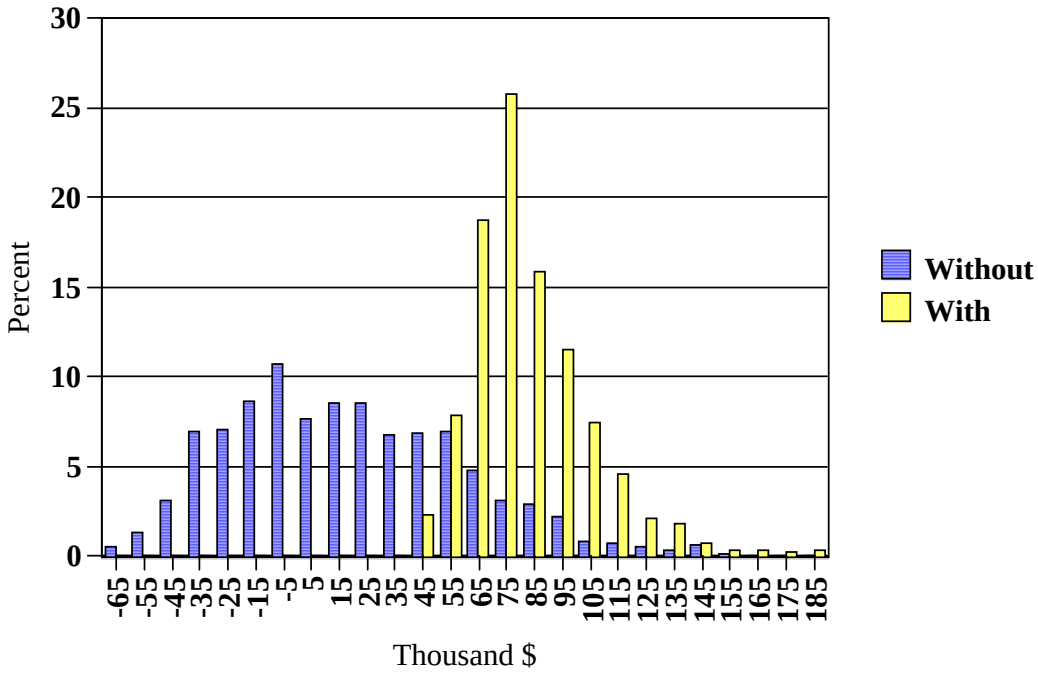

Figure 2. Distribution of Net Farm Income With the Current Farm Bill and Without the Farm Bill Provisions

