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U.S. Average Costs of Production for Major Field Crops

In this report...*Average U.S. production costs per planted acre for major field crops are presented for 1989 and 1990 along with forecasts for 1991. The Agricultural and Consumer Protection Act of 1973 and subsequent legislation require that the U.S. Department of Agriculture annually estimate costs of producing wheat, feed grains, rice, and peanuts. The cost and return accounts provide cash costs, total economic costs, and estimates of net returns.*

Enterprise cost and return statements constructed by USDA provide a national weighted average of actual costs and returns per acre of producing commodities on a historical basis. Although used for a variety of purposes, these estimates give a perspective about the relative profitability of different commodity enterprises. Average estimates of cost of production reflect a variety of farm structures, technology, and production practices and do not represent any one farm's cost. Appendix I provides information on the structure of cost and return accounts, estimation methods, and data sources.

Most commodities had only modest cost increases from 1989 to 1990. Cotton had the largest increase in average costs of production, at 6 percent. Total costs were relatively stable for barley, wheat, and oats. Projections for 1991 suggested minor cost increases for most commodities. Peanut costs were expected to have the largest relative increase when compared with other commodities (fig. 1).

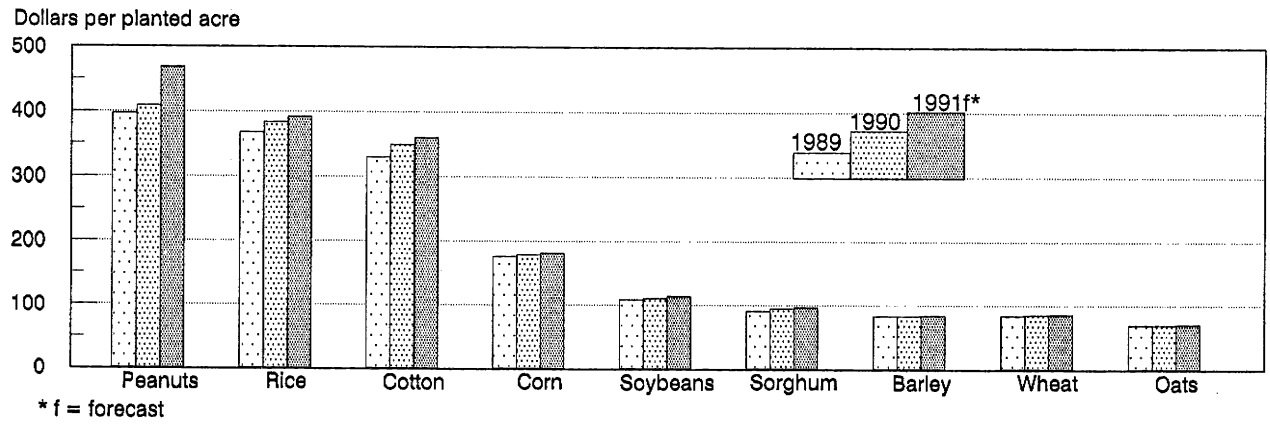
The largest expense items varied among crops. Chemical applications were the largest component of variable costs for cotton and soybeans. Fertilizer, the largest cash expense item for corn, sorghum, barley, and oats, ranged from 25 to 35 percent of variable costs. Fertilizer costs declined for nearly all commodity enterprises over the period. Fuel, lubrication, and electricity formed the largest component of variable expenses for rice.

The average return to management and risk indicates the extent to which longrun production costs are covered by average harvest-month price. Average returns were negative for program commodities because costs and returns associated with participation in Government programs are not considered.

Effects of Government Programs Not Included

Most of the following cost and return statements exclude the effects of direct Government programs. As data become available, additional statements will be prepared for program commodities that include these effects. Rice is the only commodity for which Government programs have been considered, demonstrating that returns to management and risk became positive when costs and returns from participation in Government programs are calculated.

Figure 1
Total cash costs per planted acre, 1989-91



Peanuts: A sharp rise in the costs of producing an acre of peanuts is expected in 1991 after a modest increase in 1990. The $67 increase in total economic costs is caused largely by the $44 per acre higher seed prices.

