Chapter 4

Economic Impacts of Emerging Technologies and Selected Farm Policies for **Various Size Crop Farms**

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The impacts of emerging technologies will spur many adjustments at the farm level. Policymakers must thus consider several questions as they debate the 1981 farm bill: Who will adopt these technologies and benefit the most from them—the moderate farms, large farms, or very large farms? What set of farm policies in conjunction with technology advance will benefit each size of farm the most? What combination of emerging technologies and farm policies encourages each size of farm to grow or remain at its present size? How important is technology compared to farm policy in determining farm growth? What is the likelihood of a new entrant in agriculture remaining solvent?

To help answer these questions, this chapter and the next will present the findings of an analysis of selected regions in the United States that represent significant agricultural production in the commodities considered in farm policy: dairy, corn, cotton, soybeans, rice, and wheat, Within each production region analyzed, representative commercial farms were identified for each of the three size categories: moderate, large, and very Iarge.1 It was assumed that the technology development and adoption conditions in existence would be those of the baseline environment outlined in chapter z.

Two techniques were used to analyze the effects of selected policy provisions and technology on farms within each region. Information was obtained on resource characteristics, acreages devoted to specific crops, and historic projected yields of crops eligible for farm program provisions. These data were used to develop resource characteristics of the three different farm sizes. Then a simulation model was used to analyze the economic viability and growth potential of each representative farm for selected policy and technology advance scenarios.

The following sections present the representative farms and major findings for the production areas analyzed. Obviously, more areas could have been analyzed, but neither time nor the resources allocated to this study would permit their inclusion. It is expected that the results will apply in broad principle to the major production region of which each area is a part, It is important to remember that the results of this analysis are mainly illustrative. Thus, the relative results for the several farm sizes and for the several alternative policy and technology scenarios are probably more important than any specific numbers generated by the analysis.

[1]Small and part-time farms were not included because these farm operators in general depend on off-farm employment for their primary source of income.

THE CROP FARMS ANALYZED

Corn-Soyboan Farms in the Corn Belt[a]

The North Central Region of the United States produces approximately 50 percent of the total production of corn and soybeans. Representative farms for this region are the three farms from the corn-soybean cash grain area of east central Illinois and the three farms from the irrigated row crop area of south central Nebraska.

The representative farm situations developed and used in this analysis were constructed from two basic data sources: 1) national cost-of-production surveys by the U.S. Department of Agriculture (USDA) in 1978 and 1983, and 2) farm record data collected and analyzed by the Universities of Illinois and Nebraska. The size of representative farms and acreages of owned and rented cropland were developed from the size distributions in the USDA cost-of-production surveys. The very large farms approximate the largest 10 percent of farms in the surveys, the large farms the 70th to 90th percentiles, and the moderate farms the 40th to 70th percentiles.

Financial status, as measured by net worth, debt load (both intermediate-term and long-term), and leverage ratio, differs dramatically from farmer to farmer. Data from the most recent Agricultural Finance Survey were used to depict the beginning financial characteristics for the six representative farms (tables 4-1 and 4-2).

All of the representative farms are well-mechanized production units ranging from 640 to 2,085 acres of cropland, and all farms include a combination of owned and rented land. Of the six representative farms, only the very large units in each area employ full-time workers. The other farms operate with a combination of family and part-time workers, The 11-

Table 4-1 .—Financial Characteristics of Three Representative Corn-Soybean Farms in East Central Illinois[a]

	Farm size		
	Moderate	Large	Very large
Cropland acres	640	982	1,630
Acres owned	260	429	458
Acres leased	380	553	1,172
Value of owned real estate ($1 ,OOO)[b]	900.5	1,480.6	1,538.4
Value of machinery ($1,000)	92.2	104.8	129.0
Long-term debt ($1,000)	126.1	557.4	579.2
Intermediate-term debt ($1,000)	55.3	62.9	83.8
Initial net worth ($l,OOO)[c]	855.4	1,027.6	1,106.4
Leverage ratio (fraction)	0.21	0.61	0.60
Long-term debt/asset (fraction)	0,14	0.38	0.38
Intermediate-term debt/asset (fraction)	0.60	0.60	0.65
Equity ratio (fraction)	0.82	0.62	0.63
Off-farm income ($1,000)	8.2	7.4	7.6
Minimum family living expenses ($1 ,000)	18.0	20.0	24.0
Maximum family living expenses ($1 ,000)	36.0	40.0	48.0
Marginal propensity to consume (fraction)	0.20	0.20	0.20

a A family size of four persons was assumed for the purposes of estimating family labor supply and determining appropriate income tax rates
b Includes land and buildings.
c May include assets other than land, buildings, and machinery

SOURCE: Office of Technology Assessment.

linois farms have all of their cropland devoted to cash crop production of corn and soybeans, The Nebraska farms are cash crop operations that combine both gravity and sprinkler technologies to irrigate corn and a small acreage of soybeans. In addition, they produce a substantial acreage of grain sorghum under a nonirrigated (dryland) regime. Production on this dryland acreage tends to be somewhat riskier than for the irrigated component of their farming operations, but irrigated farming still has some year-to-year yield variability, owing to weather. Although a number of these irrigated corn farms also produce some wheat and/or corn silage, those enterprises have not been included in the analysis.

The crop mix for the Nebraska farms is identical for all three farm sizes: irrigated corn (58.3 percent of cropland acres), irrigated soybeans (6 percent), and dryland sorghum (35.7 per-

[2]These representative farms were developed and analyzed in the paper "Economic Impacts of Selected Farm Policies, Income Tax Provisions, and Production Technology on the Economic Viability of Corn-Soybean Farms in East Central Illinois and Irrigated Row Crop Farms in South Central Nebraska," prepared for the Office of Technology Assessment by W. B. Sundquist.