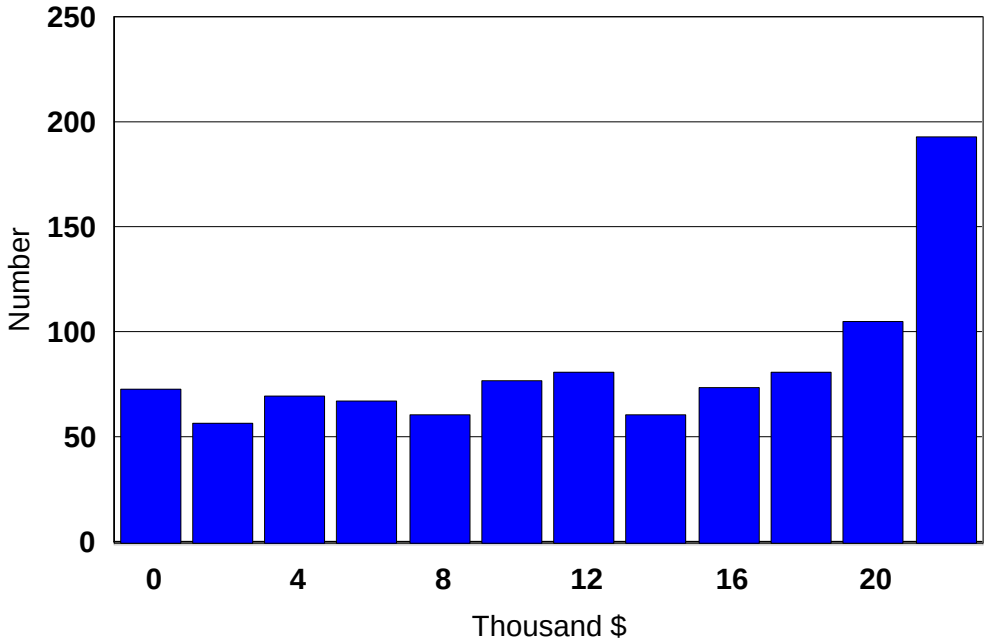

Figure 3. Distribution of Counter-cyclical Payments

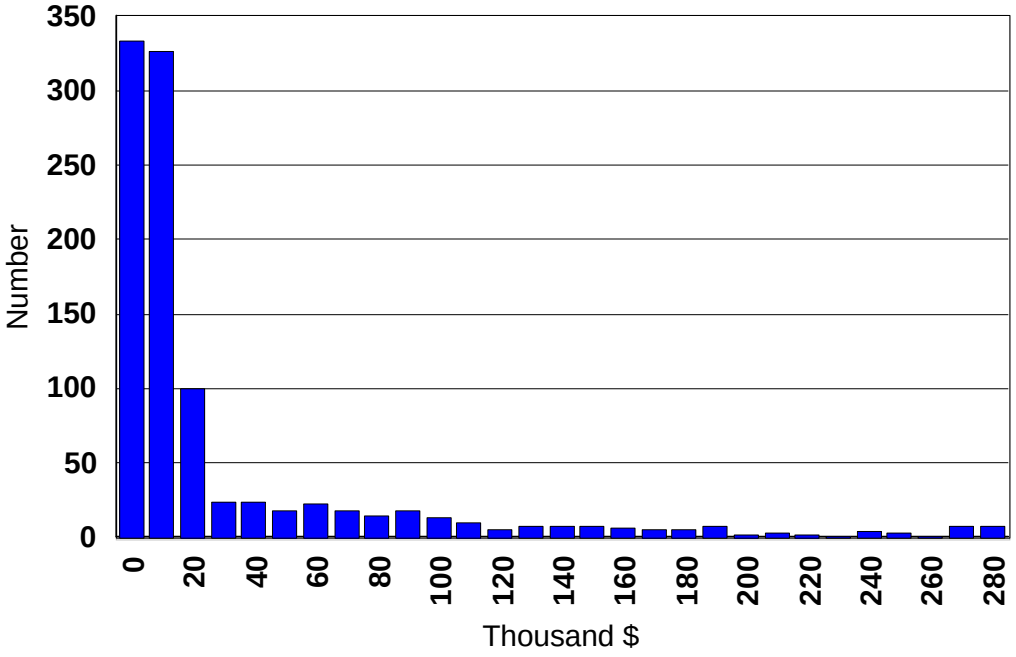

Figure 4. Distribution of the Loan Program

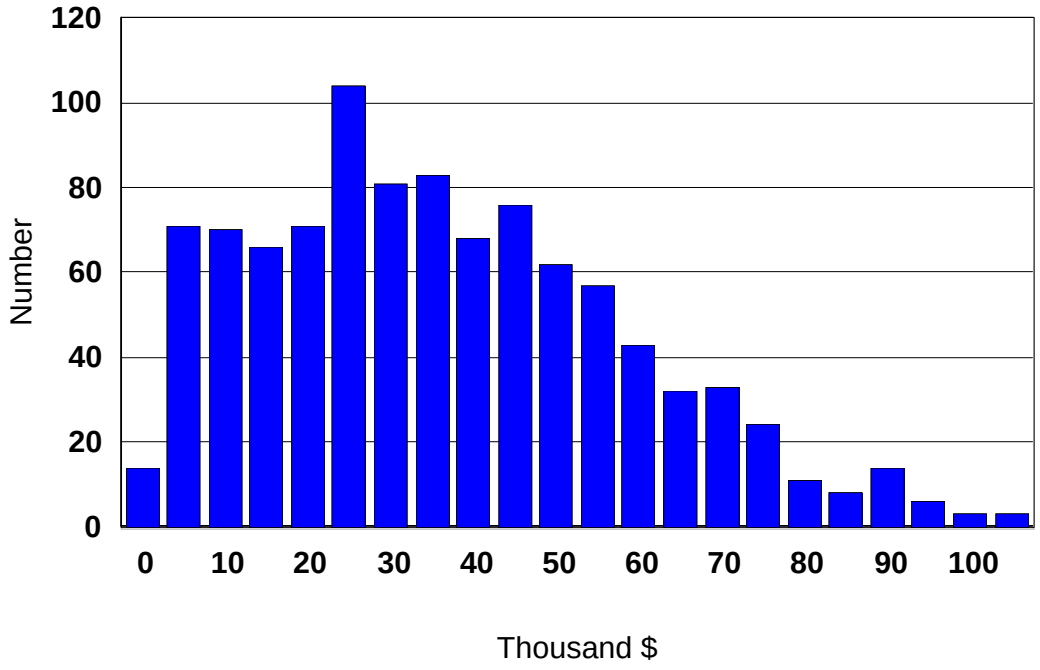

Figure 5. Distribution of Federal Crop Insurance Payments

The Sixty Percent Reduction Scenario

It has been proposed by U.S. Trade Representative Rob Portman that the United States reduce its trade distorting government subsidies, classified as amber box, by 60% if the European Union reduces its farm and export subsidies by 75%. It was assumed that amber box subsidies were at the maximum level allowed by the WTO. Therefore, the model was run again, reducing counter-cyclical and loan payments by 60%. It is possible that the counter-cyclical program will be classified as blue box, but this study assumes that it is classified as amber box. No adjustments were made on the basis of payment levels. High payment levels were reduced by 60% along with low payment levels. Figure 6 shows the income distribution of the small-size representative farm under the base scenario and when payments were reduced 60%. The average net farm income for the small-size farm is $28 thousand with the standard deviation of $5 thousand under the base scenario. With the reduction in federal farm payments, the average net farm income declines to $16 thousand and the standard deviation increases to $8 thousand. In the base model, net farm income falls between $20 and $25 thousand 46% of the time and between $25 and $30 thousand 30% of the time. With the reduction, net farm income is between $20 and $25 thousand 30% of the time and between $15 and $20 thousand 23% of the time. Figure 7 shows the base income distribution and the income distribution of the medium-size representative farm if payments were reduced 60%. The average net farm income for the medium-size farm in the base model is $66 thousand with a standard deviation of $18 thousand. With the reduction in federal farm payments, the average net farm income would be $35 thousand and the standard deviation would increase to $26 thousand. In the base model, net farm income falls between $60 and $70 thousand 48% of the time and between $80 and $90 thousand 35% of the time. With the reduction, net farm income is between $60 and $70 thousand 30% of the time and between $80 and $90 thousand 13% of the time. Figure 8 shows the base income distribution and the income distribution of the large-size representative farm if payments were reduced 60%. The average net farm income for the large-size farm is $150 thousand with a standard deviation of $47 thousand in the base model. With the reduction in federal farm payments, the average net farm income would decrease to $70 thousand and the standard deviation would increase to $69 thousand.

In the base model, net farm income of the large-size farm fell between $125 and $150 thousand 42% of the time and between $170 and $190 thousand 34% of the time. With the reduction, net farm income is between $125 and $150 thousand 21% of the time and between $170 and $190 thousand 12% of the time.

Figure 9 shows the average distribution of net farm income for all the farms in the model. The average net farm income decreases from $78 thousand under the base scenario to $39 thousand when the subsidies are reduced 60%. The average farm would lose $39 thousand, but more importantly, the standard deviation increases from $22 thousand to $32 thousand, removing most of the counter-cyclical safety net on net farm income. Average net farm income would drop by almost 50%, and the variability would increase by 47%.

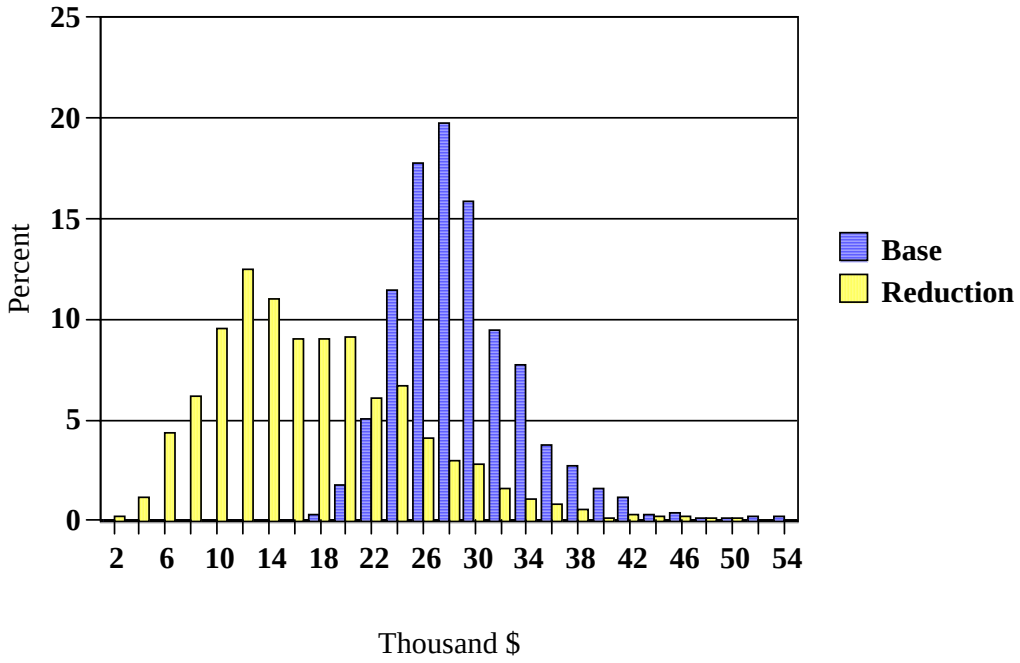

Figure 6. Net Farm Income Distribution for Small-size Farms under the Base and 60% Reduction Scenarios

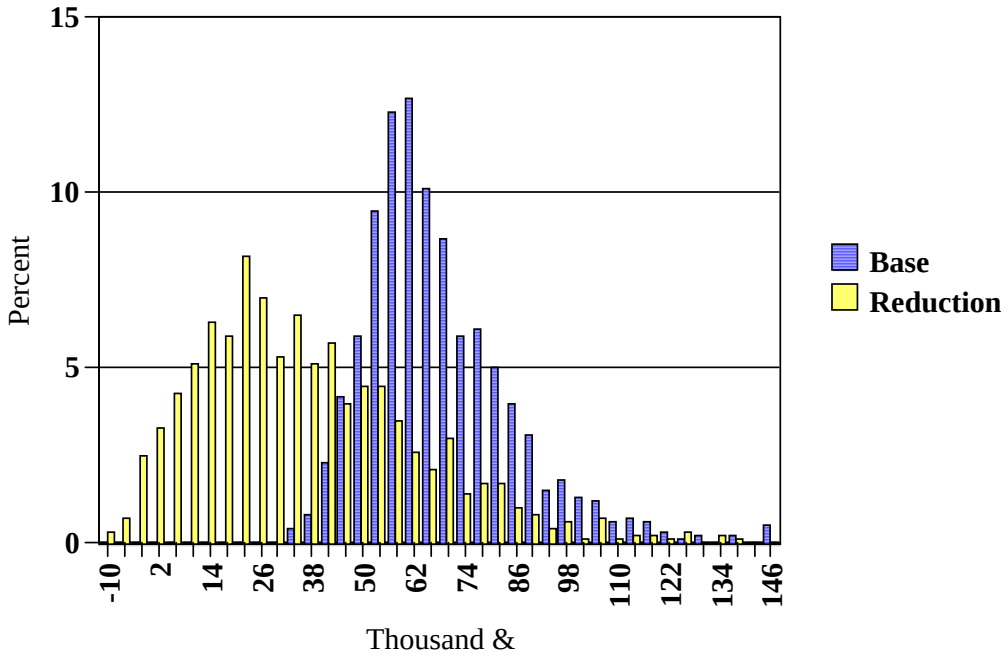

Figure 7. Net Farm Income Distribution for Medium-size Farms under the Base and 60% Reduction Scenarios

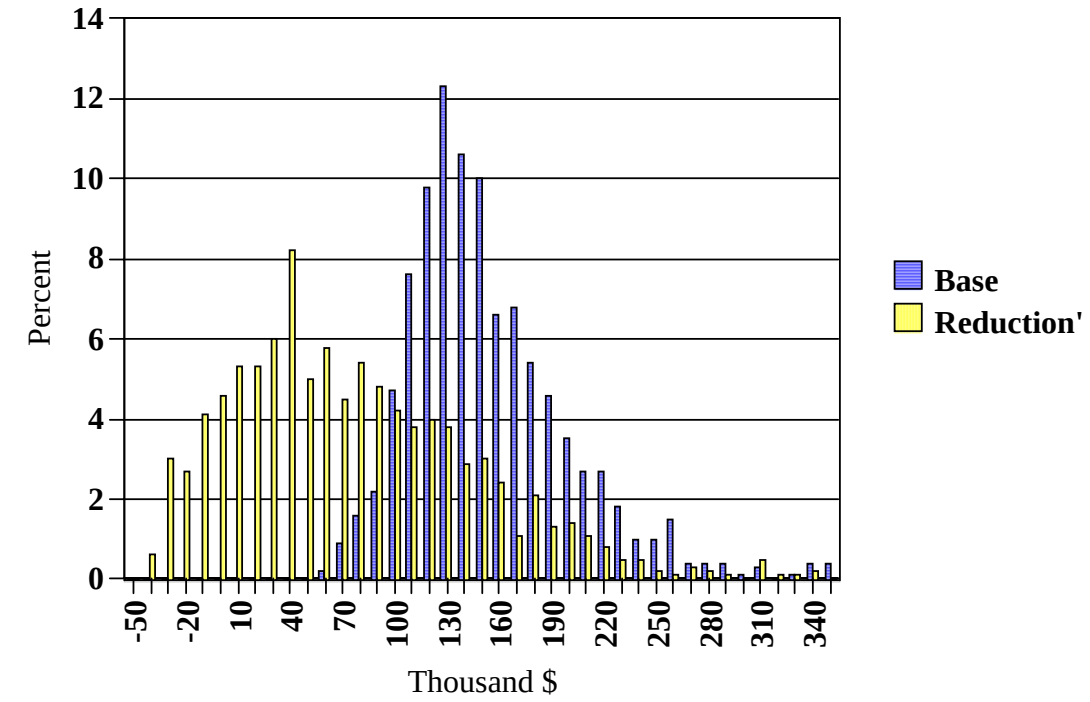

Figure 8. Net Farm Income Distribution for Large-size Farms under the Base and 60% Reduction Scenarios