Item	1989	1990	1991 forecast
		Dollars per acre	
Gross value of production	679.53	694.89	748.29
Peanuts	668.22	683.63	737.07
Peanut hay	11.31	11.26	11.22
Total cash costs	396.54	408.92	468.08
Variable cash costs	302.54	305.33	362.35
Seed	70.54	71.98	115.79
Fertilizer	20.53	18.61	18.94
Lime and gypsum	10.62	10.16	9.79
Chemicals	76.21	80.14	84.45
Custom operations	9.22	9.54	9.79
Fuel, lubrication, and electricity	36.56	38.64	38.42
Repairs	20.77	21.17	22.01
Hired labor	31.88	32.96	34.40
Drying	25.44	21.37	27.44
Technical services	.77	.76	.78
Fixed cash costs	94.00	103.59	105.73
General farm overhead	32.51	37.63	38.79
Taxes and insurance	13.72	13.48	13.91
Interest on operating loans	18.96	20.39	20.94
Interest on real estate	28.81	32.09	32.09
Gross value of production less cash costs	282.99	285.98	280.22
Economic (full ownership) costs	646.96	667.02	734.44
Variable cash costs	302.54	305.33	362.35
General farm overhead	32.51	37.63	38.79
Taxes and insurance	13.72	13.48	13.91
Capital replacement	53.82	54.91	57.09
Operating capital	9.64	9.23	7.94
Other nonland capital	15.20	16.82	17.45
Land	64.90	68.90	72.19
Peanut quota	113.90	116.79	118.88
Unpaid labor	42.07	43.93	45.84
Residual returns to management and risk	32.57	27.88	13.85
Harvest-month price (dollars per pound)	.275	.350	.292
Yield (pounds per planted acre)	2,432.40	1,954.70	2,524.22

Dry conditions in the Southeast during 1990 led to a drop in U.S. yields despite strong yields in Texas, Oklahoma, Virginia, and North Carolina. Georgia yields were the lowest since the mid-1960's. High prices for peanuts in 1990 offset the decline in yields. Gross value of production less cash expenses increased.

Poor growing conditions in 1990 led to higher seed prices in 1991. Drying expenses increased as yields recovered in 1991.

Cotton: Cotton had one of the largest increases in total economic costs in 1990, at 6 percent. Projections for 1991 suggest a smaller increase.

Item	1989	1990	1991 forecast
		Dollars per acre	
Gross value of production	411.44	462.77	na
Cotton lint	362.87	403.57	na
Cottonseed	48.57	59.20	na
Total cash costs	330.09	348.23	359.93
Variable cash costs	260.44	271.86	281.85
Seed	8.44	9.11	9.67
Fertilizer	28.43	26.15	26.62
Lime and gypsum	.40	.34	.35
Chemicals	47.81	51.19	53.95
Custom operations	11.73	12.87	13.20
Fuel, lubrication, and electricity	34.41	36.56	36.35
Repairs	23.94	25.15	26.15
Hired labor	42.96	43.80	45.71
Purchased irrigation water	9.30	8.67	8.89
Ginning	50.60	56.47	59.37
Technical services	1.52	1.55	1.59
Fixed cash costs	69.65	76.37	78.08
General farm overhead	22.29	25.80	26.60
Taxes and insurance	15.16	15.27	15.76
Interest on operating loans	14.60	15.70	16.12
Interest on real estate	17.60	19.60	19.60
Gross value of production less cash costs	81.35	114.54	na
Economic (full ownership) costs	482.09	510.31	522.99
Variable cash costs	260.44	271.86	281.85
General farm overhead	22.29	25.80	26.60
Taxes and insurance	15.16	15.27	15.76
Capital replacement	63.85	65.76	68.37
Operating capital	8.97	8.39	6.31
Other nonland capital	15.31	17.39	18.04
Land	73.36	82.38	81.58
Unpaid labor	22.71	23.46	24.48
Residual returns to management and risk	-70.65	-47.54	na
Harvest-month price (dollars per pound)	.66	.67	na
Yield (pounds per planted acre)	549.80	602.35	617.40

na = not available.

Lower fertilizer prices decreased per acre fertilizer expenses by 8 percent in 1990. Higher yields increased ginning expenses by 10 percent. Variable cash expenses increased 4 percent, while fixed cash expenses rose 12 percent. Gross value of production, although up 13 percent, failed to cover total economic costs.

Note: Ginning costs increased more than any other component of variable costs over the period, primarily because of the large increase in yields in 1990.

Rice: Total economic costs of producing rice, *excluding* the effects of direct Government programs, declined 1 percent in 1990 to $510 per planted acre. Projections for 1991 showed a 3-percent increase to $527 per acre.