Table 4-2.—Financial Characteristics of Three Representative Irrigated Corn Farms in South Central Nebraska[a]

	Farm size		
	Moderate	Large	Very large
Cropland acres	672	920	2,085
Acres owned	302	530	1,042
Acres leased	370	390	1,043
Value of owned real estate ($1 ,OOO)[b]	477.7	838.4	1,648.3
Value of machinery ($1 ,000)	102.7	112.1	183.9
Long-term debt ($1 ,000)	123.2	102.0	291.1
Intermediate-term debt ($1,000)	40.1	53.7	98.0
Initial net worth ($1 ,OOO)[c]	448.3	839.0	1,463.1
Leverage ratio (fraction)	0.39	0.20	0.27
Long-term debt/asset (fraction)	0.26	0.12	0.18
Intermediate-term debt/asset (fraction)	0.39	0.48	0.53
Equity ratio (fraction)	0.72	0.84	0.79
Off-farm income ($1,000)	8.2	8.2	9.7
Minimum family living expenses ($1 ,000)	18.0	18.0	24.0
Maximum family living expenses ($1 ,000)	36.0	36.0	48,0
Marginal propensity to consume (fraction)	0.20	0.20	0.20

a A family size of four persons was assumed for the purposes of estimating family labor supply and determining appropriate income tax rates
b Includes land and buildings
c May include assets other than land, buildings, and machinery

SOURCE Off Ice of Technology Assessment

cent). On the Illinois farms, the proportion of corn to soybeans varies only slightly for the three representative farms, with corn planted on 52 to 55 percent of the cropland acreage and soybeans on the balance.

For the Illinois farms, all cropland has the same per-acre value, while the price of cropland on the Nebraska farms reflects the differentials for four categories of land: 1) gravity irrigated, 2) sprinkler irrigated, 3) dryland with irrigation potential, and 4) dryland without irrigation potential. Each of the three Nebraska farms do, however, have the same proportions of gravity irrigation, sprinkler irrigation, and dryland acres.

Wheat Farms in the Southern Plains[a]

Approximately 65 percent of the U.S. wheat production is produced in the Great Plains. For the analysis of representative wheat farms, farms were selected from the Southern Plains region and are representative of wheat farms in western Kansas, eastern Colorado, and the Oklahoma and Texas Panhandle.

The three farms selected for the analysis are the typical moderate farm in the region (1,280 acres), a large farm (1,900 acres), and a very large farm (3,200 acres), The initial financial characteristics for the three representative farms are summarized in tabIe 4-3. The proportion of cropland owned by each farm was obtained from the most recent Agricultural Finance Survey summarized for wheat farmers in western Kansas, eastern Colorado, the Oklahoma Panhandle, and the Northern High Plains of Texas who had real estate debt.

Average long- and intermediate-term debt-to-asset ratios from the Agricultural Finance Survey were used to estimate initial values for long- and intermediate-term debts. All three wheat farms had about the same beginning equity levels (75 percent) (table 4-3). Minimum family living expenses were based on values obtained from a Texas A&M survey that asked for the minimum annual cash expenditure for family living. The Agricultural Finance Survey was used to obtain values of off-farm income for the three representative farm operators.

A typical cropping pattern in the Southern Plains is to irrigate 50 percent of all cropland and to raise wheat on one-half of this irrigated land. Grain sorghum is typically raised on the

[a]These representative farms were developed and analyzed in the paper "Economic Impacts of Selected Policies and Technology on the Economic Viability of Three Representative Wheat Farms in the Southern Plains," prepared for the Office of Technology Assessment by James W. Richardson.

Table 4-3.—Financial Characteristics of Three Representative Wheat Farms by Size in the Southern Plains

Characteristics	Farm size (acres)		
	Moderate	Large	Verv large
Cropland acres owned	640	840	1,400
Cropland acres leased	640	1,080	1,800
Acres of pastureland owned	120	220	360
Value of owned cropland ($1,000)	296.0	388.5	647.5
Value of owned pastureland	29.4	53.9	88.2
Value of machinery ($1,000)	241.9	352.2	477.2
Value of off-farm investments ($1 ,000)	37.3	49.0	53.5
Beginning cash reserve ($1 ,000)	10.0	12.0	20.0
Long-term debt ($1;000)"	60.2	86.3	143.5
Intermediate-term debt (1,000)	83.2	126.5	171.3
Initial net worth ($1 ,000)	470.3	642.3	970.7
Equity ratio (fraction)	0.77	0.75	0.75
Leverage ratio (fraction)	0.31	0.33	0.33
Long-term debt/asset (fraction)	0.19	0.20	0.20
Intermediate term debt/asset (fraction)	0.34	0.36	0.36
Off-farm income ($1,000)	12.4	9.8	9.0
Minimum family living expenses ($1 ,000)	18.0	20.0	23.0
Maximum family living expenses ($1 ,000)	40.0	50.0	50.0
Marginal propensity to consume (fraction)	0.25	0.25	0.25

SOURCE: Office of Technology Assessment,

other half of the irrigated cropland. Wheat is generally also raised on the portion of the cropland that is not irrigated. This cropping pattern was assumed for all three farms.

Numerous crop share arrangements prevail in the region for leased land. However, these arrangements generally involve the producer paying the landlord about 25 percent of the crop and the landlord paying none of the production and harvesting costs. This crop share arrangement was assumed for all leased cropland.

General Crop Farms in the Delta Region of Mississippi

The Mississippi Delta is an excellent region for analysis of general crop farms. Farms in this area can produce a variety of crops not possible in other parts of the United States. The representative farms in this region produce cotton, rice, soybeans, and wheat (or other small grains).