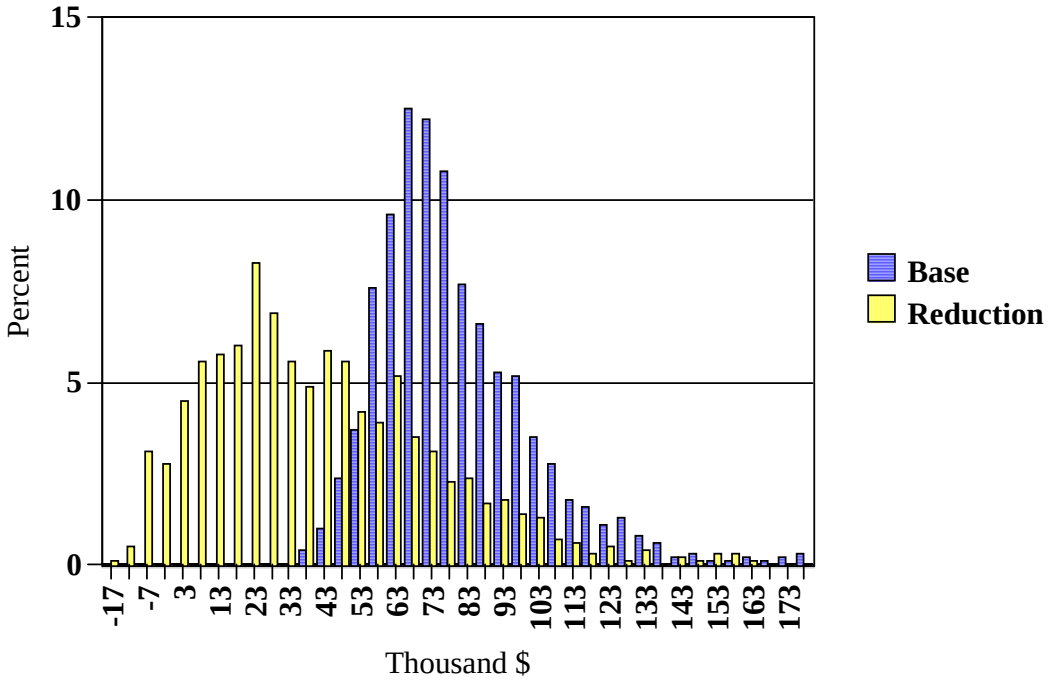

Figure 9. Net Farm Income Distribution for the Average of All Farms under the Base and 60% Reduction Scenarios

Table 12 shows average net farm income, standard deviation, and the ratio of change under the current farm bill and the 60% reduction scenarios. Net farm income for the small farm decreases by 42% under the reduction scenario. Medium and large farms' net farm income decreases by 48% and 53%, respectively. The average net farm income decrease for all farms is 50%. Large farms' net farm income decreases by a larger percentage than either the small- or medium-size farms, indicating that large farms receive a larger percentage of their income from subsidies.

Table 12. Net Farm Income and Standard Deviations under Base and 60% Reduction Scenarios

		Base	60%	Difference	Ratio
Small	Mean	28,043	16,262	11,781	0.58
	St. Dev	5,000	7,646	2,646	1.53
Medium	Mean	66,396	34,743	31,653	0.52
	St. Dev	17,659	25,730	8,071	1.46
Large	Mean	149,552	70,456	79,096	0.47
	St. Dev	47,314	69,292	21,978	1.46
All	Mean	77,596	39,051	38,545	0.50
	St. Dev	21,720	31,989	10,269	1.47

Figure 10 shows the cumulative probability of net farm income under various scenarios. In all cases, under all combinations of prices and yields, producers are better off with the current farm bill rather than either the reduction scenario or no farm bill. Since there is no cost to producers connected with the farm bill, and because even at very high prices and high yields, direct payments are made to producers, incomes are higher under the current farm bill than under the other scenarios.

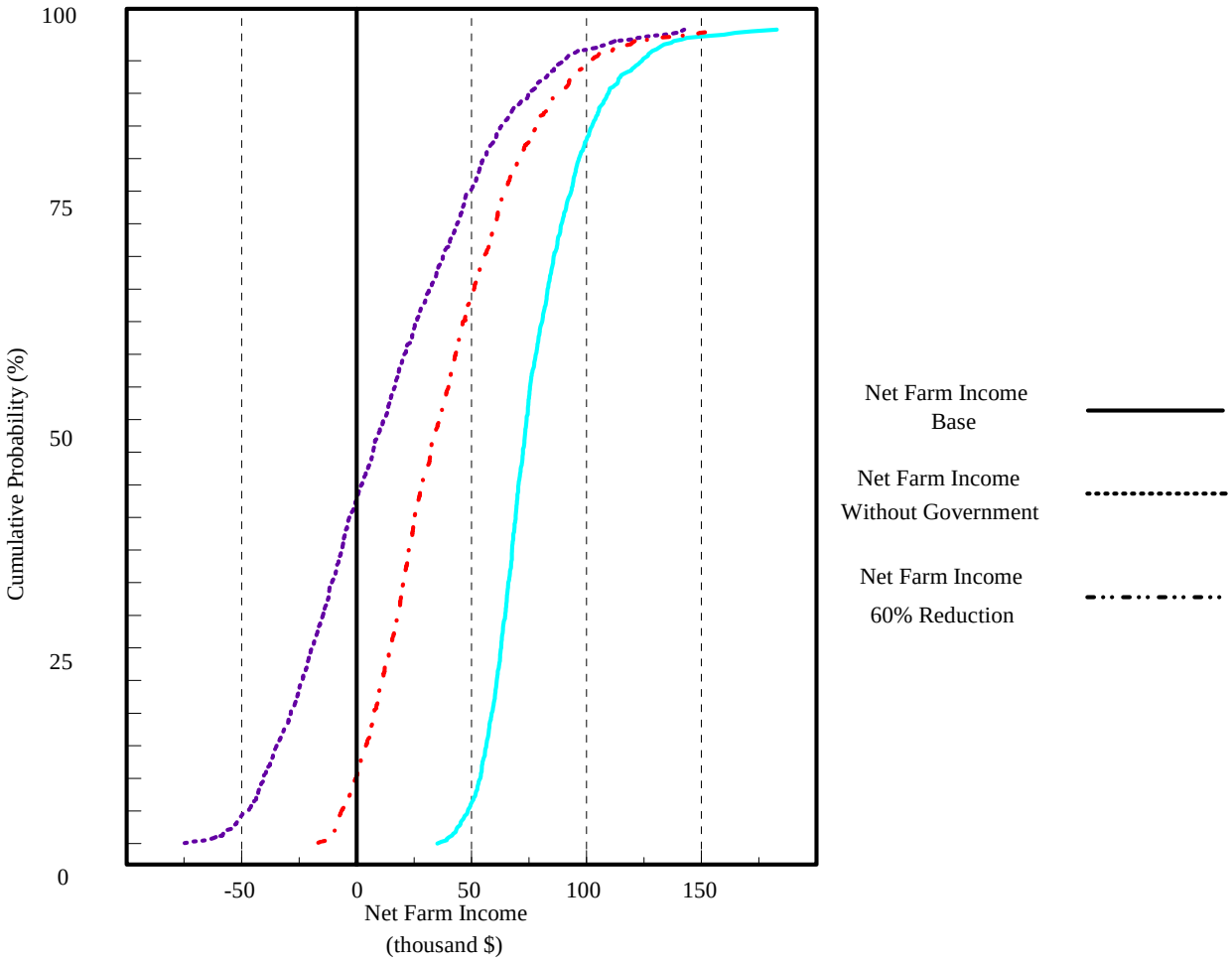

Figure 10. Cumulative Probability of Net Farm Income for the Base and 60% Reduction Scenarios

