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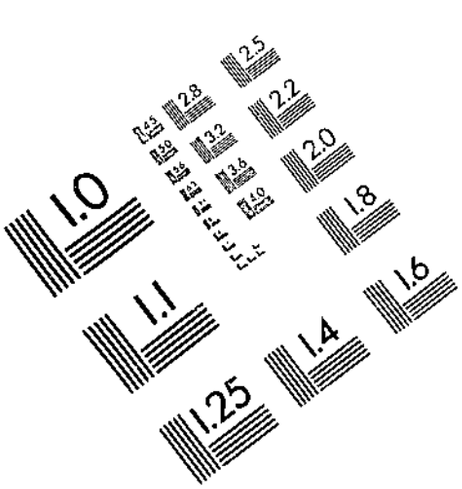

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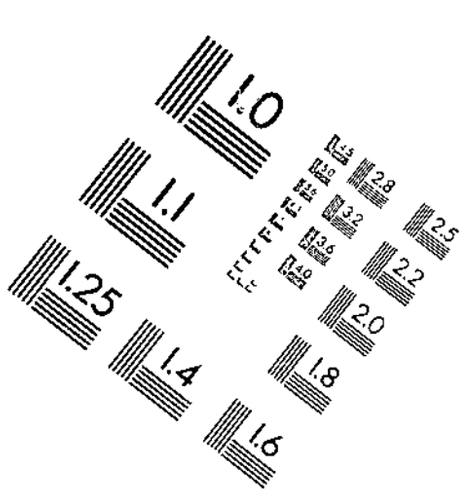

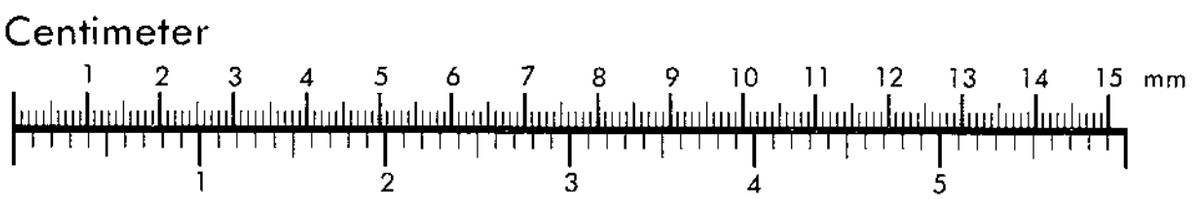

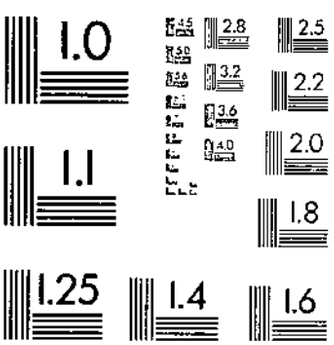

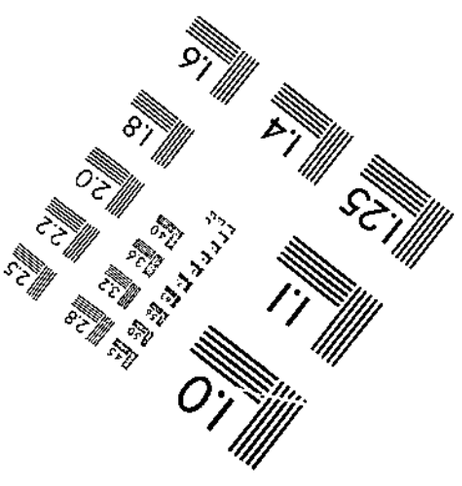

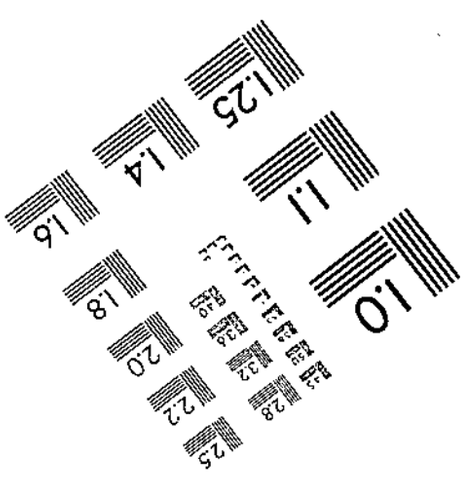

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Soybeans:

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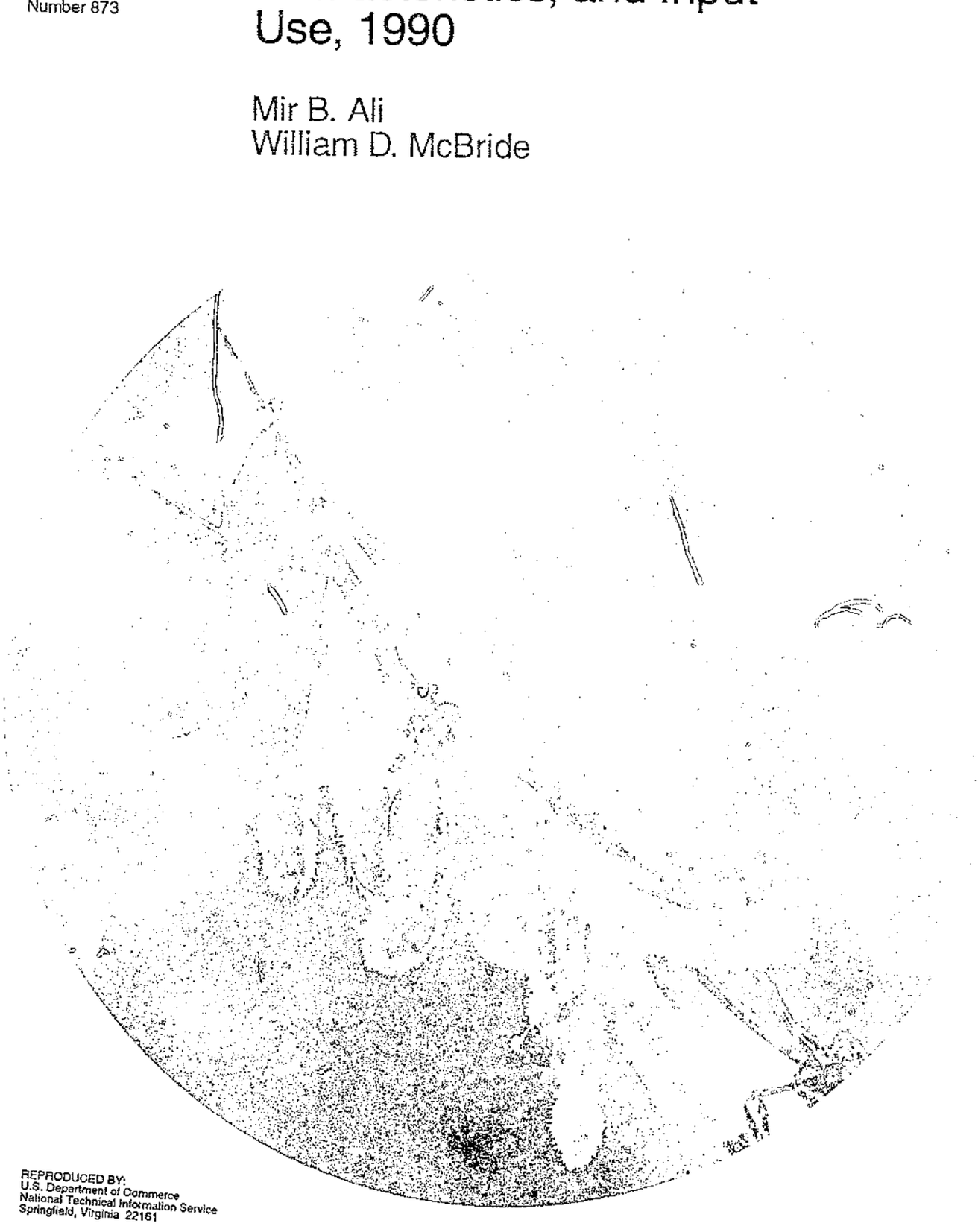
Mir B. Ali
William D. McBride



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Soybeans: State-Level Production Costs, Characteristics, and Input Use, 1990. By Mir B. Ali and William D. McBride. Agriculture and Rural Economy Division, Economic Research Service, U.S. Department of Agriculture. Statistical Bulletin Number 873.

Abstract

This report presents State-level soybean production cost and return estimates for the 1990 production year, along with coefficients of variation for each cost item. Per-acre costs are highly variable among States due to differences in production practices, inputs, and type and size of machines used in soybean production. Total per-acre economic costs varied from $151 in Mississippi to $258 in Nebraska. Soybean yields varied significantly, from about 10 bushels in Georgia to 43 bushels per planted acre in Indiana. Methods used to develop the State-level production costs and returns for 1990 are the same as those used to develop regional and U.S. weighted averages published in the *Economic Indicators of the Farm Sector: Costs of Production, 1991--Major Field Crops & Livestock and Dairy.* State-level estimates should be used for general discussion only, because statistical reliability diminishes for estimates below the regional and U.S. level due to sample size. Coefficients of variation included in this report are an indicator of the statistical reliability of each estimate.

Keywords: Costs of production, State-level, soybeans, enterprise accounts, budgets, returns, production inputs, farm characteristics

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February 1994

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Soybeans: State-Level Production Costs, Characteristics, and Input Use,1990

Mir B. Ali
William D. McBride

Introduction

Soybeans are an important cash crop in the United States, ranking second to corn in production value. In 1990, soybean production value was $11 billion, compared with $18.2 billion for corn.

In 1990, soybeans were planted on 57.8 million acres and harvested on about 56.5 million acres, both 5 percent below 1989. Production of soybeans in 1990 totaled 1.93 billion bushels, less than 1 percent below 1989. The U.S. average yield of 34.1 bushels per harvested acre was 1.8 bushels above the 1989 average yield, and equaled the then record high of 1985. Yields were higher in 1990 than in 1989 in most soybean-producing States. Record high yields were reported in Michigan, Minnesota, Wisconsin, Pennsylvania, Delaware, Maryland, and New Jersey. In 1990, the top five States in terms of planted soybean acreage were Illinois, Iowa, Minnesota, Indiana, and Missouri.

The 1990 soybean season started with late plantings due to extremely wet conditions. Crop development lagged 1 to 3 weeks behind normal as cool and wet weather prevailed. Arkansas, Missouri, and Illinois were especially late in crop development (*Crop Production, 1991).* As fall set in, there were concerns over an early frost that could affect the final stages of crop development. However, warm, dry conditions in late September and October allowed the soybean crop to reach its yield potential throughout the northern regions.

The southern regions did not have a good growing season because of uneven rainfall distribution and frequent dry weather. Dryness and high temperatures during critical summer months, especially in August, drastically reduced soybean yields. In Georgia, nearly one-fourth of the soybean acreage was abandoned as dry weather and disease problems severely injured the soybean crop. Soybean yields in the Southeast were about 8 bushels per acre below normal.

This report summarizes the 1990-production cost data for 14 soybean States. Production costs and returns along with coefficients of variation (C.V.) by State are given in tables 1 to 14. Statistical reliability of the State-level soybean production cost estimates is summarized in table 15. Also included are selected farm characteristics and production practices (app. table 1), quantities of selected inputs (app. table 2), and average machine use in the production of soybeans (app. tables 3-16).

Background

U.S. Department of Agriculture's Economic Research Service (USDA, ERS) annually estimates production costs and returns of major field crops (USDA, ERS, 1994). The estimates are calculated on a per-planted-acre basis and include both operator and landlord costs and returns. Costs are included only for the acreage planted with the intention of being harvested for beans. ERS estimates exclude the direct effects of Government programs where possible so that policymakers may be informed as to

production costs and returns in the absence of programs. Exclusion of all effects of Government programs, such as indirect effects on input prices, is not possible.

Cost-of-production estimates reflect average production practices, yields, and prices paid and received by farmers. Per-acre costs vary widely among farmers due to differences in inputs and type and size of machinery used. This variability means that costs and returns for individual farmers may differ considerably from average estimates presented in this report. Consequently, users should understand the objectives and procedures of the ERS estimates. Also, note that while the differences between costs and returns determine the profitability of a given enterprise, they are not an adequate measure of the well-being of farms producing more than one commodity.

Structure of Accounts

The State-level per-acre production cost estimates included in this report conform to the current ERS definitions and structure of accounts. Production cost and return estimates are presented in the form of a commodity account, which lists gross value of production, variable cash expenses, fixed cash expenses, economic costs, and two measures of returns.

