

Detailed Results of Macroeconomic Impacts of Technology and Public Policy on Dairy Farms

Chapter 9 presented the summary results of the macroeconomic impacts of public policies and technology on the viability of various size dairy farms. This appendix discusses in more detail the specific results of the analysis by area and size of farm. For more detail than is provided in this appendix the reader is advised to read the background paper on which this analysis is based. The paper is published in a separate volume to this report.

As with the crop farms analyses, the first step was to describe representative farms that included moderate, large, and very large farms in each production area. The second step involved a simulation of the representative farms using a Monte-Carlo, whole farm simulation model (FLIPSIM V) under alternative farm policy, income tax, finance, and technology scenarios. This model is described in appendix E.

Results for Alternative Policy and Technology Scenarios

Minnesota Dairy-52 Cows

Given the base policy scenario, the 52-cow Minnesota dairy had a 74-percent chance for survival after 10 years, but only a 26-percent chance of having a positive after-tax, net present value (table F-1). Average present value of ending net worth decreased from the initial \$417,000 to \$240,000 after 10 years. Total debt increased \$199,000, and the equity-to-asset ratio declined from 0.71 to 0.44 over the 10-year period. Average annual net farm income was a -\$22,000.

Both policy alternatives involving crop programs that increase feed prices (scenario 1) and the no-

Table F-1.—Comparison of Selected Policy Scenarios on a 52-Cow Minnesota Dairy

Criteria	Initial situation	Alternative scenarios												
		Base	1	2	3	4	5	6	7	8				
Probability of survival (percent)					58	74	62	74	58	22	74	92	50	62
Probability of positive net present value (percent)	NA	26	22	26	18	8	24	38	20	22				
After-tax net present value mean (\$1,000)	NA	-61	-89	-61	-100	-198	-62	13	-103	-88				
Average present value of ending net worth (\$1,000)	417	240	213	240	202	114	238	310	191	214				
Total debts after 10 years (\$1,000)	168	367	392	367	403	443	370	309	400	391				
Average ending equity ratio (fraction)	0.71	0.44	0.39	0.44	0.37	0.22	0.43	0.55	0.35	0.39				
Average internal rate of return (fraction)	NA	-0.02	-0.03	-0.02	-0.04	-0.09	-0.02	0.01	-0.04	-0.03				
Average annual net farm income (\$1,000)	NA	-22	-25	-22	-27	-38	-27	-14	-26	-25				

^aThe scenarios are:

Base—see chapter 9.

1—A 20-percent acreage reduction crop program—9-percent higher feed costs.

2—No crop program

3—Fifty cents-per-hundredweight lower milk price.

4—No dairy price support program.

5—Reduce income tax benefit program.

6—Milk supply control program.

7—No information technology.

8—No bovine growth hormone technology.

NA=Not applicable.

SOURCE: Office of Technology Assessment.

Table F-2.—Comparison of Selected Policy Scenarios on a 125-Cow Minnesota Dairy

Criteria	Initial situation	Alternative scenarios								
		Base	1	2	3	4	5	6	7	8
Probability of survival (percent)	NA	100	100	100	100	98	100	100	100	100
Probability of positive net present value (percent)	NA	96	88	96	86	44	94	98	54	82
After-tax net present value mean (\$1,000)	NA	369	312	369	283	59	360	461	104	235
Average present value of ending net worth (\$1,000)	969	1,120	1,072	1,119	1,049	835	1,083	1,190	869	1,007
Total debts after 10 years (\$1,000)	302	154	208	154	235	518	197	93	459	289
Average ending equity ratio (fraction)	0.76	0.89	0.86	0.89	0.85	0.67	0.87	0.93	0.70	0.81
Average internal rate of return (fraction)	NA	0.05	0.04	0.05	0.04	0.01	0.05	0.05	0.02	0.03
Average annual net farm income (\$1,000)	NA	20	12	20	8	-21	3	33	-15	2

The scenarios are
 Base—see chapter 9
 1—A 20-percent acreage reduction crop program—9 percent higher feed costs
 2—No crop program
 3—Fifty cents per hundredweight lower milk price
 4—No dairy price support program
 5—Reduce income tax benefit program
 6—Milk supply control program
 7—No information technology
 8—No bovine growth hormone technology
 NA = Not applicable

SOURCE Office of Technology Assessment

crop program that increases feed price variability (scenario 2) had little impact on the 52-cow Minnesota dairy because most of the feed is raised at the dairy rather than purchased. Crop yields were fixed, not variable, from year to year. However, simulations where crop yields were stochastic did not significantly change the results.