A Revenue Insurance Proposal

A scenario is conducted in which gross crop revenue is supported at the 70% level. The 70% level was chosen because it was suggested by the WTO Doha Round as an acceptable level and could be classified as green box support, which would not be subject to spending limits. This means that 70% of all gross revenue shortfalls below an average level would be paid to the producers in the form of cash payments. For example: A producer averages $1 million in crop receipts. If the crop receipts for a certain year are $875 thousand, the producer would receive $87.5 thousand (=(1,000-875)*0.70) from the government, which would increase his effective crop receipts to $962.5 thousand for the year. Producers would be protected against both poor yields and low prices, although low yield could be offset with high prices. The program would be fully funded by the government in the place of the counter-cyclical and loan programs. The average gross revenue without governmental support (no government scenario) for the small-,

medium-, and large-size farm is $56 thousand, $180 thousand, and $479 thousand, respectively. The average gross revenue with revenue insurance is $58 thousand, $187 thousand, and $497 thousand for the small-, medium-, and large-size farms, respectively. Gross revenue averaged $2 thousand, $7 thousand, and $18 thousand higher for the small-, medium-, and large-size farms, respectively. Revenue insurance is not an income support as such, but it reduces variation of returns. The standard deviations for the small-, medium-, and large-size farm under the no government scenario are $7 thousand, $25 thousand, and $66 thousand, respectively. Under the revenue insurance scenario, the standard deviations are reduced to $5 thousand, $18 thousand, and $49 thousand, for the small-, medium-, and large-size farms, respectively. Figures 11, 12, and 13 show the revenue distribution for the small-, medium-, and large-size farms under the no government and insurance scenarios. Revenue insurance removes most of the negative variation of the distribution but has little impact on revenues from the higher end of the distribution. Under the no government scenario, the possibilities of small-, medium-, and large-size farms not having sufficient gross revenue to generate positive net farm income are 13%, 38%, and 18%, respectively. With revenue insurance, only the medium-size farm has a possibility greater than 10% of failing to generate enough gross revenue to provide positive net farm income. Revenue insurance would provide a safety net, but would not support or raise net farm income.

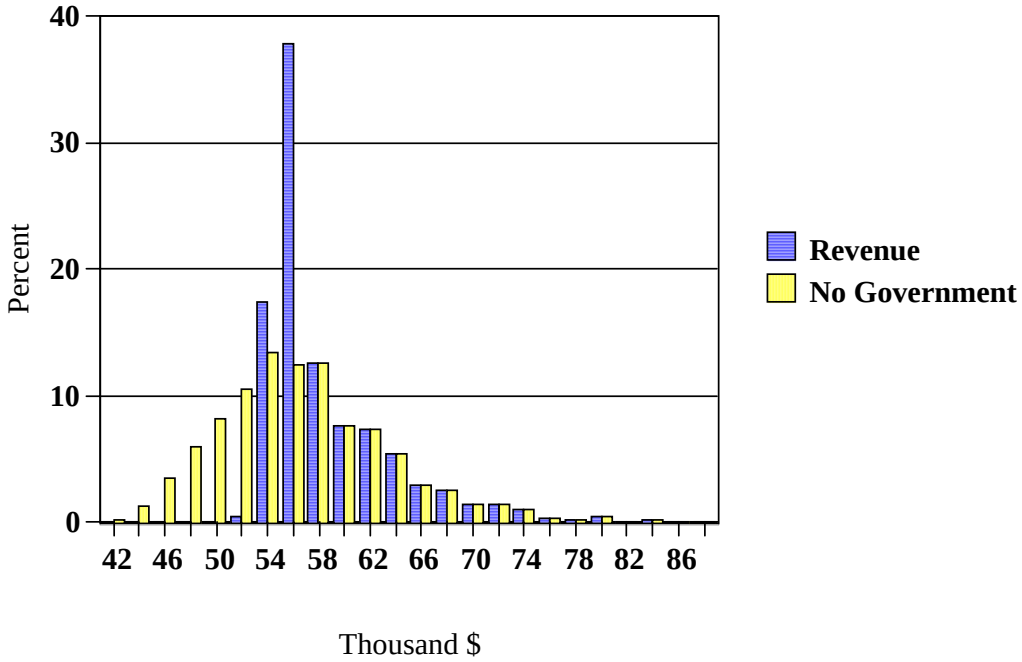

Figure 11. Distribution of Gross Revenue for Small-size Representative Farms under the No Government and Revenue Insurance Scenarios

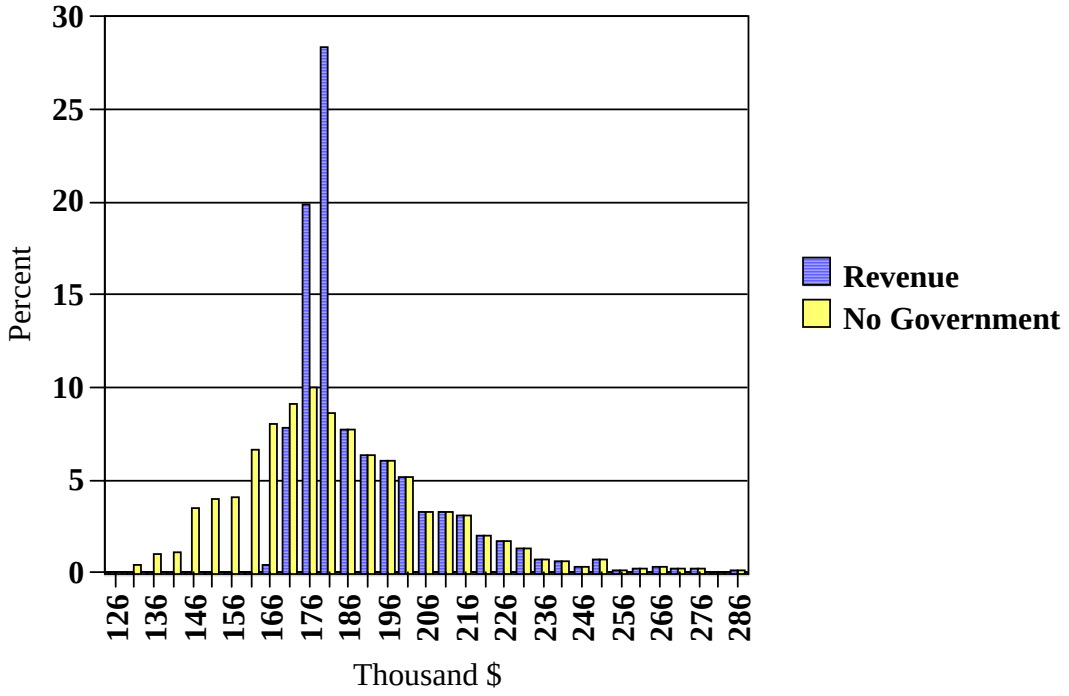

Figure 12. Distribution of Gross Revenue for Medium-size Representative Farms under the No Government and Revenue Insurance Scenarios

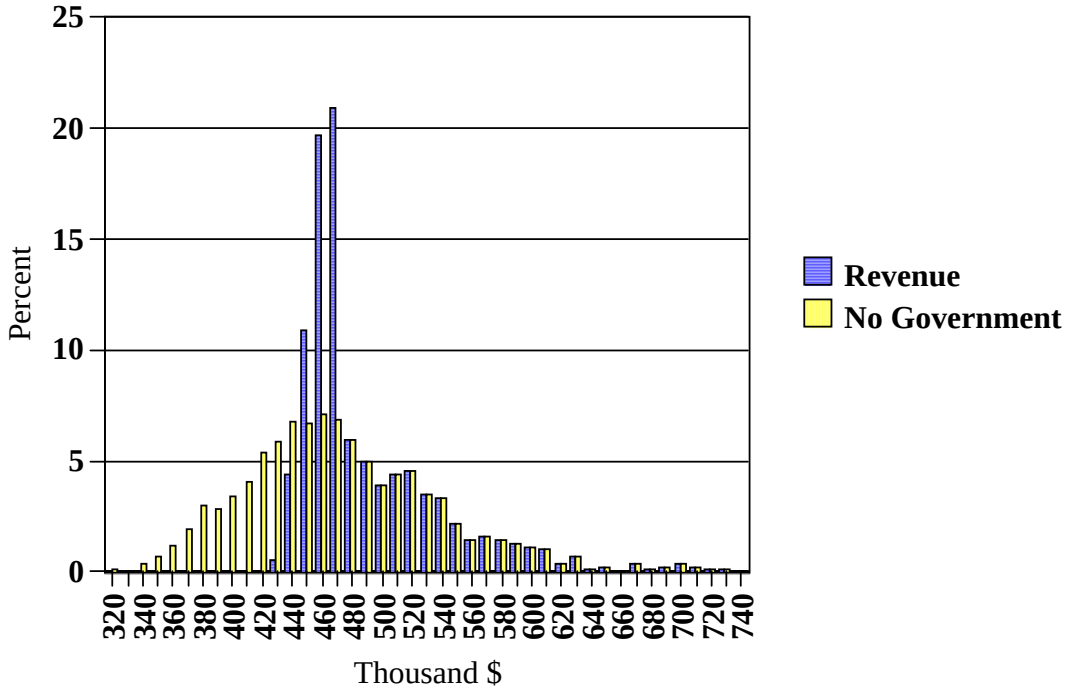

Figure 13. Distribution of Gross Revenue for Large-size Representative Farms under the No Government and Revenue Insurance Scenarios

Figure 14 shows the results for the average of all farms in the study. The average revenue is $224 thousand with no government support and $232 thousand with the revenue insurance proposal, with a standard deviation of $30 thousand without support and $23 thousand with the revenue proposal. When average gross revenue is above $225 thousand, little or no support is provided.