Item	1989	1990	1991 forecast
		Dollars per acre	
Gross value of production	421.45	325.18	398.73
Total cash costs	367.92	383.06	391.67
Variable cash costs	309.27	319.28	326.37
Seed	21.44	21.52	21.05
Fertilizer	38.61	35.75	36.39
Chemicals	40.60	42.59	44.88
Custom operations	34.24	35.05	35.95
Fuel, lubrication, and electricity	58.11	64.23	63.86
Repairs	28.32	30.01	31.20
Hired labor	38.30	41.26	43.06
Purchased irrigation water	7.16	6.97	7.15
Drying	40.70	40.06	40.94
Technical services	.47	.48	.49
Miscellaneous	1.32	1.36	1.40
Fixed cash costs	58.65	63.78	65.30
General farm overhead	20.85	23.82	24.56
Taxes and insurance	12.43	12.57	12.97
Interest on operating loans	13.23	14.13	14.51
Interest on real estate	12.14	13.26	13.26
Gross value of production less cash costs	53.53	-57.88	7.06
Economic (full ownership) costs	515.79	509.89	526.97
Variable cash costs	309.27	319.28	326.37
General farm overhead	20.85	23.82	24.56
Taxes and insurance	12.43	12.57	12.97
Capital replacement	43.81	45.76	47.57
Operating capital	12.43	11.93	8.84
Other nonland capital	20.17	22.21	23.04
Land	72.88	49.12	57.32
Unpaid labor	23.95	25.20	26.30
Residual returns to management and risk	-94.34	-184.71	-128.24
Harvest-month price (dollars per cwt)	7.45	6.06	7.23
Yield (cwt per planted acre)	56.57	53.66	55.15

Lower fertilizer prices decreased per acre fertilizer expenses by 7 percent in 1990. Fuel, repair, and hired labor expenses increased by 11 percent, 6 percent, and 8 percent, respectively. Variable cash expenses increased by 3 percent, while fixed cash expenses rose by 9 percent. Gross value of production covered only 64 percent of total economic costs.

Note: The significant decrease in the estimated land charge for 1990 resulted from the combined effects of the large percentage of rice acreage operated under share-rental arrangements and a decline in harvest-month prices and yields per planted acre, as compared with 1989.

Rice: Total economic costs of producing rice, *including* the effects of direct Government programs, remained virtually unchanged. A $19 per acre drop in estimated land charges offset moderate increases in other cost components.

Item	1989	1990
	Dollars per acre	
Gross value of production	653.85	599.56
Rice	421.45	325.18
Government payments	232.40	274.38
Total cash costs	377.23	393.39
Variable cash costs	311.40	321.57
Seed	21.44	21.52
Fertilizer	38.61	35.75
Chemicals	40.62	42.61
Custom operations	34.24	35.05
Fuel, lubrication, and electricity	58.60	64.80
Repairs	29.69	31.46
Hired labor	38.49	41.46
Purchased irrigation water	7.16	6.97
Drying	40.70	40.06
Technical services	.47	.48
Miscellaneous	1.38	1.41
Fixed cash costs	65.83	71.82
General farm overhead	23.93	27.39
Taxes and insurance	12.63	12.77
Interest on operating loans	15.26	16.32
Interest on real estate	14.01	15.34
Gross value of production less cash costs	276.62	206.17
Economic (full ownership) costs	583.66	583.25
Variable cash costs	311.40	321.57
General farm overhead	23.93	27.39
Taxes and insurance	12.63	12.77
Capital replacement	44.44	46.43
Operating capital	12.52	12.01
Other nonland capital	20.71	22.79
Land	133.94	114.93
Unpaid labor	24.09	25.36
Residual returns to management and risk	70.19	16.31
Harvest-month price (dollars per cwt)	7.45	6.06
Yield (cwt per planted acre)	56.57	53.66

Despite a decline in the set-aside rate from 25 to 20 percent in 1990, the increases in fuel and repair expenses are primarily a function of price changes, as estimated set-aside maintenance costs account for a very small portion of variable cash expenses. Estimated land charges declined by 14 percent as the drop in the market value of production offset the increase in Government payments.

Note: No projections of costs and returns were made for 1991 because processing of the production and farm program participation data was incomplete at the time these estimates were made.

Corn: Total variable cost changed little for corn production from 1989, although cost components were much different. Lower fertilizer and seed costs in 1990 were offset by increased fuel costs for machinery and drying. Projected costs were similar for 1991, but lower yields reduced returns.