The three representative farms developed for this study are a moderate farm (1,443 acres), a large farm (3,119 acres), and a very large farm (6,184 acres). Table 4-4 provides a summary of the financial and resource characteristics for the three representative farms. The long- and intermediate-term debt-to-asset ratios for the 1,443-acre farm and the 3,119-acre farm were obtained from USDA's Agricultural Finance Survey and adjusted to reflect the equity levels as reported from a 1983 mail survey of farms

Table 4-4.—Financial and Resource Characteristics for Three Representative General Crops Farms in the Delta of Mississippi, 1983

Characteristics	Farm size		
	Moderate	Large	Verv large
Age of farm operator[a]	44	44	44
Family size[a]	4	4	4
Cropland acres owned	533	1,419	3,064
Cropland acres leased	910	1,700	3,120
Acreage of principal crops in 1983:			
Cotton	395	1,088	2,250
Rice	305	574	871
Soybeans	640	1,190	2,539
Wheat (or other small grains)	82	247	180
Value of owned cropland ($1,000)	799.5	2,128.5	4,596.0
Value of farm machinery ($1,000)	378.9	786.7	1,209.8
Value of off-farm investments ($1 ,000)	129.1	210.3	358.7
Beginning cash reserve ($1,000)	31.9	71.1	141.6
Long-term debt ($1,000)	331.4	840.8	1,640.8
Intermediate-term debt ($1,000)	243.8	413.0	574.7
Net worth ($1,000)	748.6	1,921.5	4,047.5
Total equity to assets (fraction)	0.56	0.60	0.64
Long-term debt/asset (fraction)	0.41	0.40	0.36
Intermediate-term debt/asset (fraction)	0,64	0.52	0.48
Off-farm income ($1,000)	18.3	18.2	36.0
Minimum family living expenses ($1 ,000)	18.0	24.0	30.0
Maximum family living expenses ($1 ,000)	27.0	36.0	45.0
Marginal propensity to consume (fraction)	0.25	0.25	0.25

a Values for the age and family size variables assumed for simulating the effects of alternative farm program provisions for the representative farms

SOURCE: Office of Technology Assessment.

[4]These representative farms were developed and analyzed in the paper "Economic Effects of Selected Policies and Technology on the Economic Viability of General Crops Farms in the Delta Region of Mississippi," prepared for the Office of Technology Assessment by B.R. Eddleman.

in the Delta. These debt ratios are the average for part-owner general crops farms in the Mississippi Delta region that had debt on real estate in 1979. Financial ratios for the largest farm were developed by extending the ratios on a per-acre basis for a 3,457-acre farm, as reported in the most recent Agricultural Finance Survey, and were adjusted by the equity levels reported for the largest farm size group.

The mix of acreages planted in each crop changes by farm size. In general, the acreage planted in cotton and soybeans increased relative to the acreage planted in rice and wheat as farm size increased. The moderate farm planted 73 percent of tillable cropland in cotton and soybeans, while the large and the very large farm planted 89 and 82 percent, respectively, of tillable cropland in cotton and soybeans. In the analysis, as the farm was allowed to grow in size to the next largest farm size, the proportion of cropland planted to each crop was changed to reflect these relative differences in crop mix.

Cotton Farms in the Texas Southern High Plains[5]

Cotton is an important commodity in the United States, and over one-half of the cotton produced can be found in the Southern High Plains of Texas. The three farms selected for analysis are a typical moderate farm in the region (1,088 acres), a large farm (3,383 acres), and a very large farm (5,570 acres). These size farms account for 31 percent of the farms and 62 percent of the cotton lint produced in the Texas Southern High Plains.

Table 4-5 provides a summary of the demographic and financial characteristics for the three representative cotton farms used in the present study. The long- and intermediate-term debt-to-asset ratios for the moderate farm were obtained from USDA's Agricultural Finance Survey. These debt ratios are the average for part-owner cotton farmers in the Texas High Plains who had debt on real estate in 1979.

Table 4-5.—Financial Characteristics of Three Representative Cotton Farms by Size in the Texas Southern High Plains

	Farm size		
Characteristics	Moderate	Large	Very large
Age of operator	42		
Acres owned	381	1048	3,453
Acres leased	707	2,335	2,117
Value of owned cropland ($1 ,000)	222.4	611.7	2,015.4
Value of machinery ($1,000)	144.5	420.8	713.9
Value of off-farm investments ($1 ,000)	59.0	110.0	213.7
Beginning cash reserve ($1 ,000)	16.7	52.0	85.5
Long-term debt ($1,000)	61.1	120.9	488.7
Intermediate-term debt ($1 ,000)	98.3	203.6	475.4
Initial net worth ($1,000)	275.0	854.8	2,032.3
Equity ratio (fraction)	0.62	0.72	0.67
Leverage ratio (fraction)	0.61	0.40	0.49
Long-term debt/asset (fraction)	0.27	0.20	0.24
Intermediate-term debt/asset (fraction)	0.68	0.48	0.67
Off-farm income ($1,000)	16.0	0.0	0.0
Minimum family living expenses ($1 ,000)	15.2	29.1	38.0
Maximum family living expenses ($1 ,000)	50,0	50.0	60.0
Marginal propensity to consume (fraction)	0.25	0.25	0.25

SOURCE: Office of Technology Assessment

POLICY AND TECHNOLOGY SCENARIOS

The three representative farms for each production region were analyzed for the period 1983-92 under alternative policy scenarios, Six farm policy scenarios (including a continuation of the 1981 farm bill), an income tax provision scenario, two financial stress scenarios, a technology option, and a new-entrant scenario were analyzed for each farm. All assumptions and policy values associated with each scenario were held constant across farm sizes to

[5]These representative farms were developed and analyzed in the paper "Economic Impacts of Selected Policies and Technology on the Economic Viability of Three Representative Cotton Farms in the Texas Southern High Plains," prepared for the Office of Technology Assessment by James W. Richardson.