Figure 15 shows the cumulative probability for gross crop revenue with and without revenue insurance. Under the revenue insurance scenario, producers would receive benefits about 55% of the time from the government. The area between the two lines is the potential government subsidy. Since the revenue insurance only covers low return shortfalls, no payments would be made 45% of the time .

Figure 16 shows the average net farm income of average of all farms under the current government program and the revenue insurance scenario. The net farm income under the revenue scenario is substantially lower that those under the current government programs. Also, the distribution on income is wider than that under current government program. However, the revenue insurance narrows the income distribution compared to the no government program scenario.

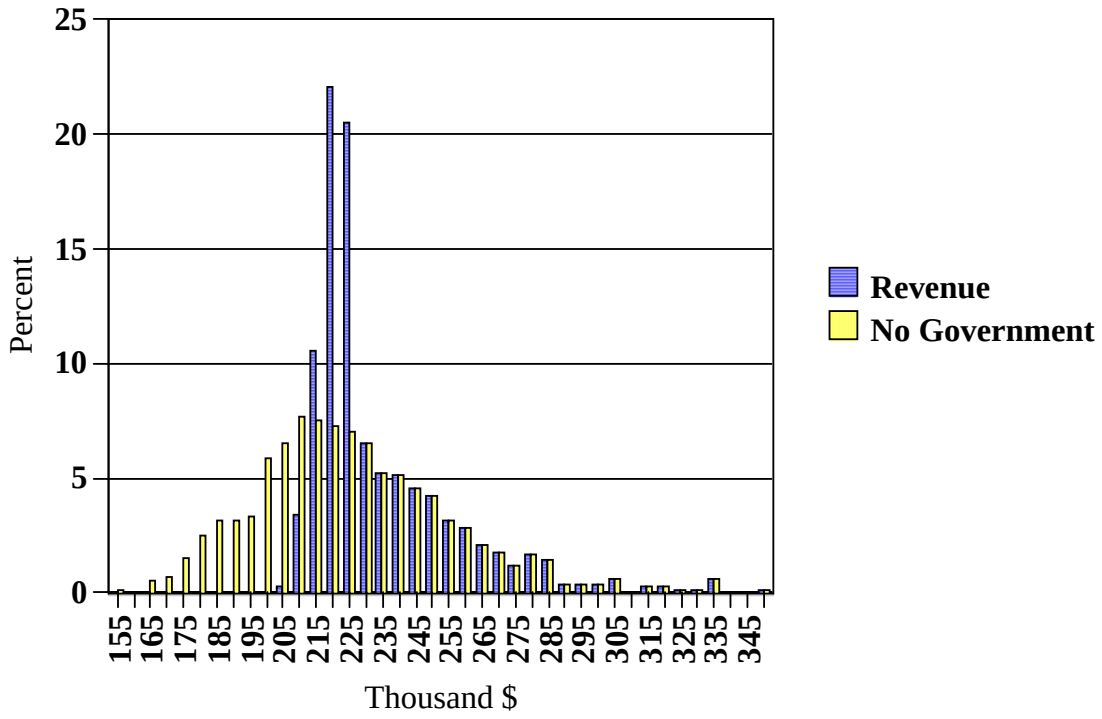

Figure 14. Distribution of Gross Revenue for the Average of All Representative Farms under the No Government and Revenue Insurance Scenarios

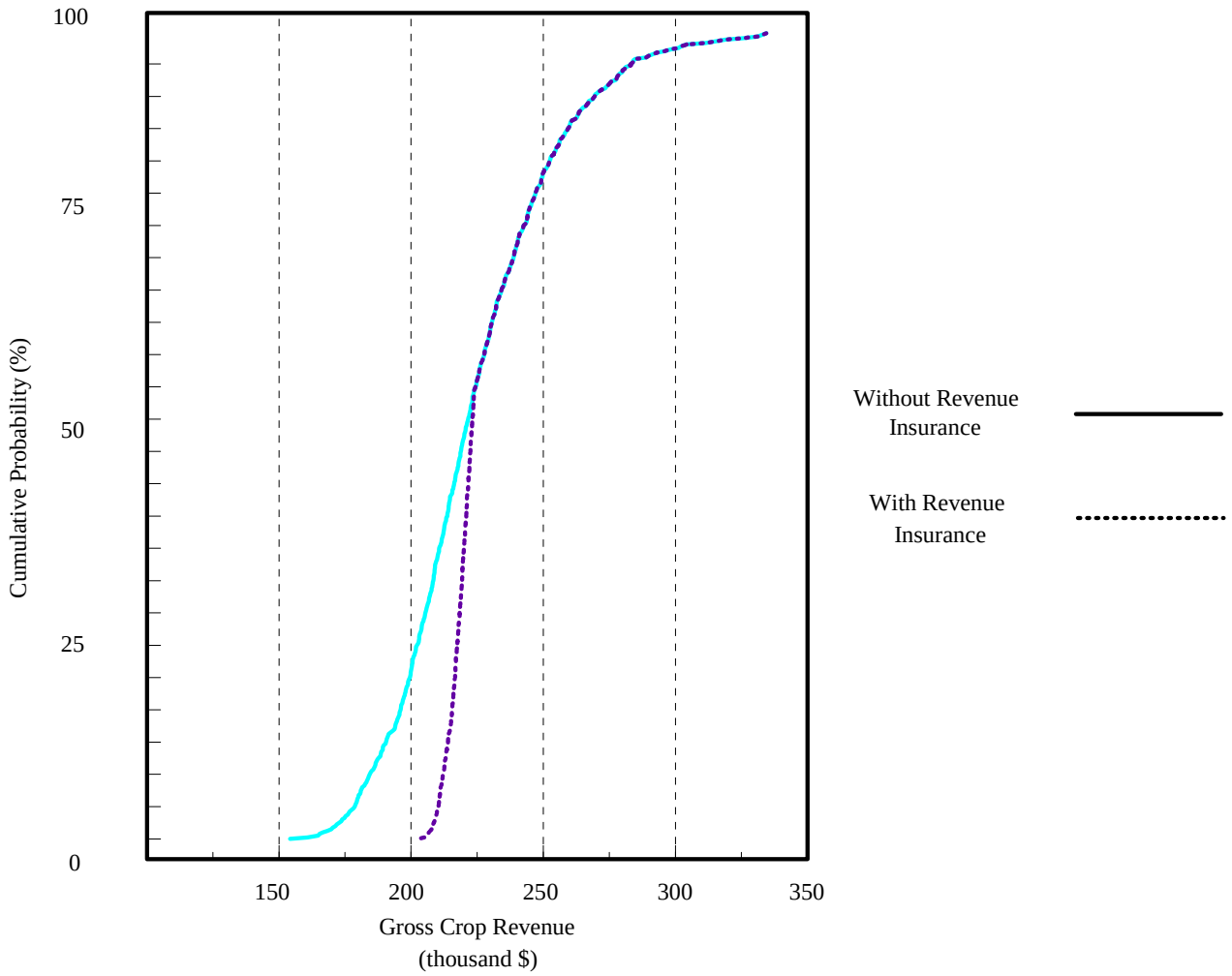

Figure 15. Cumulative Probability of Gross Revenue for the No Government and Revenue Insurance Scenarios