A support price 50 cents below the price in the base scenario reduced the probability of survival to 58 percent (scenario 3). The decline in the present value of ending net worth was more adversely affected, and debt was \$36,000 higher compared with the results from the base scenario after 10 years.

Eliminating the price-stabilizing aspects of the dairy price support program (scenario 4) resulted in a probability of survival of 22 percent for the 52-cow Minnesota dairy. The equity-to-asset ratio was 0.22 after 10 years.

Eliminating income tax benefits (scenario 5) did not change the probability of survival but did adversely affect the present value of ending net worth and total debt when compared with the base scenario.

A supply control program (scenario 6) increased the probability of survival to 92 percent, and the equity-to-asset after 10 years increased from 0.44 to 0.55. Present value of ending net worth declined

to \$310,000 after 10 years. Total debt increased but less than that under the base scenario. The supply control scenario generally was more favorable than the base scenario for the 52-cow Minnesota dairy.

The probability of survival for the 52-cow Minnesota dairy would decline to 50 percent after 10 years if productivity gains from information and nutrition technology do not materialize. The probability of survival without bovine growth hormone would decline to only 62 percent because this size dairy would adopt this technology in 1989, near the end of the 10-year period.

Minnesota Dairy- 125 Cows

Given the base policy scenario, the 125-cow Minnesota dairy had a 100-percent chance of surviving 10 years and a 96-percent chance of having a positive after-tax net present value (table F-2). The present value of ending net worth increased slightly from an initial \$969,000 to \$1,120,000 at the end of the 10-year period. Both long-term and intermediate-term debt were reduced, and the equity ratio increased from an initial 0.76 to 0.89 by the end of the 10 years.

Like the effects on the 52-cow Minnesota dairy, policies that increase the level or variability of feed

prices have little impact on the financial performance (scenarios 1 and 2) of the 125-cow dairy. Because this dairy produces most of its own feed requirement, it is insulated from short-run variations in feed costs.

A support price lower by 50 cents per hundred-weight reduced the present value of ending net worth from \$1,120,000 under the base scenario to \$1,049,000 (scenario 3). The total equity ratio was 0.85.

A dairy support program (scenario 4) reduced the probability of a positive after-tax present value to 44 percent. Both long-term and intermediate-term debt was \$216,000 higher than under the base scenario.

Eliminating the income tax benefits (scenario 5) for the 125-cow Minnesota dairy resulted in higher debts and lower present value of ending net worth, equity ratio, and average annual net farm income after 10 years, compared with the results under the base scenario.

A supply control program (scenario 6) increased the probability of a positive after-tax net present value to 98 percent, compared with 96 percent under the base scenario. Under both the base and supply control scenarios, the 125-cow dairy had a 100 percent chance of surviving the 10-year period. The dairy showed good financial progress under the sup-

ply control program as the present value of ending net worth was \$1,190,000. The total equity ratio was 0.93 at the end of the 10-year period. Average annual net farm income for the 10-year period was \$33,000, up from \$20,000 under the base scenario.

The probability of survival would remain at 100 percent without either information or bovine growth hormone technology. However, the probability of a positive net present value, average present value of ending net worth, and other financial performance measures were more adversely affected than under the base scenario.

Arizona Dairy-359 Cows

Given the base policy scenario, the 359-cow Arizona dairy had a 96 percent chance of survival and a 96 percent chance of a positive after-tax net present value for the 10-year period (table F-3). The dairy showed good financial improvement over the 10 years as present value of ending net worth was \$1,296,000 compared with \$744,000 at the beginning of the period, most debt was paid, and total equity ratio increased from 0.71 to 0.93. Average annual net farm income was \$14,000.