[6]The current version of the Firm Level Income Tax and Farm Policy Simulator (FLIPSIM V), developed by James W. Richardson and Clair J. Nixon, was used to simulate the three representative farms in each region.

allow direct comparison of their impacts on different size farms. Appendix A contains summary tables of the analysis for each farm size by region.

Farm Policy Scenarios

Current Policy

The current policy scenario involves continuation through 1992 of current income tax provisions and of the price supports, income support, and supply control programs of the 1981 farm bill. In addition, it is assumed that annual mean crop yields for the three representative farms will increase as new technologies are introduced and adopted by farmers in the baseline technology environment. For this policy scenario it is assumed that the following farm policies are in effect:

- The Commodity Credit Corporation (CCC) loan program is available to producers for corn, cotton, rice, sorghum, soybeans, and wheat.
  A 3-year, indirect, farmer-owned reserve (FOR) is available for feed grains and wheat. T
- An acreage diversion/set-aside program is in effect for 1983-85, using the actual acreage reduction levels and diversion payment rates specified for these years.
- A target price-deficiency payment program is available for corn, cotton, rice, sorghum, and wheat in all years.
- The $50,()()0-payment limitation for deficiency and diversion payments is in effect and is effective on the farm as specified.
- Farms of all sizes are eligible to participate in these farm program provisions,

Values for loan rates, target prices, diversion rates, and diversion payment rates for 1983 and 1984 are set at their actual values, expressed in 1982 dollars. Values for these variables for 1985 are set at their respective levels announced on or before September 14, 1984, by Secretary of Agriculture Block. Loan rates and target prices for 1985 are held constant through 1992. No acreage reduction program was assumed to be in effect after 1985.

It was assumed that the following options for depreciating machinery and calculating income taxes are used for the current policy scenario:

- Machinery, livestock, and buildings placed in use prior to 1981 are depreciated using the double declining balance method.
- Machinery, livestock, and buildings placed in use after 1980 are depreciated using an accelerated cost recovery method.
- The operator elects to claim first-year expensing for all depreciable items placed into use after 1980.
- The operator elects to take maximum investment tax credit (ITC) and thus reduce the basis for all depreciable assets placed into service after 1980.
- The operator adjusts crop sales across tax years to reduce current-year taxes.
- The operator may use either the regular income tax computation or income averaging to calculate Federal income tax liabilities.
- There is no maximum interest deduction for calculating taxable income.
- The actual self-employment tax rates and maximum income levels subject to this tax for 1983 and 1984 are used. Announced values for these variables in 1985-86 were used, and the 1986 values were held constant through 1992.
- The operator elects to trade in old machinery on new replacements at the end of each item's economic life.

Results Expected.—Since this policy includes price supports, income supports, and supply control programs to maintain and stabilize prices and farm income at a reasonable level and reduce the price and income risks, it is anticipated that all farms under this program will have a higher probability of remaining solvent over the lo-year planning horizon, have higher net farm incomes, and have stronger financial positions.

[7]The 1977 farm bill established FOR as a 3-year extension of the CCC loan after grain had been in the regular loan for 9 months, Stocks remain in the farm operator's control until the Secretary of Agriculture authorizes release.

Results Obtained:

- Except for Texas cotton farms, all farms in the other four regions had a 100-percent" probability of remaining solvent over the l0-year period. For Texas cotton farms, the probability of survival ranged from 92 percent for the moderate farms to 94 percent for very large farms.
- All farms in four of the five regions increased their absolute net worth by the end of the period with very large farms increasing more than the moderate farms. The two smaller farms in Illinois experienced a loss in net worth over the period, while the largest farm experienced a 14.5 percent increase in real net worth.
- On the average, all three farms were able to grow by purchasing and leasing cropland. Moderate farms grew in size at a faster rate than the very large farms. The moderate and large grain farms grew at approximately the same rate of growth.
- Average annual net farm incomes for all farms substantially benefited by the presence of price and income supports in the current policy. Removal of these program provisions resulted in negative average annual net farm incomes for farms in all regions except Illinois. (Illinois net farm incomes did not fall below zero because a large portion of cropland is devoted to soybeans, and this crop does not receive a deficiency payment.)
- Ratios of net farm income to total Government payments reveal that, across all regions, the moderate farms are more dependent on Government payments to maintain their incomes than are the very large farms.

Price supports

The price supports program is designed to prevent prices from falling below a certain level and to stabilize prices through the CCC nonrecourse loans at established loan rates to farmers. Such loans, plus interest and storage cost, can be repaid within 9 to 12 months when the commodity is sold on the cash market. If the market is not favorable for a farmer to sell the commodity and repay his loan, CCC accepts the commodity in full payment of the loan,

CCC releases its stock to the market when prices are high and withdraws stocks from the market when prices are low, Thus, the program also stabilizes prices.

Results Expected:

- Since price supports stabilize prices and prevent prices from falling below the loan rate, this program should increase farm income and reduce the price risk for farmers.
- All farms should have a higher probability of survival, greater net present value, [a] and higher net farm incomes than they would have had without the program.

Results Obtained:

- price supports increased the probability of survival for all three representative farms in all regions.
- Net farm incomes for these farms also increased with the price supports program. In all regions, the larger the farms, the greater the increase in net farm incomes.
- With increased farm incomes and reduced price risk, all three farms in all regions experienced increases in real net worth with the price supports program.
- Average ending farm sizes were not significantly different as a result of the price support program.