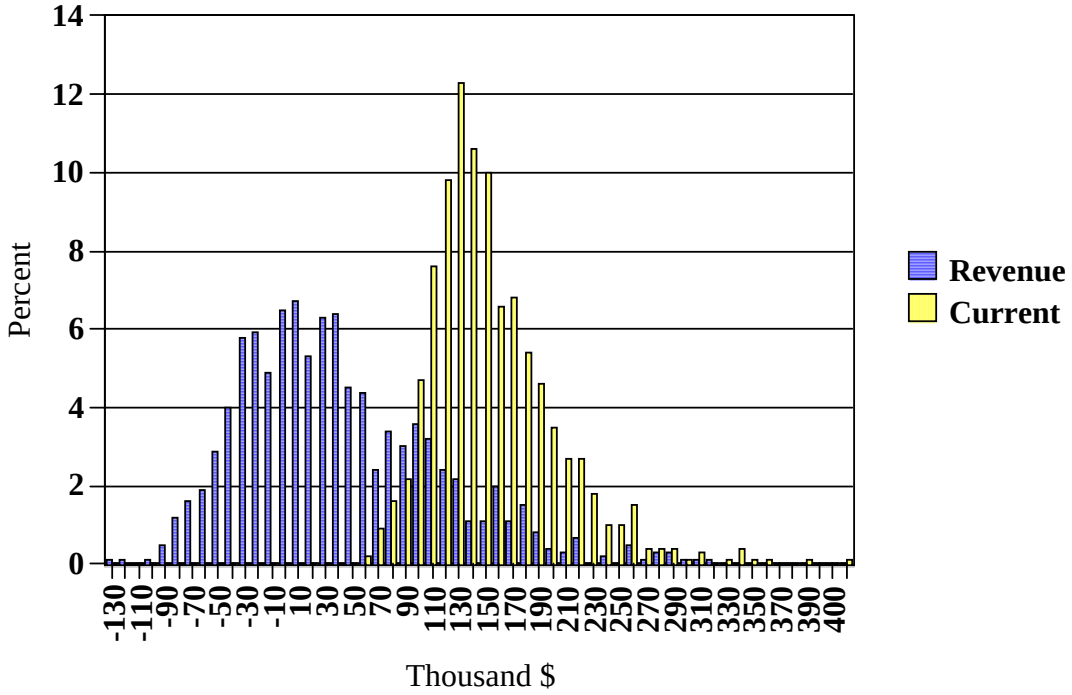

Figure 16. Distribution of Net Farm Income under the Current Government Program and the Revenue Insurance Scenario

Table 13 shows the average revenue, standard deviations, and differences between the base model and the revenue insurance scenarios. Average gross crop revenues increase between 3% and 4% for all farms, while the standard deviation decreases by 25%. Farms of all sizes would react similarly to the revenue insurance program.

Table 13. Gross Revenue and Standard Deviations under no Government and Revenue Insurance Scenarios

		No Government	Revenue	Difference	Ratio
Small	Mean	55,863	57,724	1,861	1.03
	St. Dev	6,900	5,208	-1,692	0.75
Medium	Mean	180,490	187,202	6,712	1.04
	St. Dev	24,659	18,454	-6,205	0.75
Large	Mean	478,771	496,794	18,023	1.04
	St. Dev	66,133	49,387	-16,746	0.75
All	Mean	223,904	232,178	8,274	1.04
	St. Dev	30,413	22,756	-7,657	0.75

An Income Insurance Proposal

An alternative to insuring gross revenue would be to insure net farm incomes. The Canadian Agricultural Income Stabilization Program (CAIS) insures a farmer's income (production margin) based on the difference between allowable income and allowable expenses. A five-year Olympic average is used to determine a producer's reference margin. The reference margin is then insured at various levels. The CAIS is a cost-sharing program between the federal government and producers that allows them to deposit funds during higher income years which are paid during low income years. The government subsidizes the payments depending on the level of loss.

For this study, income insurance is fully subsidized by the federal government and covers the entire net farm income at the 70% level, similar to the revenue insurance proposal. Figures 17, 18, and 19 show the distribution of the no government and income insurance scenarios. Net farm income increases $3 thousand for the small-size farm, from $8 thousand to $11 thousand. The medium-size farm's average income increases from $14 thousand to $24 thousand. Average net farm income for the large-size farm increases from $18 thousand to $43 thousand. The most important aspect of the insurance proposal is the ability to reduce the negative distribution. In the no government scenario, net farm income for the small farm is negative 23% of the time. With the insurance proposal, small farms do not experience negative net farm incomes. The medium- and large-size farms have negative net farm incomes 39% and 47% of the time, respectively, without federal farm subsidies, respectively, and 6% and 29% of the time with the income insurance proposal. Figure 20 shows the distribution of the average of all farms in the study. The average net farm income without government payments is $13 thousand with a standard deviation of $41 thousand. With the income insurance proposal, net farm income increases to $25 thousand with a standard deviation of $30 thousand. Net income is raised by $12 thousand, but more importantly, the income variation is reduced by more than one-fourth. The income insurance increases average incomes more than the revenue insurance scenario but direct payments would still be needed to raise income levels to match current levels.

Figure 21 shows the distribution differences between the current farm bill and the income insurance scenario. Although both scenarios remove the negative end of the distributions, the income insurance is centered around the $10 thousand level, while the base scenario is centered around the $70 thousand level. This figure shows the impact that the current farm bill has on net farm income. While the distribution is similar for both scenarios, the income support under the current farm bill is much greater than that under the income insurance proposal.

Figure 22 shows the cumulative probability of net farm income for the current farm bill, the income insurance scenario, and with no government payments. The insurance program increases net farm income only at the lower income range, while the current farm bill increases net farm income at every level. The area between the lines indicates the potential government payment levels. The area for the income insurance is much smaller than the area for the current farm bill.

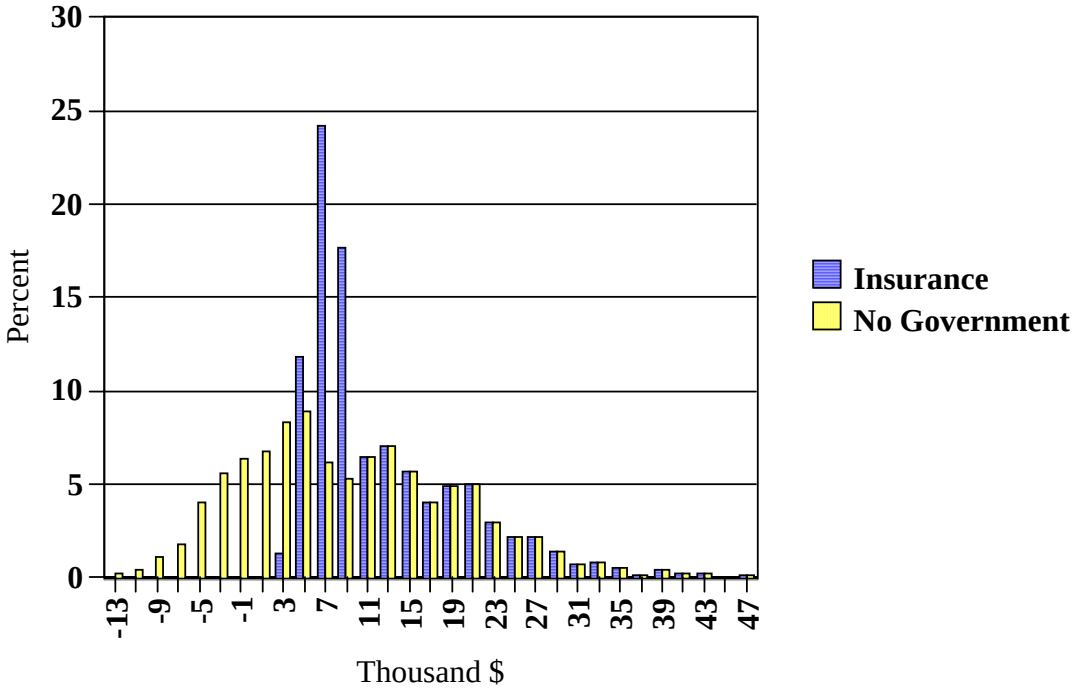

Figure 17. Distribution of Net Farm Income for Small-size Representative Farms under the No Government and Income Insurance Scenarios

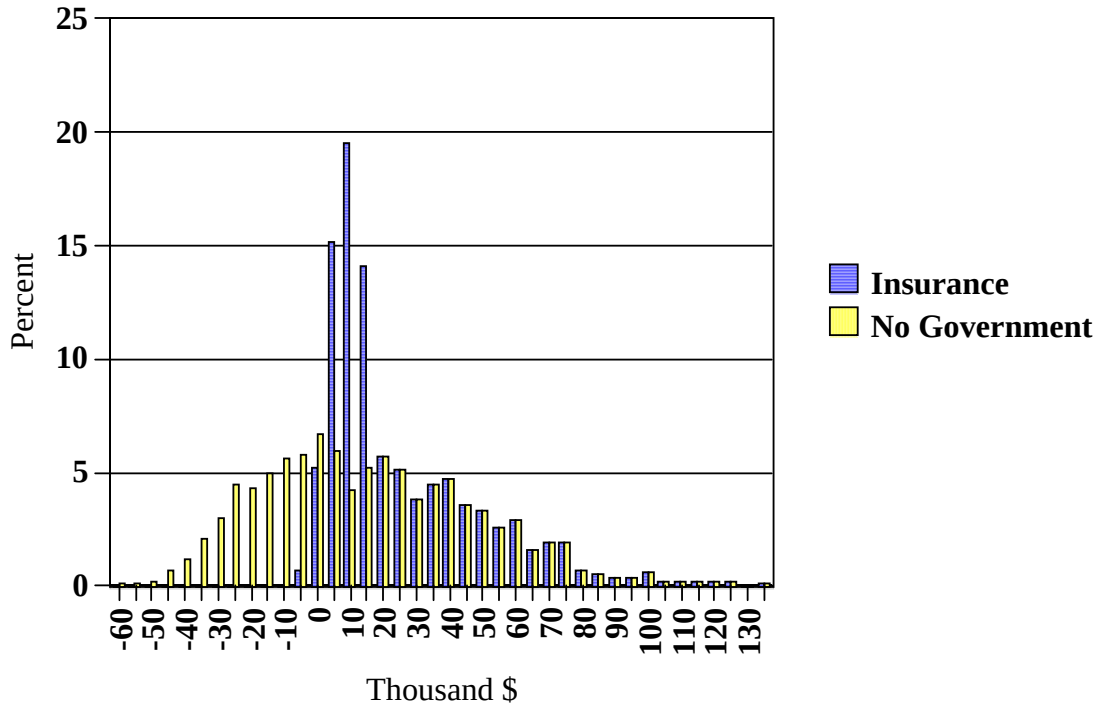

Figure 18. Distribution of Net Farm Income for Medium-size Representative Farms under the No Government and Income Insurance Scenarios