All feed is purchased by the 359-cow Arizona dairy, and the 9 percent increase in feed cost (scenario 1) reduced the probability of survival to 80 per-

Table F-3.—Comparison of Selected Policy Scenarios on a 359-COW Arizona Dairy

Criteria	Initial situation	Alternative scenarios											
		Base	1	2	3	4	5	6	7	8			
Probability of survival (percent)				NA	98	80	98	94	42	98	96	92	94
Probability of positive net present value (percent)	NA	96	72	96	90	26	96	96	96	90	90		
After-tax net present value mean (\$1,000)	NA	829	172	822	593	-326	812	1,134	543	592			
Average present value of ending net worth (\$1,000)	744	1,296	768	1,288	1,120	276	1,247	1,486	1,028	1,107			
Total debts after 10 years (\$1,000)	298	41	254	43	72	603	42	26	82	78			
Average ending equity ratio (fraction)	0.71	0.93	0.71	0.93	0.91	0.26	0.93	0.93	0.90	0.91			
Average internal rate of return (fraction)	NA	0.09	0.01	0.09	0.06	-0.15	0.09	0.11	0.06	0.07			
Average annual net farm income (\$1,000)	NA	14	-64	13	-14	-121	6	54	-21	-19			

^aThe scenarios are:

Base—see chapter 9.

1—A 20-percent acreage reduction crop program—9-percent higher feed costs.

2—No crop program

3—Fifty cents-per-hundredweight lower milk price.

4—No dairy price support program.

5—Reduce income tax benefit program.

6—Milk supply control program.

7—No information technology.

8—No bovine growth hormone technology.

NA = Not applicable.

SOURCE: Office of Technology Assessment.

cent, compared with 96 percent under the base scenario. However, the dairy still made good financial progress as debts were reduced, and the present value of ending net worth was \$768,000, compared with \$744,000 at the beginning of the period. The no-crop-program scenario (scenario 2) increased the variability of feed prices but reduced the financial progress of the dairy relatively little.

A support price 50 cents below the base scenario (scenario 3) prices reduced the probability of survival and resulted in a lower present value of ending net worth. Total equity-to-asset ratio still increased to 0.91, 2 percentage points less than that of the base scenario.

Eliminating the dairy support program (scenario 4) reduced the probability of survival to 42 percent. The after-tax net present value was -\$326. The present value of ending net worth was \$1,020,000 less than under the base and more than 60 percent lower than at the beginning of the period. Debt was tripled, and the total equity-to-asset ratio decreased from 0.71 at the beginning of the period to 0.26 at the end of the 10 years. Average annual net farm income was -\$121,000, compared with \$14,000 under the base scenario.

Eliminating income tax advantages (scenario 5) slightly reduced the present value of ending net

worth but had little effect on the probability of survival, remaining debt, and ending total equity-to-asset ratio.

With supply control (scenario 6) the probability of survival was 96 percent. Present value of ending net worth was \$190,000 higher at the end of the 10-year period. Average annual net farm income was \$54,000.

The financial progress under either the no information technology (scenario 7) or no bovine growth hormone (scenario 8) was somewhat less than under the base scenario that included both these technologies. The average annual net farm income became negative, and the probability of survival declined to 92 percent for the no information scenario and to 94 percent for the no bovine growth hormone scenario.

California Dairy-550 Cows

Given the base policy scenario, the 550-cow California dairy had a 96 percent probability of survival and positive net present value (table F-4). The dairy showed good financial improvement over the 10-year period under the base scenario. Present value of ending net worth increased from \$1,261,000 at the beginning to \$2,055,000 at the end of the 10-year

Table F-4.-Comparison of Selected Policy Scenarios on a 550-COW California Dairy

Criteria	Initial situation	Alternative scenarios												
		Base	1	2	3	4	5	6	7	8				
Probability of survival (percent)					NA	98	80	98	94	62	98	98	88	94
Probability of positive net present value (percent)	NA	96	58	98	88	32	98	96		80				96
After-tax net present value mean (\$1,000)	NA	1,178	157	1,169	798	-292	1,157	1,682		367				659
Average present value of ending net worth (\$1,000)	1,261	2,055	1,267	2,045	1,792	799	1,971	2,349		1,380				1,672
Total debts after 10 years (\$1,000)	464	105	405	110	157	739	109	92		300				185
Average ending equity ratio (fraction)	0.71	0.92	0.73	0.92	0.90	0.52	0.93	0.92		0.81				0.89
Average internal rate of return (fraction)	NA	0.08	0.00	0.08	0.06	-0.06	0.08	0.10		0.02				0.05
Average annual net farm income (\$1,000)	NA	10	-117	9	-35	-16	-5	76		-88				-57

^aThe scenarios are:

Base—see chapter 9.