Value of production is estimated by multiplying the harvest-period price times planted-acre yield. Harvest-period prices, rather than season-average prices, are used since using season-average prices reflects marketing factors like storage. Marketing is not a production cost, so storage costs are not included. Harvest-period prices and yields are specified at the State level. Payments from Government farm programs, such as deficiency and disaster payments, are excluded from gross value of production. Under the 1990 Farm Act, however, soybeans are not eligible for deficiency payments.

Variable cash expenses are those incurred only if production takes place. Expense items included in this category are seed, fertilizers, chemicals, custom operations and technical services, hired labor, fuel, electricity, lubrication, repairs, and purchased irrigation water.

Fixed expenses must be paid regardless of whether or not a crop is produced. Fixed expenses include general farm overhead, taxes, insurance, and interest on loans. Overhead costs consist of expenses for utilities (excluding water and electricity for irrigation), farm shop and office equipment and supplies, accounting and legal fees, blanket insurance policies, fence maintenance and repairs, motor vehicle registration, chemicals applied to maintain farm roads and ditches, and any other general expenses attributable to the entire farm business.

Economic costs are long-term costs that reflect the production situation as if the operation fully owned all production inputs. An opportunity cost is calculated for all capital inputs and land, whether owned, rented, or financed. Economic costs include variable cash expenses, general farm overhead, taxes and insurance, capital replacement, an imputed cost of capital invested in the production process, unpaid labor, and land. Capital replacement cost represents a portion of the value of the machinery and equipment used up during the year in the production of a crop, plus an additional cost required to bring these items up to the same level of quality that they were at the beginning of the period.

Opportunity costs are imputed from values of capital, land, and unpaid labor in alternative uses. The cost of operating capital is the expense of carrying input expenses from the time they are used until harvest. ERS imputes this cost at the 6-month U.S. Treasury bill rate, which was 7.47 percent. The cost of having capital invested in farm machinery and equipment (nonland capital) is measured using the longrun rate of return to agricultural production assets from current income, which was 3.4 percent. ERS values land in cost-of-production accounts at its rental value. The land rental rates are a composite of share (valued at the harvest-period price) and cash rental rates for a particular crop, minus real estate taxes that already have been included in other taxes and the value of inputs supplied by the landlord. ERS imputes the value of unpaid labor (hired labor is a variable cash expense) at the wage rate for agricultural workers. Additional value of unpaid labor, such as for management and entrepreneurial skill, is treated as a residual return.

Two returns are included in each account. Gross value of production less cash expenses is the net cash return that measures the shortrun cash-flow position. Gross value of production less economic costs is the residual returns to management and risk that measures the longrun position of the enterprise.

Data Sources

Production cost estimates are based on information obtained from the Farm Costs and Returns Survey (FCRS). The FCRS is a multiframe, stratified survey conducted annually by ERS and USDA's National Agricultural Statistics Service (USDA, NASS). Each year there are multiple versions of the FCRS: an in-depth, whole-farm version, and commodity cost-of-production (COP) versions. While all versions have questions about whole-farm expenses and income, each COP version gathers detailed information about input use, field operations, and production costs of a particular crop. Because of survey costs, USDA cannot undertake detailed surveys of every commodity each year. Thus, the FCRS covers each commodity about every 4 years. In nonsurvey years, production practices and technology are assumed to remain constant with the survey year. Costs are updated with price and yield data from the whole-farm version of the FCRS, ERS, and NASS publications, and other data sources.

Soybean production data were collected on the 1990 FCRS completed during February and March 1991. The soybean version of the 1990 FCRS contained questions on the organization and financial structure of the entire farming operation, as well as questions about production practices and operating expenses that were specific to the soybean enterprise. Twenty soybean-producing States were included in the 1990 FCRS soybean sample. The 1990 FCRS represents 271,841 farms that planted soybeans on 43.6 million acres and produced 1.44 billion bushels. The primary intent of the survey was to generate U.S. and regional average cost of production estimates. Therefore, most national- and regional-level estimates are statistically reliable. Appendix table 1 presents estimates for 14 soybean-producing States that have sufficient sample size to provide State-level estimates. Statistical reliability of these estimates is also examined.

Estimation Procedures

Procedures used to derive an estimate for a particular component of costs or returns are constrained by available data. Four general approaches were used to estimate the production costs: direct costing, allocation of whole-farm costs, valuing of input quantities, and indirect costing (fig. 1).

Direct costing is achieved by simply summarizing survey responses to questions about the amount paid for each item on a particular crop. This method is best suited for estimating components of variable costs such as seed, fertilizers, chemicals, custom operations, hired labor, purchased irrigation water, and technical services.

Indirect costing involves the combination of survey information and engineering formulas. Detailed information is collected on the survey regarding the machinery complement used in production. The data collected include hours of machine use, acreage covered, type and size of machine, and type of fuel used. This information is used to support equations of technical relationships that describe fuel consumption, repair requirements, and replacement costs. Engineering formulas are modified to reflect technological advances as they occur.

Allocating whole-farm expenses occurs for inputs that are not specifically associated with production of a commodity. For example, expenses for overhead items, interest, taxes, and insurance cannot be directly attributed to the production of an individual farm commodity. Survey data on production, along with secondary price data, are used to determine each farm's total value of production. Expenses incurred by the whole farm for a particular input are then allocated to an enterprise based on the enterprise's share of the operation's 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 unpaid labor. Costs are estimated by multiplying survey input quantities by State-level prices.

Components of economic costs including operating capital, nonland capital, and land are estimated using a combination of these approaches. Operating capital cost is the sum of variable expenses times the 6-month Treasury bill rate. Nonland capital is the average machinery value times the longrun rate of return to farm-sector assets. Land cost includes a combination of cash rental rates and landlords' net returns from share rental arrangements.

1990 Soybean Production Costs and Returns

At the U.S. level, per-acre soybean costs decreased slightly in 1990, mainly as a result of lower seed costs. A slight decrease in fertilizer prices was offset by a rise in fuel and chemical prices. At the U.S. level, 1990 total cash costs of producing soybeans were $106.90 per acre (or $3.23 per bushel) and total economic costs were $190.54 per acre (or $5.76 per bushel). For more details, refer to *Economic Indicators of the Farm Sector: Costs of Production, 1991--Major Field Crops & Livestock and Dairy.*

Per-acre costs and returns varied significantly among States. Variations in yields were due in part to weather patterns. Temperature and moisture are especially critical factors in late summer for pod fillings. Yield variations together with differences in crop prices translate into fluctuations in gross and net returns. Variations in production costs among States are due to differences in tillage practices, quantities and prices of inputs, and several other production factors.

Soybean enterprise gross returns in 1990 ranged from $54.88 to $252.27 per planted acre. In most States, gross returns were large enough to cover total cash costs, except in Georgia and South Carolina where returns were unusually low because of poor yields. The highest gross returns were found for Indiana soybean farms due both to relatively higher yields and prices.

Major variable cash items associated with soybean production include seed, chemicals, and fuel. Together these costs comprised about 40 to 70 percent of the total variable cash costs. There was wide variation among States. Per-acre seed expense ranged from a low of $8.61 in Arkansas to a high of $15.90 in Ohio. Chemical expense per acre ranged from $13.95 in Georgia to $24.76 in Indiana. The highest fuel expense, at $18.82 per acre, was estimated for Nebraska farms, because more acres of soybeans were irrigated than in other States. Missouri farms producing soybeans in 1990 had the lowest fuel cost at $7.02 per acre.

Fertilizer was a major variable cost item for producers in the Southeastern States. Many more producers in the Southeast fertilized soybeans than in the North. South Carolina had the highest fertilizer expense at $35.07 per acre, accounting for about one-third of variable cash costs. In contrast, northern producers most often planted soybeans after corn, which may have reduced fertilizer requirements. Per-acre fertilizer expense in the Northern States ranged from about $2 to $12, compared with $20 to $35 in the Southeast.

Kansas farms producing soybeans in 1990 had the lowest total variable cash costs among all States at $52.30 per acre. Relatively low fertilizer and chemical costs accounted for much of the cost savings. South Carolina producers had the highest variable cash costs at $109.24 per acre. Costs for fertilizers and hired labor were relatively high on South Carolina soybean operations.

Fixed cash costs ranged from $13.73 to $47.32 per planted acre. Soybean producers in Minnesota had the highest fixed cash costs, while the lowest fixed costs were estimated for South Carolina.

Total cash costs ranged from $79.32 in South Dakota to $124.42 per planted acre in Nebraska. Farms producing soybeans in Nebraska had the highest per-acre cash cost due to irrigation. Indiana had the highest returns less cash costs at $138.89 per planted acre.

Total economic costs ranged from $151.46 per acre in Mississippi to $257.94 per acre in Nebraska. Capital replacement and land costs in Nebraska were highest among all States. Estimated returns to management and risk were positive in most Northern States, including Illinois, Indiana, Iowa, Minnesota, Missouri, and South Dakota. Among Southern States, only Arkansas had positive returns to management and risk.

Statistical Reliability of Estimates

Production cost data presented in this report include an estimate of the coefficient of variation for each item. The coefficient of variation (C.V.) is a measure of relative dispersion indicating the variability of the estimated sample mean. It takes into account the variation in each cost item and also the variation in the expanded number of soybean farms estimated from the sample. The coefficient of variation is defined as the standard deviation of the estimate divided by its mean and expressed as a percentage of the estimate. In general, the smaller the C.V. the greater the reliability of the estimate. Note that survey results can also be influenced by nonsampling errors which are not measurable nor known. Nonsampling errors can be introduced by enumerators, respondents, or survey design. Efforts were made to minimize the effect of nonsampling error, consisting of the training of enumerators, review, edit of survey data, and analysis of data for comparability and consistency.

Constructing confidence intervals around the mean is a method for examining the precision of the estimate. For example, the mean total cash costs of producing soybeans in Indiana is $113.38 per acre with a coefficient of variation of 4.63. The 95-percent confidence interval for this estimate is $103.09 to $123.67 per acre. We are 95-percent confident that this interval contains the true population mean of total cash costs for producing an acre of soybeans in Indiana. Among all States, confidence intervals tended to have narrow ranges, and thus reliability of estimates improved as sample size increased (table 15).

References

U.S. Department of Agriculture, Economic Research Service. *Economic Indicators of the Farm Sector: Costs of Production, 1991--Major Field Crops & Livestock, and Dairy.* ECIFS 11-3. 1994.

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Figure 1

Approaches used to estimate the cost of production components

Direct costing	Allocating whole-farm expenses	Valuing quantities of inputs	Indirect costing	Some combination of approaches
▸Seed ▸Fertilizers ▸Chemicals ▸Custom operations ▸Hired labor ▸Purchased irrigation water ▸Technical services	▸General farm overhead ▸Interest ▸Taxes and insurance	▸Unpaid labor	▸Fuel, lubrication, electricity ▸Repairs ▸Capital replacement	▸Operating capital ▸Other nonland capital ▸Land

Table 1a--Alabama: Soybean production cash costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	89.91	na
Total, gross value of production	89.91	na
Cash expenses:		
Seed	10.71	10.87
Fertilizer	20.24	12.63
Chemicals	14.51	14.67
Custom operations	1.15	37.99
Fuel, lube, and electricity	10.99	14.30
Repairs	8.38	14.69
Hired labor	3.89	33.07
Purchased irrigation water	0.00	na
Total, variable cash expenses	69.86	9.27
General farm overhead	5.85	21.11
Taxes and insurance	8.87	23.96
Interest	2.62	33.61
Total, fixed cash expenses	17.34	9.52
Total, cash expenses	87.20	6.59
Gross value of production less cash expenses	2.71	na
Harvest-period price (dollars per bushel)	5.76	na
Yield (bushels per planted acre)	15.61	25.56

Table 1b--Alabama: Soybean production economic costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	89.91	na
Total, gross value of production	89.91	na
Economic (full-ownership) costs:		
Variable cash expenses	69.86	9.27
General farm overhead	5.85	21.11
Taxes and insurance	8.87	23.96
Capital replacement	16.87	17.11
Operating capital	2.61	9.27
Other nonland capital	10.45	25.33
Land	20.19	11.21
Unpaid labor	24.68	33.35
Total, economic (full-ownership) costs	159.38	10.99
Residual returns to management and risk	-69.47	na
Harvest-period price (dollars per bushel)	5.76	na
Yield (bushels per planted acre)	15.61	25.56

na = Not applicable.