Income Supports

Income supports are accomplished through deficiency payments and the target price. Deficiency payments are paid to farmers to make up the difference between a price determined

[a] The concept of present value is used to help measure the profit potential of an investment decision. Simply put, a dollar today is worth more than a dollar in the future because today's dollar can be invested and can accrue interest. Thus, the present value of a specified amount of money payable at a specified future date is the amount of money that one would have to invest now in order to have that future amount by that future date. In analyzing an investment over several periods, a positive present value would indicate an economically attractive decision; a negative present value would not.

to achieve a politically acceptable income level (target price) and the average market price. Deficiency payments are made on each farm's base acres and farm program yield. The farm program yield is based on each farm's yield history. Target prices were set initially to reflect an average cost of production.

Deficiency payments were initiated to raise and stabilize farmer incomes to the level of the nonfarm population while allowing farm prices to be competitive in the export market. Total annual Government payments (deficiency and diversion) were limited to $50,000.

Results Expected:

- The major impact of deficiency payments should be to increase the income level of producers who participate in the farm program. Since the payments are based on the quantity of eligible production, large-scale producers benefit more than small-scale producers, up to the $50,00()-payment limitation.
- Deficiency payments also reduce income risk for producers, increase their ability to obtain financing, and thus increase the probability of all farms remaining solvent.

Results Obtained:

- The deficiency payment program increased the probability of survival more for moderate Texas cotton farms than for the very large farm. For farms of other regions, the probability of survival was 100 percent, with or without income support.
- Income supports increased net farm incomes substantially for all farms, often moving net farm incomes from negative to positive.
- Income supports enhanced net farm incomes of all farms more than the price support program.
- The presence of the $50,00()-payment" limitation causes the income support program to benefit moderate farms relatively more than very large farms. In contrast, the price support program results in a greater relative advantage for large and very large farms.
- With reduced income risk and greater farm incomes under the income support program, all farms improved real wealth, and average after-tax net present value increased for all farms.
- Income supports increased the average ending farm size for all farms. Average ending farm size increased at a faster rate for moderate farms than for very large farms.
- Removal of the $50,000 limitation on deficiency payments benefited larger farms more than smaller farms. Big winners of this program were big farms in Texas and Mississippi. In Texas, for example, when the $50,0()()-payment limitation was removed, average annual net farm income increased $3,600, $50,000, and $104,000 for moderate, large, and very large farms, respectively.
- Increased farm income strengthened the financial positions of larger far-ins, increasing their ability to obtain more financing. All three representative farms, especially the very large farms, had increased net worth at the end of the lo-year period. For example, removal of the $50,000 limitation increased the ending net worth of the moderate Texas cotton farm by $37,000, of the large Texas farm by $441,000, and of the very large Texas farm by $1,019,000.

supply Control Policy
(Acroage Reduction Program)

The objective of acreage reduction programs is to reduce the quantity produced and thus the supply of a given commodity. Acreage reduction consists of an acreage set-aside and/or acreage diversion that is generally voluntary. Acreage set-aside programs require that participating farmers idle a percentage of their crop base acres so that they are eligible for other program benefits. Acreage diversion programs pay producers a given amount per acre to idle a percentage of their base acres. A farmer's base acres are determined by the production history of the crop.

For this analysis the provisions of the current policy were modified by adding a 15-

percent set-aside with a 5-percent diversion for corn, cotton, rice, sorghum, and wheat in 1986-92. Normal slippage[8] (30 percent for corn and 70 percent for all other crops) and program participation rates were used to estimate the resulting real increase in mean prices for these crops in 1986-92. All other provisions of the current policy were used without change.

Results Expected:

- To the extent that acreage reduction programs reduce production, they reduce supply and stocks and increase prices domestically for those commodities. Higher prices will result in higher total and net incomes for all farm sizes. Farms that participate in diversion payments also benefit from the program through increased cash receipts, up to the $50,000 limit.
- Slippage in the programs reduces the programs' effectiveness, increases the farms' net present value, and increases farm size.
- Higher incomes lead to more disposable income for debt repayment and retained earnings for accelerating farm growth.
- Farm operators' average net present value should increase.
- Faster rates of growth should be experienced by the farms because of increased cash accumulation, repayment capacity, and equity in existing land assets.

Results Obtained:

- Imposing a 20-percent acreage reduction program increased the average net present value and ending net worth for all three farms in all regions except for the large farm in Illinois.
- Imposing a 20-percent acreage reduction to existing farm programs resulted in a 20- to 300-percent increase in net farm income for almost all farms.
- Average ending farm size for all three farm sizes increased relative to the initial farm size.
- Imposing additional supply controls to existing farm programs does not substantially change the rate of growth or ending farm size of all farms. Moderate farms continued to grow at a faster rate than larger farms.
- Eliminating slippage reduced the rate of growth relative to that in the current policy for all three farm sizes.
- The less slippage in an acreage reduction program, the smaller the increase in average net present value for all three farm sizes.

No Farm Program

In the no-farm-program scenario, all farm programs outlined for the current policy were eliminated for all 10 years of the planning horizon. In this essentially free market environment, farm prices and income are very unstable because: 1) production varies, owing to weather and biological factors; and 2) demand for farm products changes. The inelastic nature of supply and demand for farm products makes farm prices particularly unstable. The variability in prices and incomes has both favorable and unfavorable aspects. From a favorable perspective, the movement in prices reflects changes in supply and demand conditions and is a signal for production regarding market needs. However, when prices become highly unstable, the signals may be misinterpreted and mistakes may be made in production and marketing decisions. The result frequently is misallocation of resources. In addition, variability in price and income increases the risk and uncertainty to the farm business.