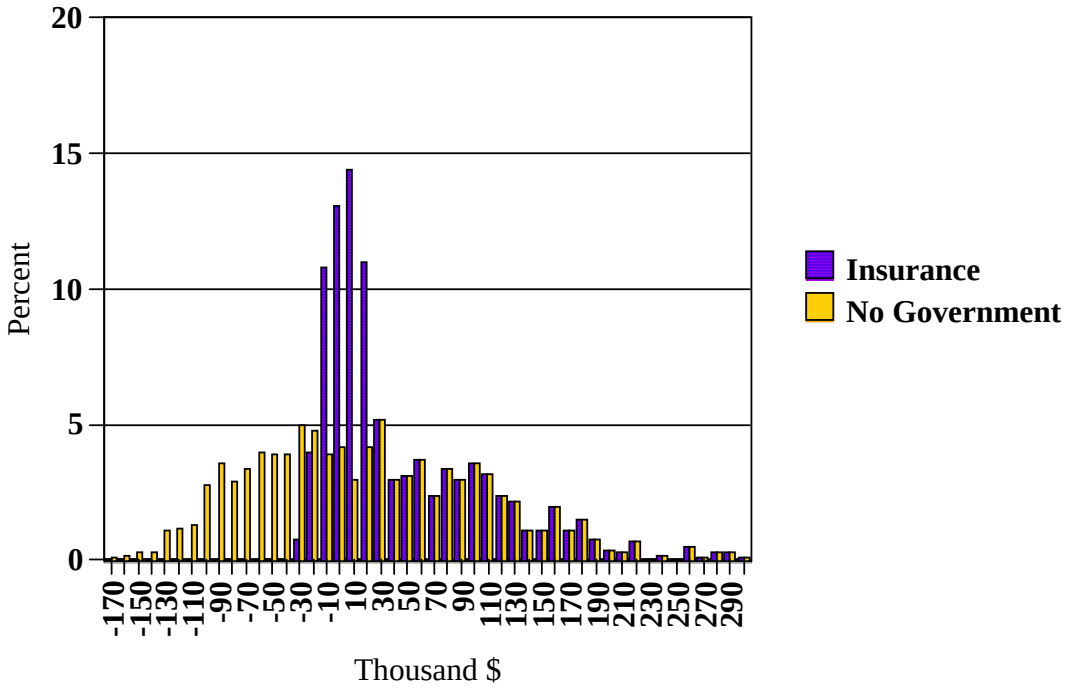

Figure 19. Distribution of Net Farm Income for Large-size Representative Farms under the No Government and Income Insurance Scenarios

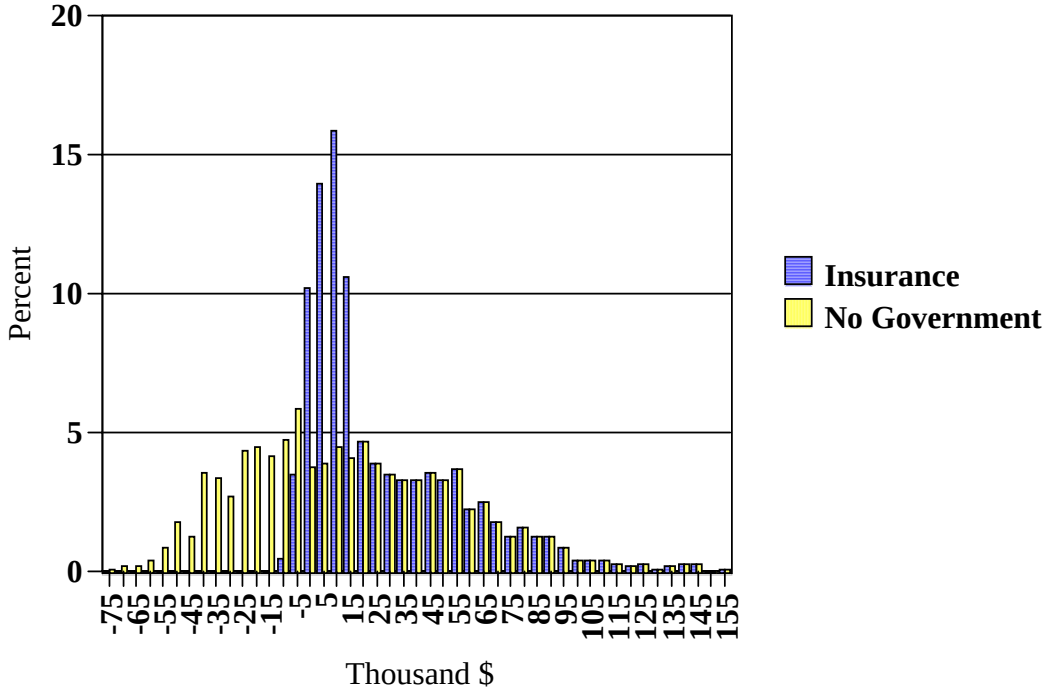

Figure 20. Distribution of Net Farm Income for the Average of All Representative Farms under the No Government and Income Insurance Scenarios

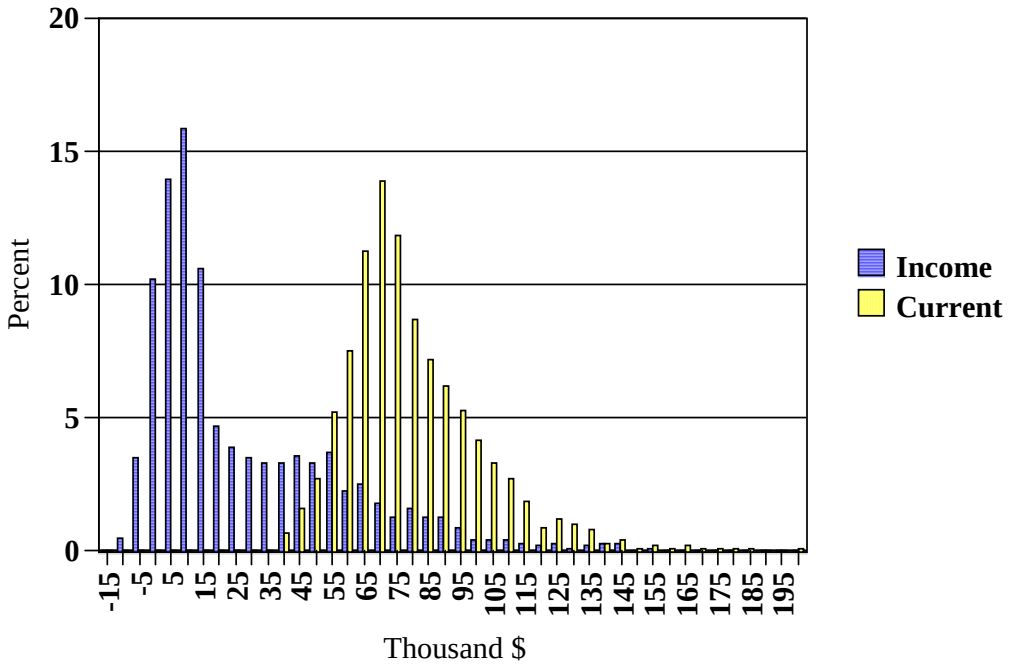

Figure 21. Distribution of Net Farm Income for the Average of All Representative Farms under the Current Government Program and Income Insurance Scenarios