Table 2a--Arkansas: Soybean production cash costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	174.14	na
Total, gross value of production	174.14	na
Cash expenses:		
Seed	8.61	9.28
Fertilizer	7.92	30.50
Chemicals	16.15	16.73
Custom operations	1.74	42.42
Fuel, lube, and electricity	15.96	16.51
Repairs	11.46	12.14
Hired labor	8.56	27.49
Purchased irrigation water	0.00	na
Total, variable cash expenses	70.41	15.09
General farm overhead	6.26	22.16
Taxes and insurance	6.79	9.88
Interest	6.61	27.68
Total, fixed cash expenses	19.66	13.39
Total, cash expenses	90.07	13.95
Gross value of production less cash expenses	84.07	na
Harvest-period price (dollars per bushel)	5.95	na
Yield (bushels per planted acre)	29.27	8.57

Table 2b--Arkansas: Soybean production economic costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	174.14	na
Total, gross value of production	174.14	na
Economic (full-ownership) costs:		
Variable cash expenses	70.41	15.09
General farm overhead	6.26	22.16
Taxes and insurance	6.79	9.88
Capital replacement	27.51	12.65
Operating capital	2.63	15.09
Other nonland capital	11.80	9.54
Land	35.07	13.59
Unpaid labor	11.66	19.16
Total, economic (full-ownership) costs	172.11	8.14
Residual returns to management and risk	2.03	na
Harvest-period price (dollars per bushel)	5.95	na
Yield (bushels per planted acre)	29.27	8.57

na = Not applicable.

Table 3a--Georgia: Soybean production cash costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	54.88	na
Total, gross value of production	54.88	na
Cash expenses:		
Seed	10.63	7.90
Fertilizer	20.31	16.16
Chemicals	13.95	11.00
Custom operations	4.03	37.29
Fuel, lube, and electricity	11.54	12.12
Repairs	9.77	6.90
Hired labor	10.77	29.14
Purchased irrigation water	0.00	na
Total, variable cash expenses	81.00	10.03
General farm overhead	3.47	47.46
Taxes and insurance	9.04	12.24
Interest	8.52	48.35
Total, fixed cash expenses	21.02	27.90
Total, cash expenses	102.02	13.12
Gross value of production less cash expenses	-47.14	na
Harvest-period price (dollars per bushel)	5.71	na
Yield (bushels per planted acre)	9.61	28.06

Table 3b--Georgia: Soybean production economic costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	54.88	na
Total, gross value of production	54.88	na
Economic (full-ownership) costs:		
Variable cash expenses	81.00	10.03
General farm overhead	3.47	47.46
Taxes and insurance	9.04	12.24
Capital replacement	17.71	12.44
Operating capital	3.02	10.03
Other nonland capital	8.49	14.73
Land	14.55	10.66
Unpaid labor	19.22	20.15
Total, economic (full-ownership) costs	156.50	8.54
Residual returns to management and risk	-101.62	na
Harvest-period price (dollars per bushel)	5.71	na
Yield (bushels per planted acre)	9.61	28.06

na = Not applicable.

Table 4a--Illinois: Soybean production cash costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	219.82	na
Total, gross value of production	219.82	na
Cash expenses:		
Seed	12.74	14.83
Fertilizer	12.61	23.08
Chemicals	19.24	11.56
Custom operations	1.69	38.65
Fuel, lube, and electricity	7.51	5.81
Repairs	7.61	3.74
Hired labor	4.32	21.46
Purchased irrigation water	0.07	51.15
Total, variable cash expenses	65.81	5.13
General farm overhead	7.91	10.24
Taxes and insurance	24.46	10.70
Interest	14.18	14.70
Total, fixed cash expenses	46.55	5.42
Total, cash expenses	112.35	4.09
Gross value of production less cash expenses	107.47	na
Harvest-period price (dollars per bushel)	5.95	na
Yield (bushels per planted acre)	36.94	4.52

Table 4b--Illinois: Soybean production economic costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	219.82	na
Total, gross value of production	219.82	na
Economic (full-ownership) costs:		
Variable cash expenses	65.81	5.13
General farm overhead	7.91	10.24
Taxes and insurance	24.46	10.70
Capital replacement	16.27	2.28
Operating capital	2.45	5.13
Other nonland capital	7.77	12.68
Land	59.95	10.66
Unpaid labor	17.19	7.14
Total, economic (full-ownership) costs	201.80	3.79
Residual returns to management and risk	18.02	na
Harvest-period price (dollars per bushel)	5.95	na
Yield (bushels per planted acre)	36.94	4.52

na = Not applicable.

Table 5a--Indiana: Soybean production cash costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	252.27	na
Total, gross value of production	252.27	na
Cash expenses:		
Seed	13.68	6.77
Fertilizer	9.41	19.98
Chemicals	24.76	5.31
Custom operations	2.67	23.14
Fuel, lube, and electricity	7.89	5.78
Repairs	8.67	5.65
Hired labor	3.33	24.66
Purchased irrigation water	0.00	na
Total, variable cash expenses	70.43	4.45
General farm overhead	10.49	11.65
Taxes and insurance	12.95	6.08
Interest	19.51	19.19
Total, fixed cash expenses	42.95	9.32
Total, cash expenses	113.38	4.63
Gross value of production less cash expenses	138.89	na
Harvest-period price (dollars per bushel)	5.91	na
Yield (bushels per planted acre)	42.69	2.84

Table 5b--Indiana: Soybean production economic costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	252.27	na
Total, gross value of production	252.27	na
Economic (full-ownership) costs:		
Variable cash expenses	70.43	4.45
General farm overhead	10.49	11.65
Taxes and insurance	12.95	6.08
Capital replacement	19.29	2.30
Operating capital	2.63	4.45
Other nonland capital	9.73	7.37
Land	73.21	9.31
Unpaid labor	15.03	11.05
Total, economic (full-ownership) costs	213.75	3.65
Residual returns to management and risk	38.52	na
Harvest-period price (dollars per bushel)	5.91	na
Yield (bushels per planted acre)	42.69	2.84

na = Not applicable.

Table 6a--Iowa: Soybean production cash costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	228.13	na
Total, gross value of production	228.13	na
Cash expenses:		
Seed	15.18	11.06
Fertilizer	2.07	40.72
Chemicals	24.11	9.41
Custom operations	5.15	48.05
Fuel, lube, and electricity	7.68	9.78
Repairs	8.05	3.84
Hired labor	3.78	50.59
Purchased irrigation water	0.00	na
Total, variable cash expenses	66.01	7.00
General farm overhead	9.73	18.91
Taxes and insurance	17.45	7.45
Interest	16.01	17.98
Total, fixed cash expenses	43.19	7.54
Total, cash expenses	109.21	5.73
Gross value of production less cash expenses	118.92	na
Harvest-period price (dollars per bushel)	5.82	na
Yield (bushels per planted acre)	39.20	5.94

Table 6b--Iowa: Soybean production economic costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	228.13	na
Total, gross value of production	228.13	na
Economic (full-ownership) costs:		
Variable cash expenses	66.01	7.00
General farm overhead	9.73	18.91
Taxes and insurance	17.45	7.45
Capital replacement	17.53	6.36
Operating capital	2.46	7.00
Other nonland capital	9.40	19.99
Land	64.67	8.26
Unpaid labor	15.57	22.24
Total, economic (full-ownership) costs	202.81	5.98
Residual returns to management and risk	25.32	na
Harvest-period price (dollars per bushel)	5.82	na
Yield (bushels per planted acre)	39.20	5.94

na = Not applicable.

Table 7a--Kansas: Soybean production cash costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	111.64	na
Total, gross value of production	111.64	na
Cash expenses:		
Seed	9.29	10.52
Fertilizer	3.10	62.13
Chemicals	14.00	11.44
Custom operations	2.99	38.29
Fuel, lube, and electricity	10.21	20.11
Repairs	8.92	6.94
Hired labor	3.81	44.28
Purchased irrigation water	0.00	na
Total, variable cash expenses	52.30	13.58
General farm overhead	6.15	14.91
Taxes and insurance	10.29	13.74
Interest	12.87	17.17
Total, fixed cash expenses	29.32	12.08
Total, cash expenses	81.62	12.24
Gross value of production less cash expenses	30.02	na
Harvest-period price (dollars per bushel)	5.69	na
Yield (bushels per planted acre)	19.62	11.87

Table 7b--Kansas: Soybean production economic costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	111.64	na
Total, gross value of production	111.64	na
Economic (full-ownership) costs:		
Variable cash expenses	52.30	13.58
General farm overhead	6.15	14.91
Taxes and insurance	10.29	13.74
Capital replacement	22.22	11.75
Operating capital	1.95	13.58
Other nonland capital	9.80	9.02
Land	28.45	8.45
Unpaid labor	25.80	20.99
Total, economic (full-ownership) costs	156.97	7.97
Residual returns to management and risk	-45.33	na
Harvest-period price (dollars per bushel)	5.69	na
Yield (bushels per planted acre)	19.62	11.87

na = Not applicable.

Table 8a--Minnesota: Soybean production cash costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	240.91	na
Total, gross value of production	240.91	na
Cash expenses:		
Seed	11.98	8.56
Fertilizer	2.23	41.14
Chemicals	21.87	5.69
Custom operations	4.89	36.54
Fuel, lube, and electricity	8.76	6.14
Repairs	9.05	5.74
Hired labor	4.25	24.63
Purchased irrigation water	0.00	na
Total, variable cash expenses	63.03	3.20
General farm overhead	12.43	9.31
Taxes and insurance	15.95	7.92
Interest	18.95	14.90
Total, fixed cash expenses	47.32	7.83
Total, cash expenses	110.35	3.74
Gross value of production less cash expenses	130.56	na
Harvest-period price (dollars per bushel)	5.76	na
Yield (bushels per planted acre)	41.82	1.75

Table 8b--Minnesota: Soybean production economic costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	240.91	na
Total, gross value of production	240.91	na
Economic (full-ownership) costs:		
Variable cash expenses	63.03	3.20
General farm overhead	12.43	9.31
Taxes and insurance	15.95	7.92
Capital replacement	18.61	5.73
Operating capital	2.35	3.20
Other nonland capital	12.22	12.82
Land	62.04	4.62
Unpaid labor	19.48	13.04
Total, economic (full-ownership) costs	206.09	3.20
Residual returns to management and risk	34.81	na
Harvest-period price (dollars per bushel)	5.76	na
Yield (bushels per planted acre)	41.82	1.75

na = Not applicable.

Table 9a--Mississippi: Soybean production cash costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	108.33	na
Total, gross value of production	108.33	na
Cash expenses:		
Seed	9.39	5.59
Fertilizer	2.34	42.06
Chemicals	20.49	8.69
Custom operations	4.85	40.15
Fuel, lube, and electricity	11.20	8.96
Repairs	9.80	4.37
Hired labor	14.34	18.19
Purchased irrigation water	0.00	na
Total, variable cash expenses	72.41	6.79
General farm overhead	7.37	38.28
Taxes and insurance	7.67	14.71
Interest	7.74	22.15
Total, fixed cash expenses	22.78	15.80
Total, cash expenses	95.19	5.31
Gross value of production less cash expenses	13.14	na
Harvest-period price (dollars per bushel)	5.89	na
Yield (bushels per planted acre)	18.39	15.71

Table 9b--Mississippi: Soybean production economic costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	108.33	na
Total, gross value of production	108.33	na
Economic (full-ownership) costs:		
Variable cash expenses	72.41	6.79
General farm overhead	7.37	38.28
Taxes and insurance	7.67	14.71
Capital replacement	19.64	8.00
Operating capital	2.70	6.79
Other nonland capital	7.82	5.06
Land	25.41	9.75
Unpaid labor	8.45	26.87
Total, economic (full-ownership) costs	151.46	4.15
Residual returns to management and risk	-43.13	na
Harvest-period price (dollars per bushel)	5.89	na
Yield (bushels per planted acre)	18.39	15.71

na = Not applicable.

Table 10a--Missouri: Soybean production cash costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	177.92	na
Total, gross value of production	177.92	na
Cash expenses:		
Seed	13.15	9.06
Fertilizer	6.21	29.12
Chemicals	19.99	6.67
Custom operations	7.30	36.83
Fuel, lube, and electricity	7.02	10.92
Repairs	7.06	9.95
Hired labor	4.07	38.13
Purchased irrigation water	0.00	na
Total, variable cash expenses	64.80	5.93
General farm overhead	6.00	16.01
Taxes and insurance	8.49	10.11
Interest	11.15	19.96
Total, fixed cash expenses	25.63	11.74
Total, cash expenses	90.44	5.07
Gross value of production less cash expenses	87.48	na
Harvest-period price (dollars per bushel)	5.81	na
Yield (bushels per planted acre)	30.62	5.12

Table 10b--Missouri: Soybean production economic costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	177.92	na
Total, gross value of production	177.92	na
Economic (full-ownership) costs:		
Variable cash expenses	64.80	5.93
General farm overhead	6.00	16.01
Taxes and insurance	8.49	10.11
Capital replacement	15.55	10.48
Operating capital	2.42	5.93
Other nonland capital	7.69	14.80
Land	44.84	7.64
Unpaid labor	13.66	11.15
Total, economic (full-ownership) costs	163.45	3.99
Residual returns to management and risk	14.47	na
Harvest-period price (dollars per bushel)	5.81	na
Yield (bushels per planted acre)	30.62	5.12

na = Not applicable.