1—A 20-percent acreage reduction crop program—9-percent higher feed costs.

2—No crop program

3—Fifty cents-per-hundredweight lower milk price.

4—No dairy price support program.

5—Reduce income tax benefit program.

6—Milk supply control program.

7—No information technology.

8—No bovine growth hormone technology.

NA = Not applicable.

SOURCE: Office of Technology Assessment.

period. Total debts were greatly reduced, and total equity-to-asset ratio increased from 0.71 to 0.92 over the lo-year period.

The crop acreage reduction policy (scenario 1), resulting in a 9 percent increase in feed costs, reduced the probability of survival to 80 percent and the probability of positive after-tax net present value to 58 percent. The no-crop-program scenario (scenario 2) had relatively little impact on the 550-cow California dairy.

A milk support price 50 cents lower (scenario 3) than under the base scenario reduced the probability of survival to 94 percent and the present value of ending net worth to \$1,792,000. The total equity-to-asset ratio after 10 years was 0.90.

The no dairy price support program (scenario 4) reduced the probability of survival to 62 percent, and reduced the present value of ending net worth to \$799,000. The total equity-to-asset ratio was 0.52 after 10 years.

Eliminating income tax advantages (scenario 5) had little impact on the financial performance of the 550-cow California dairy relative to the base scenario. The total debts and the total equity-to-asset ratio was about the same as under the base scenario.

A mandatory supply control program (scenario 6) resulting in a milk price \$1 per hundredweight

higher than in the base scenario had a favorable impact on the 550-cow California dairy. Compared with the base scenario the present value of ending net worth was \$2,349,000, or 14 percent higher, and the after-tax net present value was \$1,682,000, or 43 percent higher. The average annual net farm income increased to \$76,000.

The average present value of ending net worth and the equity ratio increased from the beginning of the period to the end even without information (scenario 7) or bovine growth hormone (scenario 8) technology. Also, total debt was reduced. However, both the probability of survival and a positive net present value declined, and average annual net farm income became negative.

California Dairy-1,436 Cows

Given the base policy scenario, the 1,436-cow California dairy had a 98 percent probability of survival and showed strong financial progress from the beginning to the end of the 10-year period (table F-5). The present value of ending net worth was \$7,332,000, compared with \$2,538,000 at the beginning of the lo-year period. The total equity-to-asset ratio increased from 0.69 at the beginning of the period to

Table F-5.—Comparison of Selected Policy Scenarios on a 1,435-COW California Dairy

Criteria	Initial situation	Alternative scenarios										
		Base	1	2	3	4	5	6	7	8		
Probability of survival (percent)				NA	98	98	98	98	98	100	96	98
Probability of positive net present value (percent)	NA	98	98	98	98	92	98	100	98	98	98	98
After-tax net present value mean (\$1,000)	NA	6,473	3,923	6,454	5,375	2,523	6,415	8,103	3,246	4,450		
Average present value of ending net worth (\$1,000)	2,538	7,332	5,477	7,316	6,509	4,418	7,142	8,543	4,648	5,747		
Total debts after 10 years (\$1,000)	1,131	145	220	148	150	307	145	98	201	145		
Average ending equity ratio (fraction)	0.69	0.94	0.92	0.94	0.94	0.91	0.94	0.95	0.94	0.95		
Average internal rate of return (fraction)	NA	0.15	0.08	0.16	0.15	0.07	0.16	0.19	0.10	0.12		
Average annual net farm income (\$1,000)	NA	449	171	447	325	7	421	653	101	207		

^aThe scenarios are:
 Base—see chapter 9.
 1—A 20-percent acreage reduction crop program—9-percent higher feed costs.
 2—No crop program
 3—Fifty cents-per-hundredweight lower milk price,
 4—No dairy price support program.
 5—Reduce income tax benefit program.
 6—Milk supply control program.
 7—No information technology,
 8—No bovine growth hormone technology.
 NA = Not applicable.

SOURCE: Office of Technology Assessment.