Item	1989	1990	1991 forecast
		Dollars per acre	
Gross value of production	255.37	269.84	246.66
Total cash costs	175.42	177.77	180.80
Variable cash costs	135.00	134.21	136.25
Seed	21.51	20.52	20.70
Fertilizer	47.21	42.58	43.34
Chemicals	22.65	22.64	23.86
Custom operations	5.71	6.02	6.18
Fuel, lubrication, and electricity	11.88	12.81	12.74
Repairs	8.94	9.28	9.65
Hired labor	8.29	8.61	8.99
Purchased irrigation water	.31	.30	.31
Drying	8.24	11.19	10.21
Technical services	.26	.26	0.27
Fixed cash costs	40.42	43.56	44.55
General farm overhead	10.42	12.06	12.43
Taxes and insurance	14.87	14.85	15.32
Interest on operating loans	5.08	5.46	5.61
Interest on real estate	10.05	11.19	11.19
Gross value of production less cash costs	79.95	92.07	65.86
Economic (full ownership) costs	286.27	292.52	294.78
Variable cash costs	135.00	134.21	136.25
General farm overhead	10.42	12.06	12.43
Taxes and insurance	14.87	14.85	15.32
Capital replacement	34.01	35.61	37.02
Operating capital	4.19	3.82	2.81
Other nonland capital	8.14	9.28	9.63
Land	57.60	59.63	57.25
Unpaid labor	22.04	23.06	24.07
Residual returns to management and risk	-30.90	-22.68	-48.12
Harvest-month price (dollars per bushel)	2.22	2.30	2.29
Yield (bushels per planted acre)	115.03	117.32	107.71

Fertilizer, the major cash cost of corn production, was driven nearly 10 percent lower in 1990 by a decline in nitrogen prices. Fuel prices, up sharply in the fall of 1990, pushed fuel cost for machinery up by 8 percent and drying up by 36 percent. A projected 1991 per acre yield of nearly 10 bushels lower than in 1990 pushes expected returns well below those of previous years.

Note: Including the effect of deficiency payments and nonrecourse loans would much improve average returns to corn production. In 1990, over 77 percent of corn base acres were enrolled in Government programs, although deficiency payments are not received on all enrolled acres.

Soybeans: Higher yields and prices in 1990, along with lower variable production costs, improved returns to soybean production from 1989. Production costs were projected to be up slightly in 1991, while yields are expected to decline.

Item	1989	1990	1991 forecast
		Dollars per acre	
Gross value of production	174.91	194.85	172.37
Total cash costs	109.20	110.87	113.95
Variable cash costs	71.54	70.18	72.27
Seed	15.04	12.47	12.64
Fertilizer	10.66	9.57	9.74
Chemicals	19.48	20.48	21.58
Custom operations	3.41	3.47	3.56
Fuel, lubrication, and electricity	8.35	9.14	9.09
Repairs	8.65	8.89	9.24
Hired labor	5.80	6.01	6.27
Purchased irrigation water	.04	.04	.04
Technical services	.11	.11	.11
Fixed cash costs	37.66	40.69	41.68
General farm overhead	9.01	10.43	10.75
Taxes and insurance	16.40	16.73	17.26
Interest on operating loans	4.85	5.24	5.38
Interest on real estate	7.40	8.29	8.29
Gross value of production less cash costs	65.71	83.98	58.42
Economic (full ownership) costs	194.83	200.64	202.04
Variable cash costs	71.54	70.18	72.27
General farm overhead	9.01	10.43	10.75
Taxes and insurance	16.40	16.73	17.26
Capital replacement	18.03	18.76	19.50
Operating capital	2.88	2.62	1.96
Other nonland capital	12.40	13.20	13.70
Land	48.21	51.48	48.61
Unpaid labor	16.36	17.24	17.99
Residual returns to management and risk	-19.92	-5.79	-29.67
Harvest-month price (dollars per bushel)	5.53	5.86	5.33
Yield (bushels per planted acre)	31.63	33.25	32.34

Seed costs moved much lower in 1990 as diminished seed stocks from the 1988 drought were replenished in 1989. Fertilizer costs, 10 percent lower in 1990, are expected to change little in 1991. Chemical costs, the largest cash cost of producing soybeans, are projected to be up by 3 percent in 1991. Higher fuel prices in the fall of 1990 pushed fuel costs up nearly 10 percent.

Note: Costs and returns data exclude effects of Government program participation where possible. Although income support programs do not exist for soybeans, nonrecourse loans and in 1991 marketing loans are available. However, the limited participation in these programs would have little effect on returns to soybean production.