Table 11a--Nebraska: Soybean production cash costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	214.61	na
Total, gross value of production	214.61	na
Cash expenses:		
Seed	14.27	7.07
Fertilizer	1.65	60.16
Chemicals	18.87	6.86
Custom operations	3.72	32.14
Fuel, lube, and electricity	18.82	10.73
Repairs	10.82	4.36
Hired labor	9.40	30.69
Purchased irrigation water	0.86	72.91
Total, variable cash expenses	78.41	4.93
General farm overhead	10.31	17.32
Taxes and insurance	19.76	5.59
Interest	15.94	21.13
Total, fixed cash expenses	46.01	8.56
Total, cash expenses	124.42	5.03
Gross value of production less cash expenses	90.20	na
Harvest-period price (dollars per bushel)	5.77	na
Yield (bushels per planted acre)	37.19	4.84

Table 11b--Nebraska: Soybean production economic costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	214.61	na
Total, gross value of production	214.61	na
Economic (full-ownership) costs:		
Variable cash expenses	78.41	4.93
General farm overhead	10.31	17.32
Taxes and insurance	19.76	5.59
Capital replacement	33.88	8.18
Operating capital	2.92	4.93
Other nonland capital	12.62	8.01
Land	75.25	6.06
Unpaid labor	24.78	19.72
Total, economic (full-ownership) costs	257.94	3.52
Residual returns to management and risk	-43.33	na
Harvest-period price (dollars per bushel)	5.77	na
Yield (bushels per planted acre)	37.19	4.84

na = Not applicable.

Table 12a--Ohio: Soybean production cash costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	205.74	na
Total, gross value of production	205.74	na
Cash expenses:		
Seed	15.90	11.07
Fertilizer	11.86	12.60
Chemicals	23.57	5.08
Custom operations	6.24	32.43
Fuel, lube, and electricity	8.69	12.09
Repairs	8.34	13.95
Hired labor	2.74	34.65
Purchased irrigation water	0.00	na
Total, variable cash expenses	77.34	4.29
General farm overhead	10.85	18.37
Taxes and insurance	16.51	11.72
Interest on operating loans	15.83	17.52
Total, fixed cash expenses	43.18	9.75
Total, cash expenses	120.52	4.65
Gross value of production less cash expenses	85.21	na
Harvest-period price (dollars per bushel)	5.89	na
Yield (bushels per planted acre)	34.93	6.23

Table 12b--Ohio: Soybean production economic costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	205.74	na
Total, gross value of production	205.74	na
Economic (full-ownership) costs:		
Variable cash expenses	77.34	4.29
General farm overhead	10.85	18.37
Taxes and insurance	16.51	11.72
Capital replacement	17.81	6.34
Operating capital	2.88	4.29
Other nonland capital	8.45	4.86
Land	55.17	13.50
Unpaid labor	27.37	19.18
Total, economic (full-ownership) costs	216.38	6.66
Residual returns to management and risk	-10.64	na
Harvest-period price (dollars per bushel)	5.89	na
Yield (bushels per planted acre)	34.93	6.23

na = Not applicable.

Table 13a--South Carolina: Soybean production cash costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	95.94	na
Total, gross value of production	95.94	na
Cash expenses:		
Seed	7.25	8.36
Fertilizer	35.07	12.54
Chemicals	21.35	22.17
Custom operations	0.81	73.20
Fuel, lube, and electricity	11.99	5.19
Repairs	10.55	1.74
Hired labor	22.02	24.14
Purchased irrigation water	0.00	na
Total, variable cash expenses	109.04	5.48
General farm overhead	4.83	28.97
Taxes and insurance	6.10	11.36
Interest	2.80	60.14
Total, fixed cash expenses	13.73	24.96
Total, cash expenses	122.77	3.79
Gross value of production less cash expenses	-26.84	na
Harvest-period price (dollars per bushel)	5.68	na
Yield (bushels per planted acre)	16.89	7.47

Table 13b--South Carolina: Soybean production economic costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	95.94	na
Total, gross value of production	95.94	na
Economic (full-ownership) costs:		
Variable cash expenses	109.04	5.48
General farm overhead	4.83	28.97
Taxes and insurance	6.10	11.36
Capital replacement	20.17	1.97
Operating capital	4.07	5.48
Other nonland capital	8.81	3.50
Land	5.68	40.90
Unpaid labor	6.14	35.42
Total, economic (full-ownership) costs	164.86	3.36
Residual returns to management and risk	-68.92	na
Harvest-period price (dollars per bushel)	5.68	na
Yield (bushels per planted acre)	16.89	7.47

na = Not applicable.

Table 14a--South Dakota: Soybean production cash costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	175.71	na
Total, gross value of production	175.71	na
Cash expenses:		
Seed	11.33	12.05
Fertilizer	2.30	32.81
Chemicals	17.06	6.34
Custom operations	1.77	45.69
Fuel, lube, and electricity	8.82	12.80
Repairs	8.37	3.76
Hired labor	4.16	65.71
Purchased irrigation water	0.00	na
Total, variable cash expenses	53.82	6.22
General farm overhead	6.24	17.04
Taxes and insurance	9.21	10.04
Interest on operating loans	10.04	17.26
Total, fixed cash expenses	25.50	11.65
Total, cash expenses	79.32	5.49
Gross value of production less cash expenses	96.39	na
Harvest-period price (dollars per bushel)	5.62	na
Yield (bushels per planted acre)	31.26	5.58

Table 14b--South Dakota: Soybean production economic costs and returns per planted acre with coefficients of variation, 1990

Item	1990	C.V.
	Dollars	Percent
Gross value of production:		
Soybeans	175.71	na
Total, gross value of production	175.71	na
Economic (full-ownership) costs:		
Variable cash expenses	53.82	6.22
General farm overhead	6.24	17.04
Taxes and insurance	9.21	10.04
Capital replacement	21.14	15.24
Operating capital	2.01	6.22
Other nonland capital	9.21	7.66
Land	45.40	12.45
Unpaid labor	13.78	15.18
Total, economic (full-ownership) costs	160.82	7.11
Residual returns to management and risk	14.89	na
Harvest-period price (dollars per bushel)	5.62	na
Yield (bushels per planted acre)	31.26	5.58

na = Not applicable.

Table 15--Statistical reliability of soybean production cost estimates, by State, 1990

State	Sample size	95 percent confidence interval					
		Cash costs			Economic costs		
		Lower bound	Mean	Upper bound	Lower bound	Mean	Upper bound
		Dollars per planted acre					
Alabama	33	75.94	87.20	98.46	141.86	159.38	176.90
Arkansas	33	65.44	90.07	114.70	144.65	172.11	199.57
Georgia	33	75.79	102.02	128.25	130.30	156.50	182.70
Illinois	84	103.34	112.35	121.36	186.81	201.80	216.79
Indiana	54	103.09	113.38	123.67	198.46	213.75	229.04
Iowa	70	96.94	109.21	121.48	179.04	202.81	226.58
Kansas	39	62.04	81.62	101.20	132.45	156.97	181.49
Minnesota	70	102.26	110.35	118.44	193.16	206.09	219.02
Mississippi	48	85.28	95.19	105.10	139.14	151.46	163.78
Missouri	55	81.45	90.44	99.43	150.67	163.45	176.23
Nebraska	37	112.15	124.42	136.69	240.14	257.94	275.74
Ohio	48	109.54	120.52	131.50	188.13	216.38	244.63
South Carolina	37	113.65	122.77	131.89	154.00	164.86	175.72
South Dakota	35	70.78	79.32	87.86	138.41	160.82	182.23

Appendix table 1--Characteristics of FCRS soybean farms, by State, 1990

Item	Unit	Alabama	Arkansas	Georgia	Illinois	Indiana	Iowa	Kansas
Share of soybean-FCRS:								
Sample size	number	33	33	33	84	54	70	39
All farms	percent	*	*	*	18	6	16	5
Total soybean production	percent	*	*	*	30	7	18	*
Acreage and yields:								
Total operated acreage	acres	425	572	338	665	480	470	528
Soybean acres planted	acres	82	254	67	240	161	151	97
Soybean acres harvested	acres	63	254	42	239	161	161	96
Soybean yield	actual bu/ac	16	29	10	37	43	39	20
Soybean yield	normal bu/ac	30	30	28	40	42	40	27
Soybean acreage-tenure:								
Percent owned	percent of acres	32	13	39	18	30	21	36
Percent cash rented	percent of acres	39	11	57	13	25	48	10
Percent share rented	percent of acres	18	75	*	69	45	30	54
Percent free rented	percent of acres	10	*	*	0	0	0	0
Soybean acreage-use:								
Irrigated	percent of acres	*	30	8	*	0	0	12
Dryland	percent of acres	98	70	92	99	100	100	88
Double-cropped	percent of acres	23	25	34	9	*	*	25
No-till	percent of acres	13	7	*	21	16	12	0
Crop previously on soybean acres:								
Barley	percent of farms	0	0	*	0	0	5	0
Corn	percent of farms	*	0	33	79	89	85	5
Oats	percent of farms	*	0	0	0	0	0	0
Rye	percent of farms	*	0	5	0	0	0	0
Sorghum	percent of farms	0	0	0	*	0	0	25
Soybeans	percent of farms	74	72	35	5	11	11	17
Wheat	percent of farms	0	*	*	*	0	0	54
Rice	percent of farms	0	13	0	0	0	0	0
Cotton	percent of farms	*	9	*	0	0	0	0
Peanuts	percent of farms	*	0	*	0	0	0	0
All hay	percent of farms	0	0	0	6	0	0	0
Other	percent of farms	17	0	15	*	0	0	0
Fallow	percent of farms	0	*	5	*	0	0	0

See footnotes at end of table.

Continued--

Appendix table 1--Characteristics of FCRS soybean farms, by State, 1990 -- Continued

Item	Unit	Minnesota	Mississippi	Missouri	Nebraska	Ohio	South Carolina	South Dakota
Share of soybean-FCRS:								
Sample size	number	70	48	55	37	48	37	35
All soybean farms	percent	12	*	11	5	9	*	5
Total soybean production	percent	12	*	7	3	7	*	5
Acreage and yields:								
Total operated acreage	acres	520	952	416	674	375	1,297	861
Soybean acres planted	acres	132	440	108	88	128	307	191
Soybean acres harvested	acres	132	436	105	88	128	300	189
Soybean yield	actual bu/ac	42	18	31	37	35	17	31
Soybean yield	normal bu/ac	41	27	33	39	39	24	32
Soybean acreage-tenure:								
Percent owned	percent of acres	46	13	42	47	24	38	25
Percent cash rented	percent of acres	41	60	7	10	47	60	35
Percent share rented	percent of acres	12	27	50	43	20	*	40
Percent free rented	percent of acres	*	0	*	0	9	*	0
Soybean acreage-use:								
Irrigated	percent of acres	*	10	*	45	0	0	6
Dryland	percent of acres	100	90	99	55	100	100	94
Double-cropped	percent of acres	*	26	9	0	*	16	0
No-till	percent of acres	*	*	7	*	16	*	7
Crop previously on soybean acres:								
Barley	percent of farms	9	*	0	*	0	0	5
Corn	percent of farms	70	*	60	79	67	29	80
Oats	percent of farms	15	0	0	0	0	*	*
Rye	percent of farms	*	0	0	0	0	0	0
Sorghum	percent of farms	*	*	11	*	0	0	0
Soybeans	percent of farms	4	73	20	14	11	44	0
Wheat	percent of farms	*	7	7	*	*	*	12
Rice	percent of farms	0	*	0	0	0	0	0
Cotton	percent of farms	0	0	0	0	0	23	0
Peanuts	percent of farms	0	0	0	0	0	0	0
All hay	percent of farms	0	0	*	0	*	0	0
Other	percent of farms	0	11	*	0	0	0	0
Fallow	percent of farms	0	*	*	0	9	*	0

* = Indicates less than 5 percent.
Note: Data may not add due to rounding.