Results Expected:

- Average farm incomes will be less with no loans or price supports because the floor on prices received for these commodities has been removed, allowing prices to fluctuate freely.
- Net present value will be lower and more unstable than with price and income supports.
- Net worth of farms will decline because the market value of cropland will be less,

[8] Slippage is the difference between the percent of production decrease and the percent of acreage reduced. These two percentages are different because farmers tend to set aside marginal lands in Government programs or intensify the cultivation of remaining land.

since there are no benefits from the programs to be capitalized into the land.

- Farms will have less probability of survival because of increased instability in prices for crops. The impact will be more pronounced for highly leveraged farms that cannot survive without price and/or income support and for smaller farms that cannot survive with high price risk.

Results Obtained:

- Removing all farm programs reduced the probability of survival for all three farm sizes in cotton and wheat regions, relative to the base policy. The probability of survival fell more for the moderate farms in these regions than for the very large farms. For example, in cotton the moderate farm's chance of remaining solvent for 10 years decreased from 92 to 42 percent; the chance for the solvency of very large farms decreased from 94 to 78 percent.
- The probability of having a positive after-tax net present value declined significantly for all farm sizes in each of the four regions except the Mississippi Delta. For example, in the Southern Plains the probability of a positive net present value for the moderate farm declined to about 10 percent. In most cases the very large farms had a higher probability of positive net present value than the moderate farms. The probability of a positive net present value was *100* percent in the Mississippi Delta without the farm program, Qwing primarily to diversification of crop production and the reduced relative yield variability in the Delta compared with that of the other regions.
- Ending net worth declined for all three farm sizes in all regions. In most regions the absolute decline in net worth was greater for the large and very large farms than for the moderate farms. For example, the large and very large Texas cotton farms experienced a $743,000 and $1,100,800 decline in net worth, respectively, from that of the current policy, while the moderate farms' net worth declined $396,800. The ending net worth of the Mississippi Delta farms declined the least of all regions because a significant portion of crop acreage was devoted to soybeans.
- In the absence of farm programs, all three farm sizes continued to grow in all regions, but at a much slower rate than under the current policy. For example, farms in the Southern Plains declined from the current policy on average about 20 percent in ending farm size.

Target Farm Program Benefits

For the target farm program benefits scenario, all farm program and income tax provisions of the current policy were used except that large farms were not eligible to participate in farm program provisions. Farms producing more than 300,000 dollars' worth of program commodities (corn, cotton, rice, sorghum, soybeans, and rice) valued at their localized loan rate were not permitted to participate directly in the program provisions (CCC loan, FOR, target price/deficiency payments, and set-aside diversions). Mean prices and relative variability in prices were not adjusted because a sufficient number of "small" farms were assumed to participate in the farm program for the price support actions of the CCC loan and FOR to function normally.

Results Expected:

- Findings for moderate farms will be the same as the findings for the current policy.
- Large and very large farms exempted from the programs will receive indirect benefits from other farms participating in the programs.
- Compared with the no-farm-program scenario, the following should be observed for large and very large farms:
  - —Net present value will be higher and more stable.
  - –-Net worth of these farms will be greater.
  - —Farms will have a greater probability of survival because of the increased stability in prices.
  - –Farms will be larger because of increased income and large repayment capacity.

Results Obtained:

Moderate farms consistently producing less than $300,000 in program crops exhibit the same growth rates, net farm incomes, and ending financial positions as they do under the current policy.

Farms that grow beyond or are initially larger than the $300,000 threshold level of sales experience lower average Government payments, net farm incomes, average net present values, and net worths than under the current policy, owing to targeting program benefits.

The larger the farm, the greater the reduction in average ending acres from the current policy for farms in the Southern plains, Nebraska, and Illinois. Moderate grain farms in these regions experienced no real change in average ending farm size because of their level of total sales being less than $300,000.

Growth rates for the very large farms in Texas and the Delta were similar to those experienced under the no-farm-program option. The moderate and large farms in the Delta experienced reduced rates of growth relative to the very large farms. A similar relationship was observed between the large and very large cotton farms in Texas. The reason for these different rates of growth is that the very large farms in these regions are less dependent on farm programs than are smaller size farms.

Tax Policy Scenarios

The Federal income tax provisions in place for the current policy were made more restrictive in the reduced income tax benefits and base farm program scenario. All farm policy provisions of the current policy were left unchanged. The more restrictive Federal income tax provisions included the following:

- Machinery, livestock, and buildings were depreciated using the straight-line cost recovery method.
- First-year expensing provisions were eliminated for all depreciable items.
- Maximum ITC provisions were eliminated.
- The maximum annual interest expense that could be used to reduce taxable income was $15,600.
- The operator was required to sell obsolete machinery upon dis-position rather than trading it in on new replacements, thus forcing recapture of excess depreciation deductions.

Results Expected:

- Making Federal income tax policies less favorable tends to increase income tax payments by reducing tax deductions. Net cash farm income is not affected directly in the first 4 to 6 years. After that, interest income usually becomes a factor, and higher tax payments the first 6 years reduce cash available for interest income in later years.
- The farm operator will have lower tax deductions and tax credits when machinery is replaced. The length of time machinery is kept will not likely be shortened from the current policy because machinery was replaced based on its normal economic life, not its depreciation life.
- Reducing tax deductions and tax credits will mean greater annual income tax payments, resulting in greater cash flow requirements and reduced ending cash reserves. Net present value will likely be reduced because of lower retained earnings and the slower accumulation of wealth.