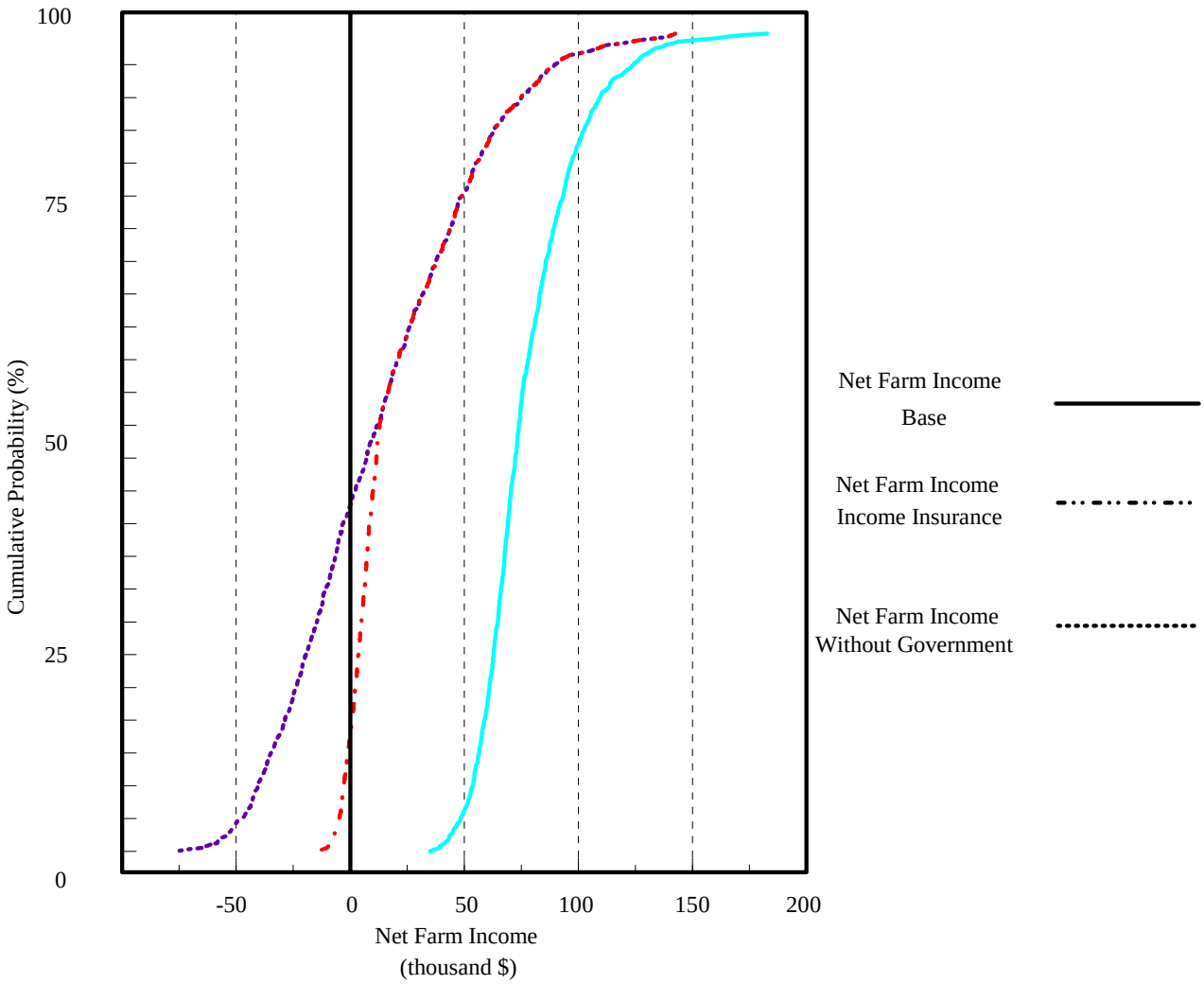

Figure 22. Cumulative Probability of Net Farm Income for the Base, No Farm Bill, and Income Insurance Scenarios

Table 14 shows the average revenue, standard deviations and differences between the no government and the income insurance scenarios. Average net income increases between 36% for the small-size farm and 143% for the large-size farm. The average net farm increase is 88%. The standard deviation decreases by 27%. Large farms would benefit from an income insurance program more than smaller farms

Table 14. Net Farm Income and Standard Deviations under No Government and Income Insurance Scenarios

		No Government	Income	Difference	Ratio
Small	Mean	8,408	11,360	2,952	1.36
	St. Dev	10,267	7,454	-2,813	0.73
Medium	Mean	13,642	23,095	9,453	1.69
	St. Dev	33,157	24,115	-9,042	0.73
Large	Mean	17,726	43,070	25,344	2.43
	St. Dev	88,648	64,247	-24,401	0.72
All	Mean	13,354	25,127	11,773	1.88
	St. Dev	41,190	29,883	-11,307	0.73

COSTS OF THE VARIOUS PROPOSALS

Governmental costs per farm are equal to governmental subsidies received by the producer. In other words, governmental costs equal increases in net farm income due to subsidies. Different programs, policies, and regulations may distribute funds differently in varying amounts, but on average they are equal. Table 15 shows the costs of the various scenarios. Also, the amounts can be viewed as increases in net farm income due to government payments. Under the current program, the small-, medium-, and large-size farms receive $20 thousand, $53 thousand, and $132 thousand in governmental support, respectively. Direct payments, which are classified as non-trade distorting, amount to $6 thousand, $16 thousand, and $35 thousand for the small-, medium-, and large-size farm, respectively.

Governmental cost under the 60% reduction scenario amounts to $8 thousand, $21 thousand, and $53 thousand for the small-, medium-, and large-size farms, or $12 thousand, $32 thousand, and $79 thousand less than the base scenario, respectively. The costs for both the revenue and income insurance scenarios are substantially less than current government payments because neither subsidizes income, they only reduce the variation of income. Additional direct payments would be needed to raise net farm income.

Per acre payments are different among the various size farms. Under all scenarios, large farms receive larger per acre payments, except for direct payments. Current farm bill spending, across all the farms in the study, averages about $38 per acre. Under the 60% reduction scenario, the average is $19 per acre. The revenue and income insurance scenarios average $5 and $7 per acre, respectively, because there is no income support in the proposals. If current direct payments were added back into revenue, the payment would be $16 and $18, respectively. To bring income back to current levels would require additional direct payments of $30 to $35 per acre.

Table 15. Governmental Costs under Various Scenarios, by Farm Size

Scenario	Small	Medium	Large
	----------dollars----------		
Current Farm Bill Programs			
Total	19,634 (37)	52,754 (37)	131,825 (40)
Direct Payments	6,441 (12)	15,852 (11)	34,678 (10)
Counter-cyclical	3,941 (7)	9,639 (7)	24,543 (7)
Loan Program	4,983 (9)	23,499 (16)	57,508 (17)
Alternative Scenarios			
60% Reduction	7,854 (28)	21,102 (15)	52,730 (16)
Revenue Insurance	1,861 (3)	6,712 (5)	18,023 (5)
Income Insurance	2,951 (7)	9,453 (7)	25,343 (8)

Per acre payments in parentheses

SUMMARY AND CONCLUSIONS

Government programs are essential to North Dakota producers. In many years, direct government payments are larger than North Dakota net farm income, which indicates that net farm income would have been negative with no governmental support. Recently, government support has amounted to over 75% of net farm income. Government programs have been built into agriculture, production costs (both fixed and variable), farming structure, marketing systems, ownership patterns, and even enterprise choice. Any major change in governmental programs would require time to allow agriculture to slowly adapt to those changes, or the shock would be dramatic and sharp.

The loan program is the most important subsidy that the government provides to North Dakota producers. The average support level between the counter-cyclical and loan program is about the same; however, the standard deviation for the loan program is much larger, indicating that the loan program provides a larger and stronger safety net than does the counter-cyclical program. Direct payments do not provide a safety net, they only increase income.

The recent proposal by the administration to reduce trade distorting subsidies by 60% would reduce average net farm income by about $39 thousand per year, plus the standard deviation would increase 47% from an average of $22 thousand to $32 thousand. This indicates that producers would be required to accept substantially more price risk.

The two insurance proposals would reduce variation in returns, but they would not increase incomes substantially as they are designed to reduce risk associated with decreases in prices and yields. Direct payments would be needed to increase income to a desirable level. The revenue insurance would cost the government about $5 per acre and the income insurance would cost about $7 per acre. There are several problems with both the revenue and income insurance which would need to be addressed. Producers' records would have to be adjusted to the accrual accounting method to isolate crop year production. Also, restrictions would have to be placed on expenses and returns, similar to the Canadian program. Some expenses and some returns would not be allowed.

WTO concerns could be addressed with either a revenue or income insurance program. If the support level is 70%, they would be classified as green box and not subject to limitations. The loan program is classified as amber box, and the counter-cyclical program is amber or blue box. There is some discussion whether the counter-cyclical program should be classified as blue or amber box. If the U.S. farm program was converted from commodity programs to an insurance program plus direct payments, all of the subsidies would be classified as green box and therefore not subject to limitations by the WTO. The only major concern would be the budget constraints.

It will be difficult to write a farm bill similar to the 2002 bill, due to the new political and economic environment. Funding for a new farm bill will be extremely tight, and restrictions by the WTO will be a much larger factor in 2006 than they were in 2001. Reduced government funding will reduce net farm income; however, there are several different ways to address the restrictions by the WTO. Subsidized insurance programs will reduce variability and, if combined with larger direct payments, could provide benefits similar to the current farm bill. However, the costs would also be similar to the 2002 farm bill.

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