Appendix table 2--Input use of FCRS soybean farms, by State, 1990

Item	Unit	Alabama	Arkansas	Georgia	Illinois	Indiana	Iowa	Kansas
Seed:								
Rate-total	lbs/acre	56	69	55	61	62	62	63
Acres reseeded	percent	*	9	5	2	5	2	2
Homegrown seed	percent	5	24	27	32	12	6	26
Purchased seed	percent	95	76	73	68	88	94	74
Fertilizer use:								
Any fertilizer	percent of farms	98	45	86	41	47	11	8
Nitrogen	percent of farms	61	27	82	16	27	7	8
Phosphorus	percent of farms	96	42	86	35	36	7	8
Potassium	percent of farms	98	42	86	40	40	8	2
Fertilizer use:								
Nitrogen	lbs/acre	8	13	13	5	8	12	41
Phosphorus	lbs/acre	41	31	44	41	44	18	41
Potassium	lbs/acre	54	44	85	86	47	60	7
Chemical use:								
Any chemicals	percent of farms	84	98	76	96	100	100	81
Herbicides	percent of farms	82	98	76	96	100	100	81
Insecticides	percent of farms	6	*	20	0	0	0	0
Herbicide treatments	times-over	1.44	1.71	1.45	1.55	1.34	1.74	0.88
Custom operations:								
Any custom operations	percent of farms	22	10	18	23	23	32	17
Land prep/cultivation	percent of farms	*	*	*	*	0	0	*
Planting	percent of farms	0	0	0	*	0	*	7
Fert/chem application	percent of farms	*	8	9	13	22	16	8
Technical services	percent of farms	0	*	0	*	*	*	*
Harvesting	percent of farms	18	*	8	9	11	17	12
Fuel use:								
Diesel	gallons per acre	6.75	9.19	6.84	4.10	4.49	4.35	3.98
Gasoline	gallons per acre	4.27	4.18	3.40	2.72	2.95	2.77	3.95
LP gas	gallons per acre	0.02	0.07	0.11	0.35	0.01	0.00	0.00
Natural gas	1000 cubic feet per acre	0.00	0.01	0.00	0.00	0.00	0.00	0.28
Electricity	kilowatt hours per acre	0.00	6.81	21.83	0.00	0.51	0.00	1.98
Labor use:								
Unpaid labor	hours per acre	4.76	2.32	3.70	2.82	2.48	2.85	4.43

See footnotes at end of table.

Continued--

Appendix table 2--Input use of FCRS soybean farms, by State, 1990 -- Continued

Item	Unit	Minnesota	Missis-sippi	Missouri	Nebraska	Ohio	South Carolina	South Dakota
Seed:								
Rate-total	lbs/acre	64	55	58	62	81	41	60
Acres reseeded	percent	*	5	*	7	7	*	0
Homegrown seed	percent	26	18	13	21	15	47	36
Purchased seed	percent	74	82	87	79	85	53	64
Fertilizer use:								
Any fertilizer	percent of farms	26	15	13	20	76	91	33
Nitrogen	percent of farms	24	11	6	16	53	49	23
Phosphorus	percent of farms	26	14	13	17	67	90	33
Potassium	percent of farms	26	15	13	3	76	91	18
Fertilizer use:								
Nitrogen	lbs/acre	10	19	6	6	5	3	5
Phosphorus	lbs/acre	19	44	33	22	25	40	20
Potassium	lbs/acre	31	70	50	5	56	84	7
Chemical use:								
Any chemicals	percent of farms	99	88	91	93	100	92	96
Herbicides	percent of farms	99	88	91	93	89	92	96
Insecticides	percent of farms	0	0	0	*	12	9	0
Herbicide treatments	times-over	1.88	2.50	1.26	1.35	0.99	2.63	1.39
Custom operations:								
Any custom operations	percent of farms	64	57	55	35	41	24	29
Land prep/cultivation	percent of farms	0	0	0	*	*	0	0
Planting	percent of farms	5	*	39	*	*	*	0
Fert/chem application	percent of farms	48	29	8	19	34	12	12
Technical services	percent of farms	13	*	*	*	*	*	14
Harvesting	percent of farms	41	52	47	22	32	19	12
Fuel use:								
Diesel	gallons per acre	5.68	7.44	3.84	9.63	4.41	8.54	4.85
Gasoline	gallons per acre	3.03	2.52	2.97	4.09	3.60	2.55	2.76
LP gas	gallons per acre	0.00	0.24	0.41	4.96	0.03	0.01	0.12
Natural gas	1000 cubic feet per acre	0.00	0.02	0.00	1.15	0.00	0.00	0.00
Electricity	kilowatt hours per acre	0.21	4.30	0.00	50.44	0.82	0.08	18.93
Labor use:								
Unpaid labor	hours per acre	3.48	1.68	2.50	4.26	4.55	1.18	2.37

* = Less than 5 percent.
Note: Data may not add due to rounding.

Appendix table 3--Alabama soybeans: Average machinery use per planted acre,1990

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.44	11	122
Deep-ripper, subsoiler	0.01	10	158
Disk plow	0.15	11	83
Moldboard plow, regular	0.13	5	120
Disk chisel (mulch tiller)	0.09	14	145
Offset disk, heavy duty	0.64	14	128
Offset disk, light duty	0.01	7	45
One-way disk	0.19	12	61
Tandem disk, plowing	0.05	9	96
Tandem disk, regular	0.77	19	143
Field cultivator	0.94	13	86
Furrow-out cultivator	0.02	10	155
Rotary hoe	0.01	10	59
Row cultivator	0.29	13	97
Rolling cultivator	0.01	10	75
Multi-weeder	0.05	17	100
Landall, do-all	0.08	14	100
Fertilizer attachment	0.11	8	155
Dry fertilizer applicator	0.03	10	93
Chemical applicator attachment	0.14	21	76
Chemical applicator, self-propelled	0.02	40	--
Chemical applicator, tractor	0.46	18	85
Chemical applicator, trailer	0.01	20	70
Drill, lister	0.19	8	80
Drill, no-till, min-till	0.06	12	105
Drill, plain, disc (grain)	0.03	13	62
Drill, press, disc, hoe	0.03	14	143
Planter, regular	0.64	12	95
Planter, air delivery	0.05	20	150
Combine, self-propelled, hillside	0.02	9	--
Combine, self-propelled, 2WD	0.60	14	--
Combine, self-propelled, 4WD	0.07	15	--

Note: Machine operations listed are not in sequence.
Machines used in custom field operations are excluded.
Machines are repeated because they are different in size or pulled by tractors of different size (horsepower).
-- = Indicates machines are self-powered or pulled by truck.
Width = Indicates the swath or width of the area covered by the machine, which is not necessarily the structural width of the machine.
Times-over = Total acres covered in an operation divided by planted acres of the crop. Note that hours per acre given for land forming equipment such as backhoe, disk border maker, ditcher, ditch closer, levee plow disk, rear-mounted blade, and quarter drain machines.

Source: 1990 Farm Costs and Returns Survey, USDA.

Appendix table 4--Arkansas soybeans: Average machinery use per planted acre, 1990

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.18	15	145
Disk plow	0.20	24	195
Offset disk, heavy duty	0.05	27	208
Single disk	0.01	21	150
Tandem disk, plowing	0.11	25	186
Tandem disk, regular	1.81	21	166
Field cultivator	0.56	25	176
Furrow-out cultivator	0.06	20	137
Rotary hoe	0.01	14	70
Row cultivator	0.40	17	126
Field conditioner (scratcher)	0.29	23	157
Finishing harrow	0.06	30	300
Culti-packer (pulverizer)	0.01	24	150
Roller-packer attachment	0.03	30	180
Roller-packer flat roller	0.04	24	132
Landall, do-all	0.65	22	163
Fertilizer attachment	0.12	40	128
Fertilizer spreader, self-propelled	0.01	40	--
Dry fertilizer spreader	0.03	39	110
Aerial chemical application	0.05	30	--
Chemical applicator attachment	0.08	28	151
Chemical applicator, tractor	0.56	23	118
Broadcast seeder	0.01	17	75
Drill, no-till, min-till	0.03	12	165
Drill, plain, disc (grain)	0.27	17	128
Drill, press, disc, hoe	0.21	23	143
Planter, no-till	0.19	23	141
Planter, regular	0.37	18	127
Combine, self-propelled, 2WD	0.82	17	--
Combine, self-propelled, 4WD	0.17	21	--
Levee-plow-disc	0.05	8	178
Float	0.16	15	162
Land plane-leveller	0.30	16	191
Grain wagon	0.23	23	152

Note: Machine operations listed are not in sequence.
Machines used in custom field operations are excluded.
Machines are repeated because they are different in size or pulled by tractors of different size (horsepower).
-- = Indicates machines are self-powered or pulled by truck.
Width = Indicates the swath or width of the area covered by the machine, which is not necessarily the structural width of the machine.
Times-over = Total acres covered in an operation divided by planted acres of the crop. Note that hours per acre given for land forming equipment such as backhoe, disk border maker, ditcher, ditch closer, levee plow disk, rear-mounted blade, and quarter drain machines.

Source: 1990 Farm Costs and Returns Survey, USDA.

Appendix table 5--Georgia soybeans: Average machinery use per planted acre, 1990

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.17	11	120
Deep ripper, subsoiler	0.12	10	127
Disk plow	0.06	5	120
Moldboard plow, regular	0.10	5	54
Moldboard plow, two-way	0.04	7	135
Subsoil chisel plow	0.02	5	70
Offset disk, heavy duty	0.11	14	96
One-way disk	0.19	26	70
Single disk	0.04	9	53
Tandem disk, plowing	0.25	17	113
Tandem disk, regular	1.20	16	129
Field cultivator	1.46	11	100
Furrow-out cultivator	0.02	10	95
Rotary hoe	0.01	10	70
Row cultivator	0.46	9	93
Rolling cultivator	0.05	10	69
Field conditioner (scratcher)	0.02	14	130
Finishing harrow	0.14	20	145
Flex-tine harrow (coil)	0.02	13	85
Multi-weeder	0.13	11	107
Bedder shaper	0.02	10	125
Bedder (disk)	0.01	10	130
Subsoiler-bedder, hipper, ripper	0.04	13	145
Fertilizer attachment	0.48	11	--
Fertilizer spreader	0.16	31	100
Chemical applicator, self-propelled	0.17	25	--
Chemical applicator, tractor	0.47	24	106
Bed-shaper planter	0.34	11	130
Lister-bedder planter	0.05	13	158
Planter, no-till	0.07	11	122
Planter, regular	0.59	11	101
Combine, self-propelled, hillside	0.07	13	--
Combine, self-propelled, 2WD	0.42	13	--
Combine, self-propelled, 4WD	0.04	14	--

Note: Machine operations listed are not in sequence.
Machines used in custom field operations are excluded.
Machines are repeated because they are different in size or pulled by tractors of different size (horsepower).
-- = Indicates machines are self-powered or pulled by truck.
Width = Indicates the swath or width of the area covered by the machine, which is not necessarily the structural width of the machine.
Times-over = Total acres covered in an operation divided by planted acres of the crop. Note that hours per acre given for land forming equipment such as backhoe, disk border maker, ditcher, ditch closer, levee plow disk, rear-mounted blade, and quarter drain machines.

Source: 1990 Farm Costs and Returns Survey, USDA.

Appendix table 6--Illinois soybeans: Average machinery use per planted acre, 1990

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.27	14	210
Disk plow	0.02	15	150
Moldboard plow, regular	0.08	8	137
Subsoil chisel plow	0.01	14	190
Disk chisel (mulch tiller)	0.10	14	172
Offset disk, heavy duty	0.10	19	144
Single disk	0.02	24	220
Tandem disk, plowing	0.17	21	154
Tandem disk, regular	0.63	23	160
Field cultivator	0.58	26	171
Rotary hoe	0.08	23	126
Row cultivator	0.48	19	124
Rolling cultivator	0.05	16	109
Field conditioner (scratcher)	0.01	20	105
Finishing harrow	0.03	23	115
Flex-tine harrow (coil)	0.06	22	130
Culti-mulcher (roller)	0.01	15	--
Spike-tooth harrow	0.02	18	117
Culti-packer (pulverizer)	0.02	15	147
Roller-packer attachment	0.15	25	--
Landall, do-all	0.10	23	226
Mulch treader	0.05	23	210
Fertilizer spreader, truck	0.05	40	--
Dry fertilizer applicator	0.01	33	185
Liquid fertilizer applicator	0.01	23	135
Dry fertilizer spreader, trailer	0.03	42	111
Chemical applicator attachment	0.08	29	168
Chemical applicator, self-propelled	0.03	47	--
Chemical applicator, self-propelled	0.03	38	--
Chemical applicator, truck	0.02	45	--
Chemical applicator, tractor	0.22	30	133
Chemical applicator, trailer	0.25	44	132
Drill, no-till, min-till	0.19	17	138
Drill, plain, disc (grain)	0.07	17	144
Drill, press, disc, hoe	0.01	24	160
Lister-bedder planter	0.01	15	160
Planter, no-till	0.10	22	132
Planter, regular	0.54	21	108
Planter, air delivery	0.09	20	123
Combine, self-propelled, hillside	0.02	15	--
Combine, self-propelled, 2WD	0.47	17	--
Combine, self-propelled, 4WD	0.48	18	--
Rotary mower	0.01	12	120
Mower, drum-disc	0.01	15	160
Grain wagon	0.32	19	125

Note: Machine operations listed are not in sequence.
Machines used in custom field operations are excluded.
Machines are repeated because they are different in size or pulled by tractors of different size (horsepower).
-- = Indicates machines are self-powered or pulled by truck.
Width = Indicates the swath or width of the area covered by the machine, which is not necessarily the structural width of the machine.
Times-over = Total acres covered in an operation divided by planted acres of the crop. Note that hours per acre given for land forming equipment such as backhoe, disk border maker, ditcher, ditch closer, levee plow disk, rear-mounted blade, and quarter drain machines.