Results Obtained:

- Adoption of a more restrictive set of Federal income tax provisions had little impact on farm survival.
- Increasing the Federal tax burden on farmers reduced the average annual rate of growth in farm size about the same for all sizes of farms in each region. Average ending farm size was about 8 percent less than that for the current policy for large and very large farms and about 4 percent less for moderate farms.
- The more restrictive income tax provisions reduced the propensity to grow through purchasing cropland and increased the

propensity to lease cropland for growth. For example, in the Mississippi Delta the growth rate in owned cropland for the moderate farm was reduced to 4 percent, and its rate of growth in leased cropland increased by 49 percent.
- The changes in the tax provisions resulted in reduced annual net farm incomes on all sizes of farms in all regions. The reduction in net farm income was greater for the very large farm relative to the moderate farm because the very large farm had more depreciable items affected by changes in depreciation rules, investment tax credit, and capital gains treatment of sales of used machinery.

Technology Scenarios

To determine the impact of technology on structure, selected farm policy scenarios were simulated, assuming increases in mean yields of crops only from the use of existing technologies. A comparison of these simulated results with the previous farm policy scenarios, which included increases in mean yields from emerging technologies, indicates the impact of new technology on structure. Three policy alternatives were analyzed under these conditions. They were the base farm policy, which continues all provisions of the 1981 farm bill, the elimination of income support provisions, and the elimination of all farm program provisions.

Results Expected:

- Technology advance would have the greatest impacts on wealth accumulation, net farm income, and rate of growth in acres controlled for very large farms that adopted the technology first and had it in use over a longer period of time.
- The greater the increase in productivity through technology advance the greater should be the rate of increase in wealth, net farm income, and rate of growth in acres controlled.
- Technology advance in the presence of price and income support programs would have greater impacts on growth in real wealth, farm acres controlled, and net farm income than it would in the absence of these programs.

Results obtained:

- Farm commodity policies had more effect on the final amount of acres controlled than did technology advance, across all sizes of farms in all regions.
- Technology advance had little impact on the final amount of acres controlled in all regions. Yield-enhancing benefits from emerging technologies increased average final farm size from o to 2 percent in the Delta, Illinois, and Texas and from 6 to 10 percent in the Southern Plains. The greatest increase in farm size occurred on very large farms in the Southern Plains under the current policy scenario because these farms are principally wheat producers, and the greatest increases in yields were predicted by OTA to occur for wheat.
- Small increases in final farm size for the other regions can be explained by the relatively smaller increases in yields (based on the results of OTA workshops for corn, soybeans, cotton, and rice).
- Farms did not exhibit any appreciably larger rates of growth in real wealth and farm size under price and income support programs than under open market conditions. But in the presence of technology advance, annual net farm income increased relatively more under the price and income support program than under open market conditions.
- Flows of new technology for all commodities in all regions were found to increase annual net farm incomes relatively more than real wealth and ending farm acreage across all sizes of farms. Net farm income was increased relatively more for the very large farms than for the moderate and large farms, across all farm policies evaluated.

Implications for the 1985 Farm Bill

. Farm programs have major impacts on rates of growth in farm size, wealth, and incomes of commercial farmers.

- Most farm program benefits are capitalized into land values and net worth. Very large farms increase their net worth significantly more than moderate farms under current farm programs.
- Moderate farms are much more dependent on farm programs to maintain their incomes than are very large farms.
- Income supports provide significantly greater benefits to moderate farms than to very large farms. (In contrast price supports provide more wealth and growth benefits to very large farms than to moderate farms.) Targeting of income supports to moderate farms is an effective policy to prolong their survival.
- Very large farms can survive without income supports. A loan safety net may be needed to deal with instability and world competitive environment.

FINANCIAL STRESS AND NEW ENTRANTS SCENARIOS

Financial Stress Scenarios

The financial position of many farmers is under severe stress. As discussed in chapter 3, the situation is serious and may not improve for some time. policy makers are considering various solutions to this problem, Two of the most discussed alternatives are interest subsidy and debt restructuring. To analyze the effects of these two financial bail-out policies, the financial position of the three representative farms in each of the four regions was modified to depict highly leveraged farms. The long-term debt-to-asset ratio for each farm was increased to 55 percent, the intermediate-term debt-to-asset ratios were set equal to 60 percent, and annual interest rates on old loans were increased to their average values for 1980-83.

Interest Subsidy

An interest subsidy is a loan at below-market interest rates. For example, if the Government's cost of money is 11 percent and the Farmer's Home Administration makes loans at 5 percent, there is a 6-percent direct interest rate subsidy. The object of an interest rate subsidy is to reduce the cash expenses for interest costs, thus increasing total net cash farm income. The total cash requirements are reduced, thereby benefiting all farms. The total saving is greater for larger farms because of the total debt being larger on these farms. An interest subsidy for the first 2 years of the lo-year simulation was provided. Interest charges on both long- and intermediate-term debt were set at 8 percent annually for the two years.

The results expected are:

- Higher probability of survival.
- Higher land values, net worth, and average net present value.
- An increase in the equity ratio because current debts are paid and longer term debts are reduced, allowing greater opportunity for the farm to grow in size because of the increased ability to leverage existing equity.

Deb? Restructuring

Debt restructuring refers to the rescheduling of loan commitments. Debt may be restructured by rewriting short- or intermediate-term debt to a long-term basis if the collateral justifies such change, The amount paid per year is then reduced. without sufficient additional long-term collateral, debt restructuring is limited to rescheduling each class of loans—short-, intermediate-, and long-term—over a longer repayment period, Also, if the debt is on a fixed interest rate basis and interest rates have declined, the debt might be rescheduled in part to take advantage of lower interest rates to obtain a longer repayment period. For the highly leveraged farms, debt restructuring was provided through increasing the length of intermediate-term loans by 1 year and by converting a portion of the intermediate-term debt

to long-term debt as long as the long-term debt to asset ratio did not exceed 65 percent.