Grain sorghum: Returns to grain sorghum production improved in 1990 as higher yields and prices offset greater production costs. Increased costs and lower yields projected for 1991, reduced returns.

Item	1989	1990	1991 forecast
		Dollars per acre	
Gross value of production	104.10	122.85	118.54
Total cash costs	90.73	95.04	97.20
Variable cash costs	60.96	62.39	63.80
Seed	3.87	4.01	4.05
Fertilizer	19.21	16.96	17.26
Chemicals	10.34	11.10	11.70
Custom operations	4.04	4.60	4.72
Fuel, lubrication, and electricity	11.67	12.94	12.87
Repairs	8.41	9.00	9.36
Hired labor	2.77	2.86	2.98
Purchased irrigation water	.13	.13	.13
Drying	.46	.73	.67
Technical services	.06	.06	.06
Fixed cash costs	29.77	32.65	33.40
General farm overhead	8.61	9.97	10.28
Taxes and insurance	8.21	8.47	8.74
Interest on operating loans	5.76	6.20	6.37
Interest on real estate	7.19	8.01	8.01
Gross value of production less cash costs	13.37	27.81	21.34
Economic (full ownership) costs	150.34	161.65	164.08
Variable cash costs	60.96	62.39	63.80
General farm overhead	8.61	9.97	10.28
Taxes and insurance	8.21	8.47	8.74
Capital replacement	25.24	27.10	28.17
Operating capital	2.19	2.03	1.51
Other nonland capital	6.33	7.43	7.71
Land	27.72	32.84	31.95
Unpaid labor	11.08	11.42	11.92
Residual returns to management and risk	-46.24	-38.80	-45.54
Harvest-month price (dollars per bushel)	2.04	2.10	2.19
Yield (bushels per planted acre)	51.03	58.50	54.13

Lower nitrogen prices in 1990 sent fertilizer costs down nearly 12 percent. With fuel prices much higher in the fall of 1990, fuel costs for machinery and drying rose well above 1989 levels. Prices climbed steadily in each year from 1989 to 1991, although lower yields in 1991 reduced returns.

Note: Including the effects of deficiency payments and nonrecourse loans would much improve average returns to grain sorghum. About 70 percent of sorghum base acres were enrolled in Government programs in 1990, although deficiency payments are not received on all enrolled acres.

Barley: Planted acre costs of producing barley declined slightly in 1990. Average economic costs were $3.10 per bushel ($156.24 per acre), indicating that harvest-month barley prices covered about two-thirds of the longrun costs of producing a bushel of barley. Both cash and economic costs were projected to be slightly up in 1991.

Item	1989	1990	1991 forecast
		Dollars per acre	
Gross value of production	118.76	110.26	106.50
Barley	115.21	106.99	103.48
Barley, straw	3.55	3.27	3.02
Total cash costs	83.09	83.42	84.59
Variable cash costs	59.00	57.79	58.39
Seed	8.52	7.50	6.76
Fertilizer	15.59	14.15	14.40
Lime and gypsum	.15	.15	.15
Chemicals	6.50	6.81	7.18
Custom operations	2.56	2.79	2.86
Fuel, lubrication, and electricity	8.14	8.54	8.49
Repairs	8.18	8.17	8.49
Hired labor	6.71	7.01	7.32
Purchased irrigation water	2.41	2.43	2.49
Technical services	.24	.24	.25
Fixed cash costs	24.09	25.63	26.20
General farm overhead	6.21	7.16	7.38
Taxes and insurance	8.10	7.71	7.96
Interest on operating loans	3.55	3.81	3.91
Interest on real estate	6.23	6.95	6.95
Gross value of production less cash costs	35.67	26.84	21.91
Economic (full ownership) costs	157.43	156.24	158.50
Variable cash costs	59.00	57.79	58.39
General farm overhead	6.21	7.16	7.38
Taxes and insurance	8.10	7.71	7.96
Capital replacement	27.43	27.58	28.67
Operating capital	1.33	1.19	0.87
Other nonland capital	6.89	7.63	7.92
Land	36.32	34.59	34.17
Unpaid labor	12.15	12.59	13.14
Residual returns to management and risk	-38.67	-45.98	-52.00
Harvest-month price (dollars per bushel)	2.63	2.12	2.06
Yield (bushels per planted acre)	43.88	50.48	50.23

U.S. average yields included in the barley costs of production estimates increased 15 percent to 50 bushels per planted acre in 1990, but harvest-month prices fell from $2.63 to $2.12 per bushel, resulting in a 7-percent decline in the estimated crop value. Barley prices and yields were projected to decline slightly in 1991, but the net effect is minimal and receipts were expected to remain similar to those of 1990.