Source: 1990 Farm Costs and Returns Survey, USDA.

Appendix table 7--Indiana soybeans: Average machinery use per planted acre, 1990

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.18	13	184
Coulter-chisel plow	0.02	9	180
Disk plow	0.02	17	275
Moldboard plow, regular	0.21	9	158
Disk chisel (mulch tiller)	0.24	15	192
Offset disk, heavy duty	0.10	18	130
One-way disk	0.03	30	240
Single disk	0.01	22	90
Tandem disk, plowing	0.13	10	144
Tandem disk, regular	0.47	19	143
Field cultivator	0.04	22	170
Field cultivator	0.69	23	165
Rotary hoe	0.07	27	117
Row cultivator	0.63	21	129
Rolling cultivator	0.02	15	103
Field conditioner (scratcher)	0.03	21	140
Finishing harrow	0.12	28	180
Flex-tine harrow (coil)	0.03	21	135
Culti-mulcher (roller)	0.11	15	134
Culti-packer (pulverizer)	0.02	17	125
Landall, do-all	0.04	20	202
Roterra	0.01	15	115
Fertilizer attachment	0.26	20	160
Liquid fertilizer applicator	0.01	45	110
Anhydrous applicator, trailer	0.02	30	275
Dry fertilizer spreader, trailer	0.03	40	94
Chemical attachment	0.49	24	123
Chemical applicator, self-propelled	0.11	60	--
Chemical applicator, truck	0.07	45	--
Chemical applicator, tractor	0.16	31	109
Chemical applicator, trailer	0.17	37	104
Drill, air deliver	0.03	17	80
Drill, no-till, min-till	0.12	20	119
Drill, plain, disc (grain)	0.06	18	114
Drill, press, disc, hoe	0.10	16	89
Planter, no-till	0.14	19	120
Planter, regular	0.54	21	120
Planter, air delivery	0.07	17	119
Combine, self-propelled, hillside	0.02	15	--
Combine, self-propelled, 2WD	0.75	17	--
Combine, self-propelled, 4WD	0.21	15	--
Grain wagon	0.13	28	122
Shredder, rotary	0.03	15	155

Note: Machine operations listed are not in sequence.
Machines used in custom field operations are excluded.
Machines are repeated because they are different in size or pulled by tractors of different size (horsepower).
-- = Indicates machines are self-powered or pulled by truck.
Width = Indicates the swath or width of the area covered by the machine, which is not necessarily the structural width of the machine.
Times-over = Total acres covered in an operation divided by planted acres of the crop. Note that hours per acre given for land forming equipment such as backhoe, disk border maker, ditcher, ditch closer, levee plow disk, rear-mounted blade, and quarter drain machines.

Source: 1990 Farm Costs and Returns Survey, USDA.

Appendix table 8--Iowa soybeans: Average machinery use per planted acre, 1990

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.29	12	158
Coulter-chisel plow	0.02	9	123
Deep ripper, subsoiler	0.02	16	263
Moldboard plow, regular	0.12	7	147
Stubble-mulch plow	0.04	10	110
Disk chisel (mulch tiller)	0.12	15	211
Offset disk, heavy duty	0.06	21	143
Single disk	0.03	23	175
Tandem disk, plowing	0.34	20	153
Tandem disk, regular	0.40	21	145
Field cultivator	0.01	12	84
Field cultivator	0.70	28	172
Rotary hoe	0.15	22	117
Row cultivator	0.65	18	116
Rolling cultivator	0.01	20	140
Field conditioner (scratcher)	0.03	30	143
Spike-tooth harrow	0.02	20	63
Springtooth harrow	0.03	23	129
Subsoiler-bedder, hipper, ripper	0.01	28	84
Dry fertilizer applicator	0.01	40	215
Dry fertilizer spreader, trailer	0.02	38	145
Chemical applicator attachment	0.37	26	123
Atv/motorcycle	0.01	20	--
Chemical applicator, self-propelled	0.03	35	--
Chemical applicator, tractor	0.12	29	132
Chemical applicator, trailer	0.16	35	107
Drill, air deliver	0.01	30	190
Drill, no-till, min-till	0.31	17	120
Drill, plain, disc (grain)	0.02	15	121
Drill, press, disc, hoe	0.02	20	160
Bed-shaper planter	0.01	20	140
Planter, no-till	0.04	13	104
Planter, regular	0.48	19	120
Planter, air delivery	0.12	25	120
Combine, self-propelled, hillside	0.01	18	--
Combine, self-propelled, 2WD	0.60	17	--
Combine, self-propelled, 4WD	0.30	17	--
Mower, flail	0.01	15	140
Grain wagon	0.39	30	122
Shredder, rotary	0.01	14	85
Stalk shredder	0.08	14	138

Note: Machine operations listed are not in sequence.
Machines used in custom field operations are excluded.
Machines are repeated because they are different in size or pulled by tractors of different size (horsepower).
-- = Indicates machines are self-powered or pulled by truck.
Width = Indicates the swath or width of the area covered by the machine, which is not necessarily the structural width of the machine.
Times-over = Total acres covered in an operation divided by planted acres of the crop. Note that hours per acre given for land forming equipment such as backhoe, disk border maker, ditcher, ditch closer, levee plow disk, rear-mounted blade, and quarter drain machines.

Source: 1990 Farm Costs and Returns Survey, USDA.

Appendix table 9--Kansas soybeans: Average machinery use per planted acre, 1990

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.23	16	151
Deep ripper, subsoiler	0.04	15	255
Disk plow	0.03	16	120
Moldboard plow, regular	0.02	7	121
Stubble-mulch plow	0.03	22	175
Subsoil chisel plow	0.06	20	300
Disk chisel (mulch tiller)	0.03	14	255
Offset disk, heavy duty	0.12	19	156
One-way disk	0.08	16	100
Single disk	0.04	14	85
Tandem disk, plowing	0.06	18	127
Tandem disk, regular	1.06	21	149
Field cultivator	1.07	26	159
Furrow-out cultivator	0.04	13	90
Row cultivator	0.41	16	99
Field conditioner (scratcher)	0.07	25	170
Flex-tine harrow (coil)	0.03	33	110
Spike-tooth harrow	0.02	30	143
Springtooth harrow	0.01	48	170
Bedder shaper	0.01	20	180
Roller-packer attachment	0.06	36	300
Roto-tiller	0.01	20	180
Fertilizer attachment	0.07	20	--
Dry fertilizer spreader, trailer	0.02	28	106
Liquid fertilizer applicator, trailer	0.02	45	123
Chemical applicator attachment	0.09	21	130
Chemical applicator, truck	0.01	35	--
Chemical applicator, tractor	0.15	21	102
Chemical applicator, trailer	0.11	32	99
Drill, air deliver	0.01	18	143
Drill, plain, disc (grain)	0.07	16	50
Drill, press, disc, hoe	0.12	21	108
Planter, regular	0.64	19	97
Planter, air delivery	0.13	25	136
Combine, self-propelled, hillside	0.01	20	--
Combine, self-propelled, 2WD	0.77	17	--
Combine, self-propelled, 4WD	0.12	18	--

Note: Machine operations listed are not in sequence.
Machines used in custom field operations are excluded.
Machines are repeated because they are different in size or pulled by tractors of different size (horsepower).
-- = Indicates machines are self-powered or pulled by truck.
Width = Indicates the swath or width of the area covered by the machine, which is not necessarily the structural width of the machine.
Times-over = Total acres covered in an operation divided by planted acres of the crop. Note that hours per acre given for land forming equipment such as backhoe, disk border maker, ditcher, ditch closer, levee plow disk, rear-mounted blade, and quarter drain machines.

Source: 1990 Farm Costs and Returns Survey, USDA.

Appendix table 10--Minnesota soybeans: Average machinery use per planted acre, 1990

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.30	15	190
Coulter-chisel plow	0.11	7	152
Deep ripper, subsoiler	0.03	19	298
Moldboard plow, regular	0.26	7	143
Stubble-mulch plow	0.02	12	175
Subsoil chisel plow	0.07	19	313
Disk chisel (mulch tiller)	0.03	14	211
Offset disk, heavy duty	0.14	14	92
Tandem disk, regular	0.32	19	138
Field cultivator	1.20	29	183
Rotary hoe	0.11	23	115
Row cultivator	0.74	19	108
Rolling cultivator	0.21	20	109
Field conditioner (scratcher)	0.01	24	170
Finishing harrow	0.01	32	200
Flex-tine harrow (coil)	0.07	25	92
Multi-weeder	0.29	35	204
Springtooth harrow	0.02	16	100
Culti-packer (pulverizer)	0.01	20	150
Dry fertilizer applicator	0.06	30	73
Anhydrous applicator, trailer mounted	0.01	28	170
Chemical applicator attachment	0.16	32	119
Chemical applicator, self-propelled	0.10	50	--
Chemical applicator, small truck	0.06	47	--
Chemical applicator, tractor	0.25	31	111
Chemical applicator, trailer	0.31	35	79
Drill, air deliver	0.01	28	135
Drill, plain, disc (grain)	0.01	20	88
Drill, press, disc, hoe	0.21	23	129
Bed-shaper planter	0.06	22	127
Planter, no-till	0.04	20	123
Planter, regular	0.51	21	110
Planter, air delivery	0.15	22	119
Combine, self-propelled, hillside	0.04	22	--
Combine, self-propelled, 2WD	0.76	19	--
Combine, self-propelled, 4WD	0.07	19	--
Mower, flail	0.02	15	140
Frontend loader	0.04	6	108
No-attachment	0.02	18	165
Grain wagon	0.14	21	81
Hay wagon	0.02	7	128
Rock picker	0.03	6	89
Shredder, flail	0.03	16	105
Stalk shredder	0.20	15	119
No-attachment	0.01	25	100

Note: Machine operations listed are not in sequence.
Machines used in custom field operations are excluded.
Machines are repeated because they are different in size or pulled by tractors of different size (horsepower).
-- = Indicates machines are self-powered or pulled by truck.
Width = Indicates the swath or width of the area covered by the machine, which is not necessarily the structural width of the machine.
Times-over = Total acres covered in an operation divided by planted acres of the crop. Note that hours per acre given for land forming equipment such as backhoe, disk border maker, ditcher, ditch closer, levee plow disk, rear-mounted blade, and quarter drain machines.

Source: 1990 Farm Costs and Returns Survey, USDA.

Appendix table 11--Mississippi soybeans: Average machinery use per planted acre, 1990

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.20	14	151
Disk plow	0.20	18	124
Subsoil chisel plow	0.14	8	165
Offset disk, heavy duty	0.06	24	209
Offset disk, light duty	0.02	25	170
One-way disk	0.02	21	195
Single disk	0.02	17	143
Tandem disk, plowing	0.58	20	153
Tandem disk, regular	0.92	21	148
Field cultivator	1.21	24	152
Furrow-out cultivator	0.02	12	95
Rotary hoe	0.13	20	198
Row cultivator	0.54	18	137
Rolling cultivator	0.02	20	160
Field conditioner (scratcher)	0.06	23	153
Finishing harrow	0.04	20	139
Rail, pipe, log, plank	0.22	19	113
Springtooth harrow	0.01	20	130
Bedder (disk)	0.03	18	150
Roller-packer flat roller	0.03	25	135
Landall, do-all	0.36	18	130
Fertilizer spreader, self-propelled	0.01	60	--
Fertilizer spreader, truck	0.04	29	--
Dry fertilizer spreader, trailer	0.01	30	140
Chemical applicator attachment	0.30	20	143
Chemical applicator, self-propelled	0.16	46	--
Chemical applicator, tractor	0.73	27	114
Drill, no-till, min-till	0.01	21	161
Drill, plain, disc (grain)	0.12	15	123
Drill, press, disc, hoe	0.02	21	180
Bed-shaper planter	0.26	18	109
Planter, no-till	0.02	30	165
Planter, regular	0.48	18	140
Planter, air delivery	0.13	50	166
Combine, self-propelled, hillside	0.01	28	--
Combine, self-propelled, 2WD	0.44	20	--
Combine, self-propelled, 4WD	0.26	19	--
Backhoe	0.02	8	--
Ditcher (vee or rotary)	0.18	2	116
Land plane-leveller	0.07	20	120
Grain wagon	0.14	28	109
No-attachment	0.03	37	--

Note: Machine operations listed are not in sequence.
Machines used in custom field operations are excluded.
Machines are repeated because they are different in size or pulled by tractors of different size (horsepower).
-- = Indicates machines are self-powered or pulled by truck.
Width = Indicates the swath or width of the area covered by the machine, which is not necessarily the structural width of the machine.
Times-over = Total acres covered in an operation divided by planted acres of the crop. Note that hours per acre given for land forming equipment such as backhoe, disk border maker, ditcher, ditch closer, levee plow disk, rear-mounted blade, and quarter drain machines.