Restructuring debt has the same type of expected effects as interest rate subsidy; however, they differ in their methods. Debt restructuring does not reduce the annual interest payments in the initial period unless long-term interest rates are less than intermediate-term interest rates. Annual principal payments are reduced, thus reducing cash flow needs of the farm operator,

Results Experienced From Financial Stress Scenarios

- Restructuring initial debt for highly leveraged farms failed to increase appreciably the probability of survival for each size of farm in any region except for moderate and large wheat farms in the southern Plains.
- In all regions, the interest rate subsidy strategy substantially increased the survival rate and average net farm income more than did the restructuring of farms' debts.
- Both debt restructuring and interest subsidy policies resulted in increased growth in real wealth (i. e., ending net worth) on the very large farms in all regions.
- Except for Texas cotton farms, the very large farms with high debts in each region are not as dependent upon financial bail out strategies for survival as the moderate and large farms.
- Debt restructuring resulted in less rapid rates of growth in rear wealth than interest rate subsidies on moderate and large farms in the Corn Belt and High Plains regions.

New Entrants Into Farming Scenario

All previous simulations of the effects from the farm commodity policy alternatives were based on representative farms operated by established farm producers. These simulations provide indications of the short-run effects of the alternative farm commodity policy provisions on economic survival and growth characteristics of established farm operations, They do not provide information on the survivability and economic viability of potentially new entrants into farming. To obtain some general notions of the effects of selected farm commodity policies on newly established farming operations, the smallest farm in each region was simulated under the condition that the farm operator was a new entrant.

In this scenario the entering farm operator was allowed to have only minimum equity in owned farmland (30 percent) and farm machinery (35 percent), All farm machinery was considered to have a new machinery cost, and annual interest rates on long- and intermediate-term loans were equal to the 1980-83 averages, The operator was not allowed to have any off-farm investments. Because the farm operator was paying the full cost of all inputs (land, capital, machinery, and labor), these simulations provide an indication of long-run survivability and profitability of the representative farms. Three policy alternatives were analyzed under these conditions for the new entrant. They were the base farm policy, which continues all provisions of the 1981 farm bill, the elimination of the target price/deficiency payments provision of the program (no income support provisions), and the elimination of all farm program provisions,

Results Expected:

- New entrants would be expected to face lower probabilities of survival, slower rates of real wealth accumulation, and slower rates of growth in farm size than would current operators on the representative farms in each region under existing farm legislation. Because both depreciation adjustments on machinery and annual cash requirements for debt repayment on real estate and machinery loans are based on new 1982 costs and current (1980-83) interest rates, annual net farm incomes will be lower for new entrants than for current operators, under existing policy.
- Elimination of income support provisions of the 1981 farm bill will be expected to reduce the probability of survival, rate of growth in real net worth and farm size, and annual net farm incomes of new en-

trants in each region. The greatest impacts would be expected for specialized crop farms producing commodities eligible for target prices and deficiency payments. Elimination of all farm program provisions would be expected to reduce further the rate of growth in real wealth and farm size. Annual net farm incomes for new entrants would be expected to be even lower, particularly on representative farms producing commodities eligible for set-aside and paid diversion provision.

Results Obtained:

- New entrants exhibited considerably lower probabilities of survival under the base farm policy than did current operators for all specialized crop farms. Only the diversified crop farms in Nebraska and the Mississippi Delta exhibited relatively high probabilities of survival for new entrants under current farm commodity policy.
- New entrants experienced much lower rates of real wealth accumulation than did current operators under current policy. In three of the regions—High Plains wheat farm and Nebraska and Illinois crop farms —real net worth after 10 years was lower than initial net worth on the farms, indicating that the new entrant operator had to sell owned cropland to remain solvent. Net farm incomes were negative for all farms, with the High Plains wheat farm experiencing the largest relative decline in annual net income.
- New entrant farm operators in the High Plains wheat and Nebraska and Illinois crop regions were unable to increase farm size over the l0-year period under current farm policy. The Texas cotton farm and Mississippi Delta crop farms experienced considerable growth, 20 and 27 percent, respectively.
- Eliminating the target price/deficiency payments provision of current legislation substantially decreased the probability of survival and ending net worth on all farms. Only the Texas cotton farms exhibited any appreciable growth in farm acreage (about 6 percent).
- Under the policy alternative of no farm programs, none of the farms exhibited reasonable potentials for remaining solvent over the 10 years. Farms in the Texas High Plains, Southern Plains, and Corn Belt had less than a lo-percent probability of survival. Mississippi Delta farms had only a 60-perCent chance for remaining solvent over the 10 years.
- Under the current farm program only the Nebraska and Mississippi Delta crop farms had sufficient returns for new farmers to enter agriculture with a reasonable chance of remaining solvent and making a reasonable return on their investment.
- Elimination of income support, price support, and supply control provisions of current farm policy resulted in new entrant farmers in all four regions facing little chance of surviving and becoming economically viable farming operations.
- Other sources of income, economic assistance, or wealth accumulation will be required for these new entrants to survive economically in an open market farm policy environment.

Implications for the 1985 Farm Bill

- Restructuring of debt for highly leveraged farms does not appreciably increase their probability of survival.
- Interest rate subsidy substantially increases average net farm income more than debt restructuring, It is, therefore, a more effective strategy to ease financial stress.
- Very large farms with high debts are not as dependent on these programs for survival as moderate farms. under either of these programs, very large farms grow significantly in farm size and real wealth.
- New entrants into agriculture will not likely survive even with current farm programs. Other sources of income, economic assistance, or wealth accumulation will be required.