Wheat: Average cash costs were $2.53 per bushel ($84.90 per acre) and the economic costs was $4.05 per bushel ($137.98 per acre). Both cash and economic costs were projected to be relatively stable in 1991.

Item	1989	1990	1991 forecast
		Dollars per acre	
Gross value of production	103.28	106.66	92.44
Wheat	99.83	104.20	90.02
Wheat, straw	3.45	2.46	2.42
Total cash costs	83.92	84.90	86.33
Variable cash costs	59.93	60.88	61.74
Seed	7.68	7.60	7.53
Fertilizer	16.43	16.13	16.38
Lime and gypsum	.27	.27	.27
Chemicals	5.02	5.12	5.27
Custom operations	4.07	4.15	4.24
Fuel, lubrication, and electricity	8.05	8.66	8.57
Repairs	13.22	13.53	13.93
Hired labor	4.95	5.16	5.31
Purchased irrigation water	.20	.20	.21
Technical services	.04	.04	.04
Fixed cash costs	23.85	24.02	24.59
General farm overhead	5.01	5.23	5.39
Taxes and insurance	10.07	10.40	10.73
Interest on operating loans	2.99	2.99	3.07
Interest on real estate	5.78	5.40	5.40
Gross value of production less cash costs	19.50	5.20	6.10
Economic (full ownership) costs	135.14	137.98	137.83
Variable cash costs	59.93	60.88	61.74
General farm overhead	5.01	5.23	5.39
Taxes and insurance	10.07	10.40	10.73
Capital replacement	9.63	9.86	10.15
Operating capital	2.41	2.24	1.80
Other nonland capital	16.15	16.55	17.02
Land	23.27	23.78	21.69
Unpaid labor	8.67	9.04	9.30
Residual returns to management and risk	-31.86	-31.34	-45.40
Harvest-month price (dollars per bushel)	3.81	2.83	3.00
Yield (bushels per planted acre)	26.22	36.82	30.01

Weather remained a key determining factor in 1990. U.S. average yields for States included in the wheat costs of production program increased 40 percent to 37 bushels per planted acre in 1990, but harvest-month price fell from $3.81 to $2.83 per bushel, resulting in only a 3-percent increase in the estimated value of the crop. An increase in wheat prices and a decline in yields were projected in 1991. The net effect should be somewhat lower receipts than in 1990.

Oats: In 1990 economic costs were $2.27 per bushel ($138.66 per acre), indicating that the $1.09 per bushel price received at harvest-month covered about half of the longrun costs of producing a bushel of oats. Cash and economic costs in 1991 were forecast to be very similar to those of 1990.

Item	1989	1990	1991 forecast
		Dollars per acre	
Gross value of production	97.32	80.90	67.53
Oats	81.69	66.88	54.65
Oats, straw	15.63	14.02	12.88
Total cash costs	68.80	69.53	70.27
Variable cash costs	49.00	48.64	48.81
Seed	9.56	8.58	7.84
Fertilizer	12.38	11.02	11.22
Lime and gypsum	1.44	1.53	1.56
Chemicals	1.10	1.10	1.16
Custom operations	6.39	6.96	7.14
Fuel, lubrication, and electricity	6.81	7.60	7.56
Repairs	6.78	6.90	7.17
Hired labor	4.54	4.95	5.17
Fixed cash costs	19.80	20.89	21.47
General farm overhead	3.13	3.64	3.75
Taxes and insurance	13.23	13.51	13.94
Interest on operating loans	1.15	1.22	1.25
Interest on real estate	2.29	2.52	2.52
Gross value of production less cash costs	28.52	11.37	-2.75
Economic (full ownership) costs	140.02	138.66	139.12
Variable cash costs	49.00	48.64	48.81
General farm overhead	3.13	3.64	3.75
Taxes and insurance	13.23	13.51	13.94
Capital replacement	24.93	24.30	25.26
Operating capital	.95	.88	.64
Other nonland capital	6.95	7.48	7.76
Land	26.16	23.85	21.88
Unpaid labor	15.67	16.36	17.07
Residual returns to management and risk	-42.70	-57.76	-71.59
Harvest-month price (dollars per bushel)	1.52	1.09	1.08
Yield (bushels per planted acre)	53.74	61.16	50.60

U.S. average yields for States included in the oats costs of production program increased 14 percent to 61 bushels per acre in 1990, but harvest-month prices fell from $1.52 in 1989 to $1.09 per bushel in 1990, resulting in an 18-percent decline in grain value of the oats crop. Receipts will continue to decline because of projected lower yields in 1991.