Source: 1990 Farm Costs and Returns Survey, USDA.

Appendix table 12--Missouri soybeans: Average machinery use per planted acre, 1990

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.32	13	153
Deep ripper, subsoiler	0.03	15	230
Disk plow	0.03	24	165
Moldboard plow, regular	0.03	6	109
Stubble-mulch plow	0.01	18	90
Offset disk, light duty	0.05	15	120
Single disk	0.06	18	120
Tandem disk, plowing	0.04	18	147
Tandem disk, regular	1.08	18	132
Field cultivator	0.73	22	140
Row cultivator	0.41	17	95
Rolling cultivator	0.01	15	96
Field conditioner (scratcher)	0.01	12	110
Rail, pipe, log, plank	0.01	11	--
Culti-packer (pulverizer)	0.01	14	130
Landall, do-all	0.10	16	127
Mulch treader	0.04	14	135
Dry fertilizer applicator	0.01	60	90
Liquid fertilizer applicator	0.01	30	95
Dry fertilizer spreader, trailer	0.10	55	138
Chemical applicator attachment	0.16	24	120
Chemical applicator, self-propelled	0.01	60	--
Chemical applicator, small truck	0.02	30	--
Chemical applicator, tractor	0.48	22	97
Chemical applicator, trailer	0.11	28	73
Drill, plain, disc (grain)	0.17	23	123
Drill, press, disc, hoe	0.04	21	146
Lister-bedder planter	0.01	15	95
Planter, no-till	0.13	16	97
Planter, regular	0.52	15	80
Planter, air delivery	0.06	15	110
Combine, self-propelled, 2WD	0.51	14	--
Combine, self-propelled, 4WD	0.25	26	--
Grain wagon	0.10	19	129
Shredder, rotary	0.02	14	100

Note: Machine operations listed are not in sequence.
Machines used in custom field operations are excluded.
Machines are repeated because they are different in size or pulled by tractors of different size (horsepower).
-- = Indicates machines are self-powered or pulled by truck.
Width = Indicates the swath or width of the area covered by the machine, which is not necessarily the structural width of the machine.
Times-over = Total acres covered in an operation divided by planted acres of the crop. Note that hours per acre given for land forming equipment such as backhoe, disk border maker, ditcher, ditch closer, levee plow disk, rear-mounted blade, and quarter drain machines.

Source: 1990 Farm Costs and Returns Survey, USDA.

Appendix table 13--Nebraska soybeans: Average machinery use per planted acre, 1990

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.07	12	133
Deep ripper, subsoiler	0.02	10	140
Moldboard plow, two-way	0.03	7	220
Offset disk, heavy duty	0.03	13	155
Offset disk, light duty	0.05	15	125
One-way disk	0.02	21	175
Single disk	0.01	15	110
Tandem disk, plowing	0.10	20	139
Tandem disk, regular	0.95	19	129
Field cultivator	0.67	24	145
Furrow-out cultivator	0.21	20	148
Rotary hoe	0.13	17	107
Row cultivator	0.78	15	119
Rolling cultivator	0.04	18	183
Finishing harrow	0.07	34	150
Spike-tooth harrow	0.03	24	77
Bedder (disk)	0.01	28	110
Fertilizer applicator attachment	0.09	14	--
Chemical applicator attachment	0.32	21	148
Chemical applicator, tractor	0.19	22	140
Chemical applicator, trailer	0.08	38	124
Drill, plain, disc (grain)	0.04	24	150
Drill, press, disc, hoe	0.07	12	110
Bed-shaper planter	0.01	10	110
Lister-bedder planter	0.01	10	80
Planter, no-till	0.22	23	149
Planter, regular	0.45	16	109
Planter, air delivery	0.21	22	113
Combine, self-propelled, hillside	0.09	16	--
Combine, self-propelled, 2WD	0.73	15	--
Ditcher (vee or rotary)	0.01	15	130
Corrugator	0.07	10	110
No-attachment	0.08	17	90
Grain wagon	0.08	32	136
Shredder, flail	0.07	18	135
Shredder, rotary	0.02	11	101
Stalk shredder	0.11	13	133

Note: Machine operations listed are not in sequence.
Machines used in custom field operations are excluded.
Machines are repeated because they are different in size or pulled by tractors of different size (horsepower).
-- = Indicates machines are self-powered or pulled by truck.
Width = Indicates the swath or width of the area covered by the machine, which is not necessarily the structural width of the machine.
Times-over = Total acres covered in an operation divided by planted acres of the crop. Note that hours per acre given for land forming equipment such as backhoe, disk border maker, ditcher, ditch closer, levee plow disk, rear-mounted blade, and quarter drain machines.

Source: 1990 Farm Costs and Returns Survey, USDA.

Appendix table 14--Ohio soybeans: Average machinery use per planted acre, 1990

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.36	11	169
Coulter-chisel plow	0.01	19	270
Moldboard plow, regular	0.36	7	135
Disk chisel (mulch tiller)	0.02	13	153
Offset disk, heavy duty	0.17	17	103
One-way disk	0.00	18	130
Tandem disk, plowing	0.03	9	61
Tandem disk, regular	0.12	15	99
Field cultivator	1.03	21	156
Rotary hoe	0.06	19	101
Row cultivator	0.42	19	103
Rolling cultivator	0.20	10	74
Finishing harrow	0.14	15	130
Culti-mulcher (roller)	0.07	13	121
Spike-tooth harrow	0.02	14	83
Springtooth harrow	0.02	13	115
Culti-packer (pulverizer)	0.18	20	160
Roller-packer attachment	0.02	15	100
Landall, do-all	0.06	24	238
Fertilizer applicator attachment	0.09	16	--
Dry fertilizer applicator	0.01	50	120
Dry fertilizer spreader, trailer	0.07	41	101
Chemical applicator attachment	0.08	23	--
Chemical applicator, tractor	0.26	29	119
Chemical applicator, trailer	0.27	31	74
Drill, no-till, min-till	0.01	10	127
Drill, plain, disc (grain)	0.12	17	73
Drill, press, disc, hoe	0.18	15	119
Planter, no-till	0.28	17	105
Planter, regular	0.41	17	104
Planter, air delivery	0.02	18	85
Combine, self-propelled, 2WD	0.65	17	--
Combine, self-propelled, 4WD	0.21	25	--
Rotary mower	0.02	20	150
Backhoe	0.01	4	90
Grain wagon	0.21	31	100

Note: Machine operations listed are not in sequence.
Machines used in custom field operations are excluded.
Machines are repeated because they are different in size or pulled by tractors of different size (horsepower).
-- = Indicates machines are self-powered or pulled by truck.
Width = Indicates the swath or width of the area covered by the machine, which is not necessarily the structural width of the machine.
Times-over = Total acres covered in an operation divided by planted acres of the crop. Note that hours per acre given for land forming equipment such as backhoe, disk border maker, ditcher, ditch closer, levee plow disk, rear-mounted blade, and quarter drain machines.

Source: 1990 Farm Costs and Returns Survey, USDA.

Appendix table 15--South Carolina soybeans: Average machinery use per planted acre, 1990

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.07	14	146
Deep ripper, subsoiler	0.03	14	350
Disk plow	0.05	22	153
Moldboard plow, regular	0.02	10	68
Subsoil chisel plow	0.56	26	175
Offset disk, heavy duty	0.62	16	131
Offset disk, light duty	0.02	14	119
Single disk	0.01	10	305
Tandem disk, plowing	0.65	19	157
Tandem disk, regular	0.58	17	143
Field cultivator	0.25	16	111
Furrow-out cultivator	0.01	20	95
Rotary hoe	0.01	13	198
Row cultivator	0.15	13	99
Rolling cultivator	1.03	13	111
Field conditioner (scratcher)	0.01	14	110
Finishing harrow	0.03	17	120
Spike-tooth harrow	0.01	20	100
Bedder (disk)	0.01	10	180
Subsoiler-bedder, hipper, ripper	0.62	17	178
Landall, do-all	0.01	10	190
Fertilizer applicator attachment	0.04	11	125
Fertilizer spreader, truck	0.03	45	--
Anhydrous applicator	0.63	18	207
Dry fertilizer spreader	0.02	20	111
Liquid fertilizer applicator	0.01	20	80
Dry fertilzer spreader, trailer	0.01	30	85
Chemical applicator attachment	0.06	13	116
Chemical applicator, self-propelled	0.58	29	--
Chemical applicator, tractor	0.71	17	131
Chemical applicator, trailer	0.09	20	94
Bed-shaper planter	0.07	12	141
Lister-bedder planter	0.03	15	198
Planter, no-till	0.05	12	168
Planter, regular	0.88	12	112
Planter, air delivery	0.01	10	80
Combine, self-propelled, 2WD	0.85	14	--
Combine, self-propelled, 4WD	0.09	17	--

Note: Machine operations listed are not in sequence.
Machines used in custom field operations are excluded.
Machines are repeated because they are different in size or pulled by tractors of different size (horsepower).
-- = Indicates machines are self-powered or pulled by truck.
Width = Indicates the swath or width of the area covered by the machine, which is not necessarily the structural width of the machine.
Times-over = Total acres covered in an operation divided by planted acres of the crop. Note that hours per acre given for land forming equipment such as backhoe, disk border maker, ditcher, ditch closer, levee plow disk, rear-mounted blade, and quarter drain machines.

Source: 1990 Farm Costs and Returns Survey, USDA.

Appendix table 16--South Dakota soybeans: Average machinery use per planted acre, 1990

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.50	17	176
Disk chisel (mulch tiller)	0.01	16	180
Tandem disk, plowing	0.01	17	130
Tandem disk, regular	0.88	23	149
Field cultivator	0.64	26	155
Furrow-out cultivator	0.01	15	145
Row cultivator	1.07	18	117
Rolling cultivator	0.06	17	155
Field conditioner (scratcher)	0.02	18	110
Finishing harrow	0.02	20	60
Flex-tine harrow (coil)	0.37	31	125
Spike-tooth harrow	0.02	36	100
Springtooth harrow	0.02	60	130
Fertilizer applicator attachment	0.10	19	--
Liquid fertilizer applicator, trailer	0.04	26	103
Chemical applicator attachment	0.17	18	125
Atv/motorcycle	0.03	20	--
Chemical applicator, self-propelled	0.03	30	--
Chemical applicator, small truck	0.03	60	--
Chemical applicator, tractor	0.53	26	110
Chemical applicator, trailer	0.22	48	92
Drill, plain, disc (grain)	0.17	16	150
Drill, press, disc, hoe	0.02	16	--
Planter, no-till	0.04	13	75
Planter, regular	0.62	19	115
Planter, air delivery	0.15	17	103
Combine, self-propelled, hillside	0.06	15	--
Combine, self-propelled, 2WD	0.86	16	--
Grain wagon	0.03	23	60
Stalk shredder	0.02	13	95

Note: Machine operations listed are not in sequence.
Machines used in custom field operations are excluded.
Machines are repeated because they are different in size or pulled by tractors of different size (horsepower).
-- = Indicates machines are self-powered or pulled by truck.
Width = Indicates the swath or width of the area covered by the machine, which is not necessarily the structural width of the machine.
Times-over = Total acres covered in an operation divided by planted acres of the crop. Note that hours per acre given for land forming equipment such as backhoe, disk border maker, ditcher, ditch closer, levee plow disk, rear-mounted blade, and quarter drain machines.

Source: 1990 Farm Costs and Returns Survey, USDA.

U.S. Department of Agriculture
Economic Research Service

SUMMARY OF REPORT SB-871

Rankings of States and Commodities by Farm Cash Receipts

December 1993

Contact: Cheryl Steele, 202-219-0804

Cattle and calves, dairy products, corn, soybeans, and hogs were the leading U.S. agricultural commodities (in terms of cash receipts) in 1992. The top three commodities had the same ranking as in 1991, while soybeans and hogs traded places. The leading States for the top five commodities were:

- **Cattle and calves**: Texas, Nebraska, Kansas, Colorado, and Oklahoma.
- **Dairy products**: Wisconsin, California, New York, Pennsylvania, and Minnesota.
- **Corn**: Illinois, Iowa, Nebraska, Indiana, and Minnesota.
- **Soybeans**: Illinois, Iowa, Indiana, Minnesota, and Missouri.
- **Hogs**: Iowa, Illinois, Minnesota, Nebraska, and Indiana.