0.94 at the end. Total debt was cut by 87 percent from the beginning to the end of the period.

The acreage reduction scenario, resulting in 9 percent higher feed prices, reduced the probability of survival to 96 percent (scenario 1). Total equity-to-asset ratio was 0.92.

Eliminating the crop program (scenario 2) had little impact on the financial position of the 1,436-cow California dairy. Debt, equity-to-asset ratio, and present value of ending net worth were all about the same as under the base scenario.

A milk support price 50 cents lower (scenario 3) than under the base scenario resulted in an 11 percent lower present value of ending net worth after 10 years. Total debt increased slightly, and the total equity-to-asset ratio remained the same as the base.

Eliminating the dairy price support program (scenario 4) reduced the probability of survival to 96 percent. The present value of ending net worth was \$4,418,000, or 40 percent lower than under the base scenario.

Eliminating the income tax advantages (scenario 5) did not affect the probability of survival, total debt, or equity-to-asset ratio. However, the present value of ending net worth decreased 2.6 percent from the base scenario.

With supply control (scenario 6), the probability of survival of the 1,436-cow California dairy in-

creased to 100 percent. The present value of ending net worth was \$8,543,000, or about 17 percent higher than under the base scenario. All intermediate-term debt was paid, and only \$96,000 of long-term debt remained after 10 years under the supply control program. Average annual net farm income increased 45 percent, to \$653,000.

If the productivity gains associated with information on bovine growth hormone technologies do not materialize, the financial performance will be adversely affected, but the probability of survival for the 1,436-cow California dairy would remain about the same. Average present value of ending net worth was 37 percent lower without information and nutrition technology (scenario 7) and 22 percent lower without bovine growth hormone technology (scenario 8).

Florida Dairies

Given the base policy scenario, the probability of survival was 98 percent for the 350-cow and 100 percent for the 600-cow and 1,436-cow Florida dairies (tables F-6, F-7, and F-8). Debt was reduced over the 10-year period on all three dairies. The total equity-to-asset ratio after 10 years was at least 0.84. The present value of ending net worth increased 33 per-

Table F-6.—Comparison of Selected Policy Scenarios on a 350-Cow Florida Dairy

Criteria	Initial situation	Alternative scenarios											
		Base	1	2	3	4	5	6	7	8			
Probability of survival (percent)				NA	96	58	98	86	36	94	98	86	88
Probability of positive net present value (percent)	NA	88	34	88	78	28	88	98	66	78			
After-tax net present value mean (\$1,000)	NA	448	-185	445	235	-305	425	663	154	270			
Average present value of ending net worth (\$1,000)	757	1,004	463	1,002	825	317	936	1,164	706	846			
Total debts after 10 years (\$1,000)	304	198	577	198	300	679	226	130	376	287			
Average ending equity ratio (fraction)	0.71	0.84	0.46	0.84	0.74	0.32	0.81	0.89	0.68	0.76			
Average internal rate of return (fraction)	NA	0.07	-0.04	0.07	0.03	-0.12	0.07	0.10	0.03	0.05			
Average annual net farm income (\$1,000)	NA	-6	-83	-6	-31	-97	-9	25	-40	-28			

^aThe scenarios are:

Base—see chapter 9

1—A 20-percent acreage reduction crop program—9-percent higher feed costs.

2—No crop program

3—Fifty cents-per-hundredweight lower milk price.

4—No dairy price support program

5—Reduce income tax benefit program.

6—Milk supply control program

7—No information technology

8—No bovine growth hormone technology

NA = Not applicable

SOURCE: Office of Technology Assessment.

Table F-7.—Comparison of Selected Policy Scenarios on a 600-COW Florida Dairy

Criteria	Initial situation	Alternative scenarios								
		Base	1	2	3	4	5	6	7	8
Probability of survival (percent)	NA	100	96	100	100	72	100	100	98	100
Probability of positive net present value (percent)	NA	100	80	100	100	56	100	100	86	98
After-tax net present value mean (\$1,000)	NA	1,617	602	1,612	1,281	85	1,576	2,011	701	1,151
Average present value of ending net worth (\$1,000)	1,465	2,453	1,778	2,455	2,255	1,268	2,306	2,681	1,748	2,164
Total debts after 10 years (\$1,000)	468	116	280	116	124	587	116	116	233	129
Average ending equity ratio (fraction)	0.76	0.94	0.86	0.94	0.94	0.66	0.94	0.93	0.89	0.94
Average internal rate of return (fraction)	NA	0.10	0.06	0.10	0.09	-0.04	0.11	0.12	0.06	0.08
Average annual net farm income (\$1,000)	NA	83	-28	82	44	-97	68	137	-24	23

The scenarios are:

Base—see chapter 9.