Appendix I--Definitions and Procedures

Structure of Accounts

The principle guiding USDA's methods for calculating and presenting cost and return estimates is to compare the current returns with the value of inputs used in production and to distinguish this comparison from investment costs which generate future returns. Cost and return statements summarize operator and landlord costs incurred during the production period for a particular commodity. Costs and returns are estimated on a per-planted-acre basis to facilitate cross-commodity comparisons. Costs are included only for acreage planted with the intention of being harvested for grain.

Value of production is estimated by multiplying price times yield, plus any value of secondary products, such as straw. Production is valued at time of harvest. Cash costs consist of both variable and fixed expenses. Variable expenses include seed, fertilizer, chemicals, custom operations, hired labor, fuel, repairs, purchased irrigation water, drying, cotton ginning, and technical services. Fixed cash expenses include taxes and insurance, general farm overhead, and interest paid on farm business debt.

Economic costs are long-term costs that account for all production inputs, without regard to ownership or equity positions of farm operators. Economic costs include variable cash expenses, fixed cash expenses except interest payments, capital replacement, and imputed costs of land, unpaid labor, and capital invested in production inputs and machinery. Capital replacement is the portion of the value of machinery and equipment, in addition to repairs, that is used up in the production of a particular crop. The opportunity costs associated with land as a production input are estimated based on land rental rates for each crop. The land rental rates are a composite of share and cash rents. Share rents are affected by prices used to value the crop harvested and provided to landlords. The cost of operating capital is the expense of carrying inputs from the time they are used until harvest. The annual average rate on 6-month U.S. Treasury bills is used to measure this cost. The cost of having capital invested in farm machinery and equipment is measured using the longrun rate of return to production assets from current income.

Gross value of production less cash expenses is a measure of short-term returns to production and the amount of cash left after all cash expenses, including interest payments, have been made. Residual returns to management and risk is the difference between gross value of production and total economic costs. Returns to management and risk based on cost and return statements that exclude Government programs, on average, should be negative.

Estimation Methods

Four general approaches are used to derive an estimate for a particular component of costs or returns: direct costing, allocation of whole-farm costs, valuing of input quantities, and indirect costing (app. fig. 1).

Direct costing involves summarizing responses to a question about the amount paid for a particular item. This method is used to estimate components of variable costs such as chemicals, custom operations, hired labor, purchased irrigation water, and technical services. Allocating whole-farm expenses occurs for inputs not specifically associated with production of a commodity. Expenses incurred by the whole-farm for a particular input are then allocated to an enterprise based on its shares of total value of production. Valuing quantities of inputs requires survey data of the physical quantities of inputs used in production. This approach is used for inputs such as seed, fertilizer, lime and gypsum, and unpaid labor. Costs are estimated by multiplying quantities used by State- or regional-level prices.

Indirect costing combines information on a farm's machinery size and field operations with standardized engineering performance coefficients to derive fuel, repair, and replacement costs.

Economic costs such as operating capital, nonland capital, and land are estimated using a combination of these approaches. For example, to compute operating capital (which is total variable expenses times the 6-month Treasury bill rate), we base fertilizer costs on valuing quantities. But, we use indirect costing to compute repair costs.

Data Sources

Since 1984, the primary source of data used to develop enterprise cost and return estimates has been the Farm Costs and Returns Survey (FCRS). The survey is administered annually in the 48 contiguous States through personal interviews by trained enumerators. The FCRS is an integrated

Appendix figure 1
Approaches used to estimate cost of production components

Direct costing	Allocating whole-farm expenses	Valuing quantities of inputs	Indirect costing	Some combination of approaches
• Chemicals • Custom operations • Hired labor • Purchased irrigation water • Technical services • Custom drying • Miscellaneous • Peanut quota	• General farm overhead • Interest	• Seed • Fertilizer • Lime and gypsum • Unpaid labor • Drying • Ginning	• Fuel, lubrication, and electricity • Repairs • Capital replacement	• Operating capital • Other nonland capital • Land • Taxes and insurance

survey that combines multiple versions of a questionnaire. Enterprise cost data have been collected on a 4-year rotating cycle. The cost of production versions of the questionnaires are designed to provide cost estimates and information about production practices for a specific commodity and representative coverage of other desired information. Each questionnaire or observation represents a number of similar farms, the particular number being the survey expansion factor, which is the inverse of the probability of the observation being selected in the sample.