A new report by USDA's Economic Research Service, *Ranking of States and Commodities by Cash Receipts, 1992*, presents two types of ranking information: (1) the 25 leading commodities for each State and the Nation, ranked according to the estimated value of receipts; and (2) the ranking of States by receipts from each of the 25 leading U.S. commodities and by several major commodity groups.

U.S. net farm income rose 21 percent in 1992 to $48.6 billion. Cash receipts from sales of crops were up $2.9 billion and farmers added another $2.8 billion worth of crops to inventories for future sale or onfarm use as feed or seed. Cash receipts from livestock and livestock products were down slightly.

California the Most Diverse Agricultural Producer, Vermont the Least

In 12 States, over 50 percent of receipts were from sales of a single commodity, indicating a high degree of dependence on the production and market conditions for that commodity. In 10 States, a single livestock commodity accounted for more than half of the State's total agricultural receipts:

Cattle and calves: Wyoming (70 percent of total receipts), Colorado (63 percent), Kansas (58 percent), Nevada (55 percent), Oklahoma (53 percent), Nebraska (53 percent).

Dairy: Vermont (76 percent), Wisconsin (57 percent), New York (52 percent).

Broilers: Delaware (63 percent).

Alaska and Rhode Island had a single crop commodity (greenhouse/nursery) that accounted for more than 50 percent of total receipts.

Seven States had sufficient diversification in their agricultural production such that the leading commodity accounted for less than 20 percent of total receipts. The States and the two leading commodities (by percent of total receipts) are: California--dairy (14) and greenhouse (10); South Carolina--tobacco (16) and broilers (12); Oregon--cattle (16) and greenhouse (15); Virginia--cattle (16) and broilers (15); Florida--oranges (18) and greenhouse (17); Minnesota--dairy (18) and corn (17); and Ohio--soybeans (19) and corn (19).

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SUMMARY OF REPORT #AIB-683

Characteristics, Production Costs Compared For U.S. Wheat Producers

October 1993

Contact: Dargan Glaze, (202) 219-0801.

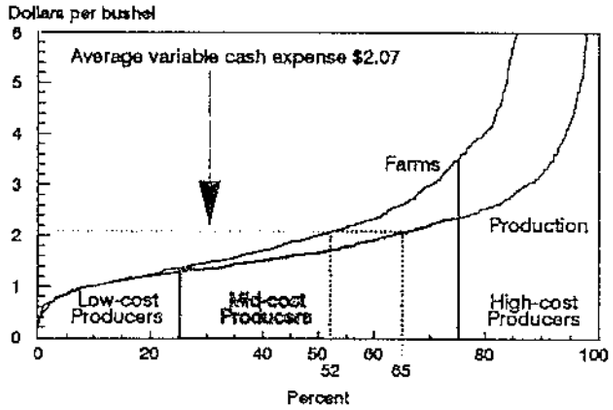
Producing a bushel of wheat cost U.S. farmers an average of $2.07 in variable cash expenses in 1989. Individual farm costs ranged from less than $1.37 to more than $3.49 per bushel. Wheat acreage, yields, and regional differences among producers influenced wheat production costs. These findings are drawn from a recently published report by USDA's Economic Research Service, *Characteristics and Production Costs of U.S. Wheat Farms, 1989.*

Differences in regional production practices and adverse weather conditions were major influences on production costs and yields. Dry weather and warm temperatures reduced already low subsoil moisture levels throughout the Plains in 1989, resulting in lower wheat yields. Low snowfall and low temperatures caused freeze damage in some parts of the Central and Southern Plains region (CO, KS, NE, OK, and TX), resulting in that region's accounting for 64 percent of all farms in the high-cost group. Since high-cost wheat farms were more diversified than low-cost farms, wheat contributed less to their total farm income. Low-cost producers were concentrated in the North-Central (IL, IN, MO, NY, OH, and PA) and Northern Plains regions (ND, SD, MN, MT, and WY). Other wheat production regions included the Southeast (AL, AR, GA, LA, MS, NC, SC, and VA) and the Pacific (AZ, CA, ID, NM, OR, and WA).

Although there was close to a 7-percent decline in winter wheat production in 1989, the decline was more than offset by increased production of spring and durum wheat, increasing total wheat production by nearly 12 percent for the year. About a fourth of the winter wheat acreage planted was not harvested in 1989, compared with less than 19 percent for all wheat classes. Data for this study are from the 1989 Farm Costs and Returns Survey (FCRS) of U.S. wheat farms. Responses represented 189,877 farms producing 1.27 billion bushels of wheat on about 51.8 million acres (62 percent of U.S. wheat production and 68 percent of planted acreage).

Cumulative distribution of wheat variable cash expenses, 1989

About 52 percent of FCRS wheat farms had variable cash expenses at or below the average cost of $2.07 per bushel, while 65 percent of the total wheat harvest was produced at or below the average variable cash expense.



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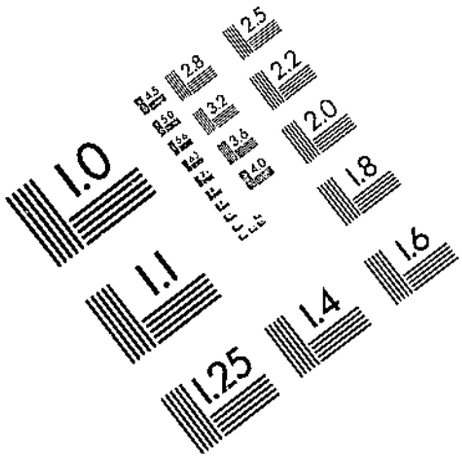

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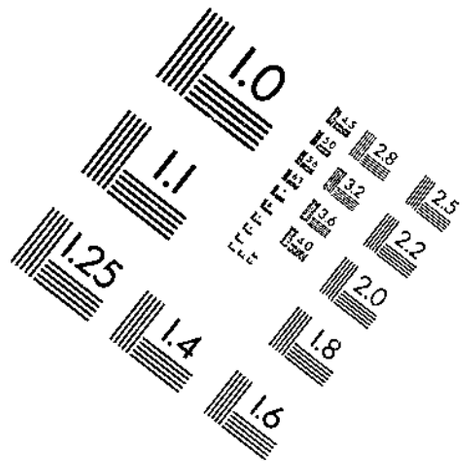

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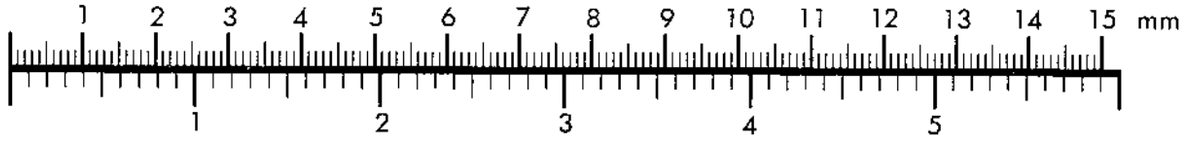

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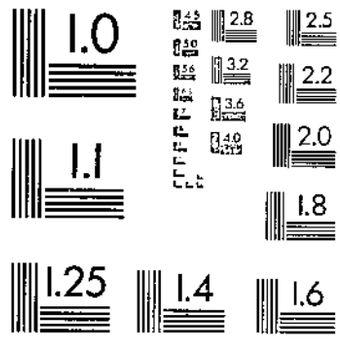

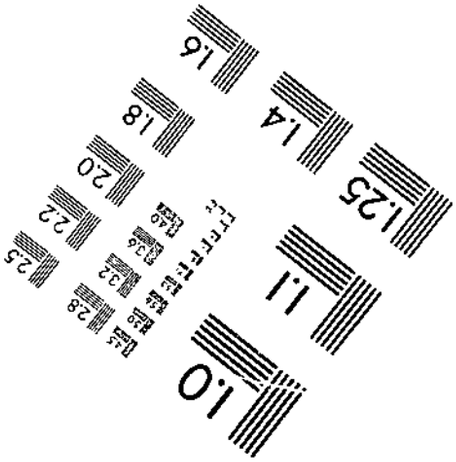

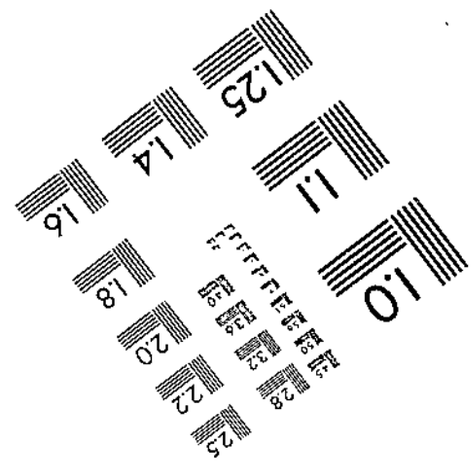

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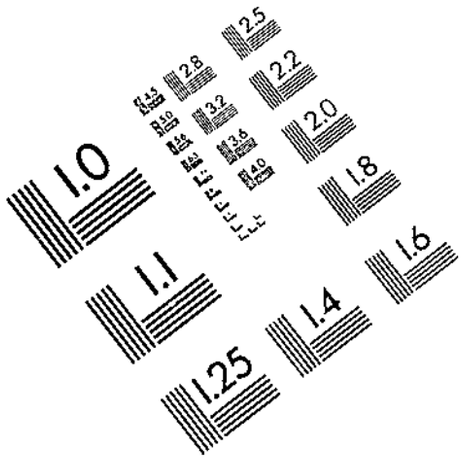

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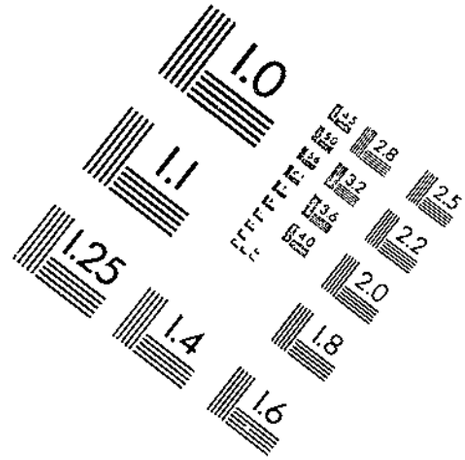

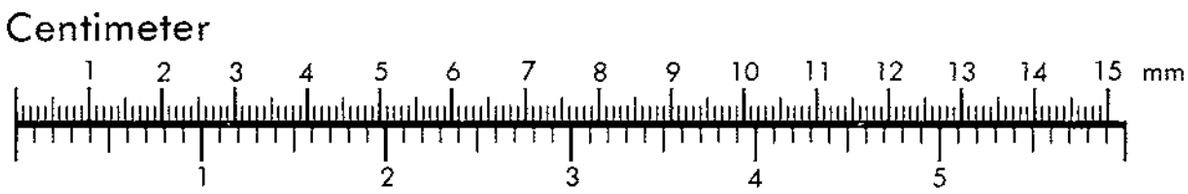

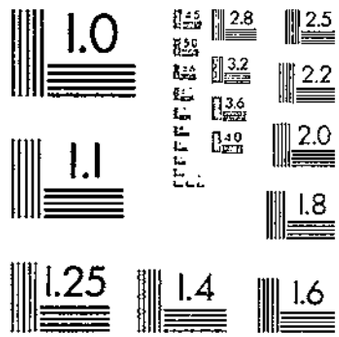

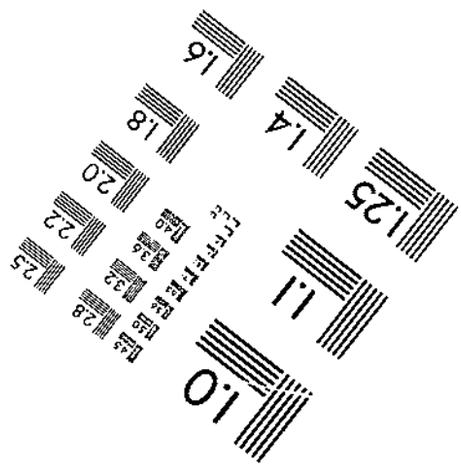

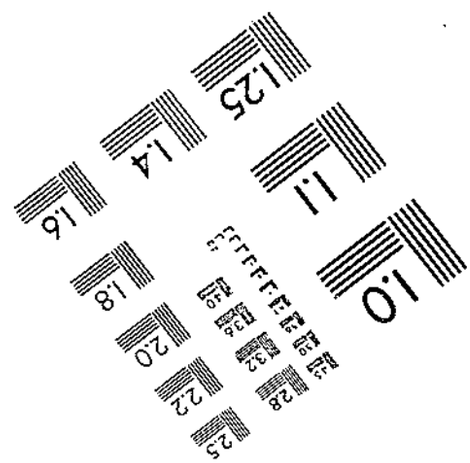

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