1—A 20-percent acreage reduction crop program—9-percent higher feed costs.

2—No crop program

3—Fifty cents+ per-hundredweight lower milk price.

4—No dairy price support program.

5—Reduce income tax benefit program.

6—Milk supply control program.

7—No information technology.

8—No bovine growth hormone technology.

NA = Not applicable.

SOURCE: Office of Technology Assessment.

Table F-8.—Comparison of Selected Policy Scenarios on a 1,436-COW Florida Dairy

Criteria	Initial situation	Alternative scenarios								
		Base	1	2	3	4	5	6	7	8
Probability of survival (percent)	NA	100	100	100	100	100	100	100	100	100
Probability of positive net present value (percent)	NA	100	100	100	100	100	100	100	100	100
After-tax net present value mean (\$1,000)	NA	8,396	6,020	8,387	7,501	4,712	8,182	9,413	5,046	6,667
Average present value of ending net worth (\$1,000)	3,343	9,257	7,560	9,263	8,591	6,625	8,966	10,038	6,650	7,874
Total debts after 10 years (\$1,000)	1,053	195	195	195	195	195	195	195	195	195
Average ending equity ratio (fraction)	0.76	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.96	0.96
Average internal rate of return (fraction)	NA	0.16	0.13	0.16	0.15	0.11	0.16	0.17	0.12	0.14
Average annual net farm income (\$1,000)	NA	635	404	634	536	242	607	769	272	433

The scenarios are:

Base—see chapter 9.

1—A 20-percent acreage reduction crop program—9-percent higher feed costs.

2—No crop program

3—Fifty cents+ per-hundredweight lower milk price.

4—No dairy price support program.

5—Reduce income tax benefit program.

6—Milk supply control program.

7—No information technology.

8—No bovine growth hormone technology.

NA = Not applicable.

SOURCE: Office of Technology Assessment.

cent on the 350-cow dairy, 67 percent on the 600-cow dairy, and 177 percent on the 1,436-cow dairy.

The crop acreage reduction policy (scenario 1) reduced the probability of surviving the 10-year period to 58 percent for the 350-cow dairy and to 96 percent for the 600-cow dairy. The probability of survival remained at 100 percent on the large 1,436-cow Florida dairy.

Eliminating the crop program (scenario 2) had relatively little impact on all three Florida dairies. The probability of survival remained unchanged at 100 percent for the 600-cow and 1,436-cow dairies and at 96 percent on the 350-cow dairy.

A milk support price 50 cents below the base (scenario 3) did not affect the probability of survival for the 1,436-cow dairy but reduced the probability of survival for the 350-cow dairy to 86 percent. The present value of ending net worth was about 18 percent lower for the 350-cow dairy, 8 percent lower for the 600-cow dairy, and 7 percent lower for the 1,436-cow dairy.

The no-dairy-program scenario (scenario 4) reduced the probability of survival to 36 percent for the 350-cow dairy and to 72 percent for the 600-cow dairy. The probability of survival remained at 100 percent for the 1,436-cow dairy. The present value of ending net worth was at least 28 percent less under the no-dairy-program scenario than under the base scenario for all three Florida dairies.

Eliminating income tax advantages (scenario 5) had relatively little impact on all three Florida dairies. The present value of ending net worth was about 7 percent less for the 350-cow dairy but only

3 percent less for the 1,436-cow dairy. Total debt remained the same for the 1,436-cow dairy but was somewhat higher for the smaller dairies.

A supply control policy (scenario 6) improved the financial position of each of the dairies. Compared with the base scenario, the present value of ending net worth increased about 16 percent for the 350-cow dairy, 9 percent for the 600-cow dairy, and 8 percent for the 1,436-cow dairy.

Like dairies in other regions, both no information technology (scenario 6) and no bovine growth hormone technology (scenario 8) adversely affected the financial positions of the Florida dairies after 10 years.