Additional information is required to supplement the basic technical information collected through the FCRS. The majority of secondary data sources are part of USDA's overall survey program administered by the National Agricultural Statistics Service (NASS). Information on deficiency payment rates, program payment yields, and participation rates used to develop estimates which include the direct effect of Government programs is obtained from the Agricultural Stabilization and Conservation Service. These secondary data are also used to update cost and return estimates between survey years.

Government Programs and Cost of Production

The Government operates deficiency payment programs for corn, grain sorghum, barley, oats, wheat, rice, and upland cotton. Farmers and landlords, if they participate in the programs, may receive direct payments based on historical program yields. Marketing loan programs exist for rice, cotton, and oilseeds where participants can repay CCC loans at the lower of either the loan rate or world price.

Direct payments and participation costs have been excluded from enterprise cost and return estimates. Beginning in 1988 with rice, an additional set of cost and return estimates was calculated, which included the direct effects of program participation. Similar statements will be prepared for other program commodities as survey data are collected.

For program crops, total returns include an estimate of the value of production based on average harvest month prices, the value of any secondary products, deficiency payments per planted acre, and any marketing loan payments. Costs incurred to maintain set-aside acreage are reflected in different variable cost components such as seed, fertilizer, fuel, and labor. Since the allocation of some components of fixed costs are based on relative value of production, these estimates differ when program effects are considered. Finally, the opportunity costs associated with land as a production input is affected by program participation because of the influence on rental rates.

Forecast Methods

Cost of production estimates for 1991 were based on the 1990 estimates. They are projections made from preliminary price and yield data and projections of prices paid indexes.

Appendix II--Data Reliability

Cost of production commodities are surveyed on a 4-year rotating basis. Survey results are only indications of the total population. They may differ from data collected in a complete census using the same questionnaires, instructions, and enumerators. A measure of this sample variability, called sampling error, is available from survey results. Sampling errors may be expressed as a percentage of the estimate. These percentages are referred to as coefficients of variation (C.V.) and are shown for selected commodities and survey years.

Item	Rice 1988	Wheat 1989	Soybeans 1990
		Percent	
Gross value of production	1.18	4.58	2.04
Total cash costs	1.82	2.86	1.67
Variable cash costs	1.76	2.62	2.39
Seed	2.26	3.01	4.50
Fertilizer	2.00	5.29	12.63
Chemicals	3.45	4.35	3.72
Custom operations	4.75	6.67	14.40
Fuel, lubrication, and electricity	3.15	3.26	3.38
Repairs	1.98	1.90	1.76
Hired labor	7.35	7.57	12.57
Purchased irrigation water	9.59	21.23	52.03
Drying	2.31	na	na
Miscellaneous	14.84	na	na
Technical services	30.04	21.56	25.95
Fixed cash costs	5.00	4.37	3.14
General farm overhead	4.69	5.15	4.28
Taxes and insurance	3.94	4.79	4.77
Interest on operating loans	4.92	6.94	8.91
Interest on real estate	17.70	7.57	8.86
Gross value of production less cash costs	43.43	24.80	5.18
Economic (full ownership) costs	1.60	2.42	1.53
Variable cash costs	1.76	2.62	2.39
General farm overhead	4.69	5.15	4.28
Taxes and insurance	3.94	4.79	4.77
Capital replacement	2.27	2.97	2.17
Operating capital	1.76	2.62	2.39
Other nonland capital	3.20	3.63	4.02
Land	3.38	3.87	4.17
Unpaid labor	4.65	5.21	5.44
Residual returns to management and risk	5.81	6.16	55.29

na = not applicable.

In general, the smaller the C.V. the greater the reliability of the estimate. The confidence interval for total cash cost of producing wheat in 1989 would be between $78.20 and $89.64 based on 95-percent probability.

Note: Survey data are also influenced by nonsampling errors, which are not measurable or known. Nonsampling errors may be introduced by enumerators, respondents, and questionnaire design among other factors. Efforts were made to minimize these errors and maintain survey accuracy, including training of data collectors, detailed review and edit of data, and analysis of data for comparability and consistency.

For more information...

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Cotton, Rice, Peanuts	Mike Salassi or Robert Dismukes
Wheat, Barley, Oats	Dargan Glaze or Mir Ali
Corn, Soybeans, Sorghum	William McBride

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