Results for Financial Stress Scenarios

Minnesota Dairies

Given the high debt (scenario 9), the 52-cow Minnesota dairy had a zero-percent probability of survival over the 10-year period (table F-9). The probability of survival remained zero even with subsidized interest (scenario 10) and restructuring debt (scenario 11). The same result was obtained for new entrant operators (scenarios 12, 13, and 14).

The 125-cow Minnesota dairy in an initial high debt position had a 24 percent probability of survival (scenario 9) (table F-10). A new entrant with high debt also had a zero probability of survival (scenario 12). Therefore, there was a zero probability of survival under both higher feed costs (scenario 13) and no dairy programs (scenario 14).

Table F-9.—Comparison of Selected Policy Scenarios on a 52. COW Minnesota Dairy, Assuming High Debt and New Entrant Conditions

Criteria	High debt			New entrants				
	Initial situation	Scenarios			Initial situation	Scenarios		
		9	10	11		12	13	14
Probability of survival (percent)	NA	0	0	0	NA	0	0	0
Probability of positive net present value (percent)	NA	0	0	0	NA	0	0	0
After-tax net present value mean (\$1,000)	NA	-103	-108	-99	NA	-103	-103	-102
Average present value of ending net worth (\$1,000)	246	104	98	109	264	143	144	145
Total debts after 10 years (\$1,000)	340	423	424	419	466	505	503	504
Average ending equity ratio (fraction)	0.42	0.21	0.20	0.22	0.36	0.23	0.23	0.23
Average internal rate of return (fraction)	NA	-0.17	-0.19	-0.16	NA	-0.11	-0.10	-0.10
Average annual net farm income (\$1,000)	NA	-46	-42	-44	NA	-90	-90	-91

The scenarios are:

- 9—Base—continuation of present dairy policy and assuming high debt,
 - 10—Subsidize interest rate so that effective rate on all loans is 8 percent.
 - 11 —Restructure debt.
 - 12—Base policy and new entrant.
 - 13—New entrant and no price support for dairy.
 - 14—New entrant and a 9-percent increase in feed costs.
- NA = Not applicable.

SOURCE: Office of Technology Assessment

Table F-10.—Comparison of Selected Policy Scenarios on a 125-Cow Minnesota Dairy, Assuming High Debt and New Entrant Conditions

Criteria	High debt			New entrants				
	Initial situation	Scenarios			Initial situation	Scenarios		
		9	10	11		12	13	14
Probability of survival (percent)	NA	24	16	28	NA	0	0	0
Probability of positive net present value (percent)	NA	24	16	28	NA	0	0	0
After-tax net present value mean (\$1,000)	NA	-80	-147	-59	NA	-237	-256	-241
Average present value of ending net worth (\$1,000)	554	341	280	351	575	291	274	292
Total debts after 10 years (\$1,000)	718	910	943	906	963	1,016	1,026	1,021
Average ending equity ratio (fraction)	0.44	0.30	0.25	0.31	0.37	0.23	0.22	0.24
Average internal rate of return (fraction)	NA	-0.06	-0.09	-0.06	NA	-0.15	-0.16	-0.16
Average annual net farm income (\$1,000)	NA	-51	-58	-49	NA	-117	-121	-121

^aThe scenarios are:

- 9—Base—continuation of present dairy policy and assuming high debt.
 10—Subsidize interest rate so that effective rate on all loans is 8 percent.
 11—Restructure debt.
 12—Base policy and new entrant.
 13—New entrant and no price support for dairy.
 14—New entrant and a 9-percent increase in feed costs.
 NA = Not applicable.

SOURCE: Office of Technology Assessment

Table F-11.—Comparison of Selected Policy Scenarios on a 359-Cow Arizona Dairy, Assuming High Debt and New Entrant Conditions

Criteria	High debt			New entrants				
	Initial situation	Scenarios			Initial situation	Scenarios		
		9	10	11		12	13	14
Probability of survival (percent)	NA	66	70	68	NA	52	6	16
Probability of positive net present value (percent)	NA	66	70	68	NA	52	6	16
After-tax net present value mean (\$1,000)	NA	417	466	440	NA	270	-320	-173
Average present value of ending net worth (\$1,000)	471	709	746	730	528	583	64	217
Total debts after 10 years (\$1,000)	570	326	297	325	715	459	787	700
Average ending equity ratio (fraction)	0.45	0.63	0.68	0.64	0.42	0.52	0.04	0.23
Average internal rate of return (fraction)	NA	0.01	0.03	0.02	NA	-0.01	-0.22	-0.08
Average annual net farm income (\$1,000)	NA	-59	-46	-56	NA	-109	-191	-191

^aThe scenarios are:

- 9—Base—continuation of present dairy policy and assuming high debt.
 10—Subsidize interest rate so that effective rate on all loans is 8 percent.
 11—Restructure debt.
 12—Base policy and new entrant.
 13—New entrant and no price support for dairy.
 14—New entrant and a 9-percent increase in feed costs.
 NA = Not applicable.

SOURCE: Office of Technology Assessment.

Arizona Dairy-359 Cows

Given the high debt base (scenario 9), the 359-cow Arizona dairy had a 66-percent probability of survival and improved its financial position from the beginning to the end of the 10-year period (table F-11). The present value of ending net worth was \$709,000, compared with a \$471,000 beginning net worth. Total debt was reduced \$244,000 over the 10-year period. The total equity-to-asset ratio increased from 0.45 at the beginning of the period to 0.63 at the end.

Restructuring debt (scenario 11) increased the probability of survival from 66 to 70 percent and improved the present value of ending net worth and equity-to-asset ratio compared with that of the high debt base (scenario 9).

A new entrant with high debt had a 52-percent probability to survive over the 10-year period (scenario 12). A new entrant under the no-dairy-price-support program (scenario 13) had only a 6-percent probability of survival. Increased feed costs (scenario 14) decreased a new entrant's probability of survival from 52 to 16 percent.

Florida Dairy-350 Cows

Given the high debt base (scenario 9), the 350-cow Florida dairy had only a 34-percent probability of survival (table F-12). Present value of ending net worth was \$375,000; beginning net worth was \$466,000. The total equity-to-asset ratio decreased from 0.44 at the beginning to 0.38 at the end of the 10-year period.

The interest subsidy (scenario 10) increased the probability of survival from 38 percent to 42 percent and increased the present value of ending net worth from \$375,000 to \$382,000, compared with the results of high debt base (scenario 9). The debt

restructuring policy (scenario 11) improved present value of ending net worth for the 350-cow Florida dairy compared with the results of high debt base scenario (scenario 9). However, the improvement was considerably less than under the interest subsidy scenario.

A new entrant with high debt had only a 22-percent probability of survival (scenario 12). The probability of survival declined to 2 percent, given a 9-percent higher feed cost (scenario 13). The no-dairy-price-support program reduced the probabilities of survival of a new entrant and a high debt dairy from 22 to 2 percent (scenario 14).

Table F-12.—Comparison of Selected Policy Scenarios on a 350-COW Florida Dairy, Assuming High Debt and New Entrant Conditions

Criteria	High debt				New entrants			
	Initial situation	Scenarios			Initial situation	Scenarios		
		9	10	11		12	13	14
Probability of survival (percent)	NA	34	38	36	NA	22	2	2
Probability of positive net present value (percent)	NA	34	38	36	NA	22	2	2
After-tax net present value mean (\$1,000)	NA	6		23	NA	-75	-297	-263
Average present value of ending net worth (\$1,000)	466	375	382	392	527	326	116	181
Total debts after 10 years (\$1,000)	594	609	609	602	773	741	897	897
Average ending equity ratio (fraction)	0.44	0.38	0.39	0.39	0.41	0.31	0.10	0.17
Average internal rate of return (fraction)	NA	-0.05	-0.04	-0.04	NA	-0.05	-0.22	-0.03
Average annual net farm income (\$1,000)	NA	-88	-76	-85	NA	-155	-194	-211

^aThe scenarios are:
 9—Base—continuation of present dairy policy and assuming high debt
 10—Subsidize interest rate so that effective rate on all loans is 8 percent.
 11—Restructure debt.
 12—Base policy and new entrant
 13—New entrant and no price support for dairy
 14—New entrant and a 9-percent increase in feed costs.
 NA = Not applicable.

SOURCE: Office of Technology Assessment.