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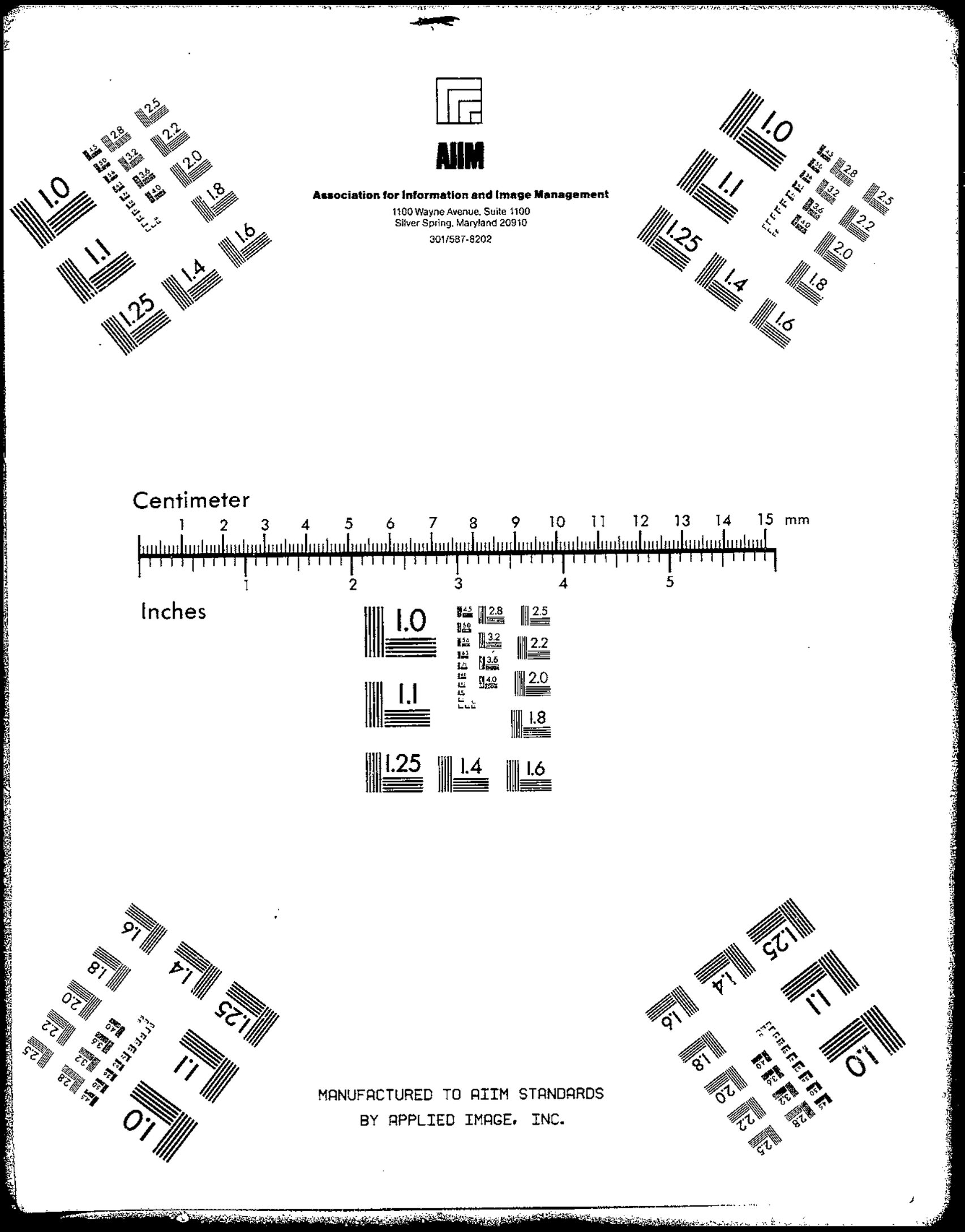
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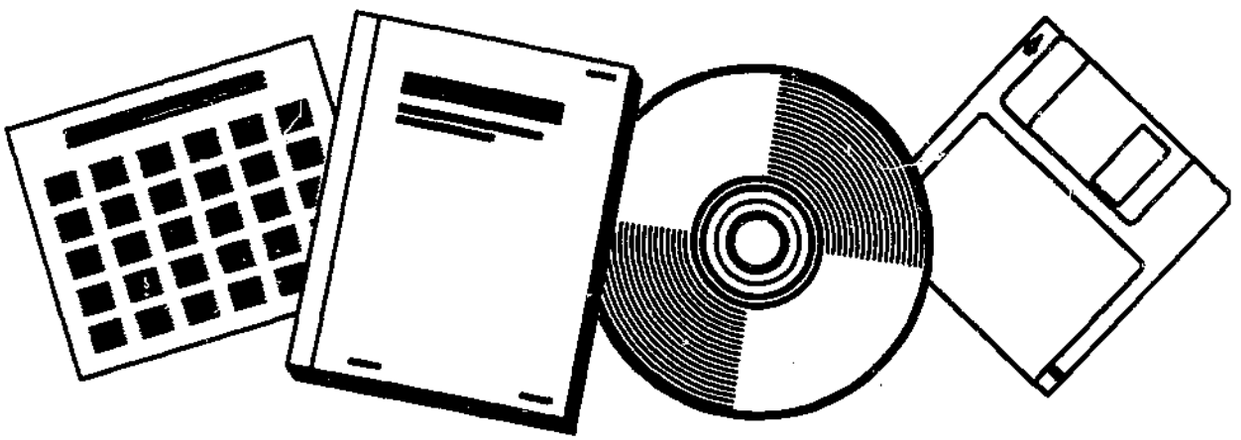

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United States Department of Agriculture

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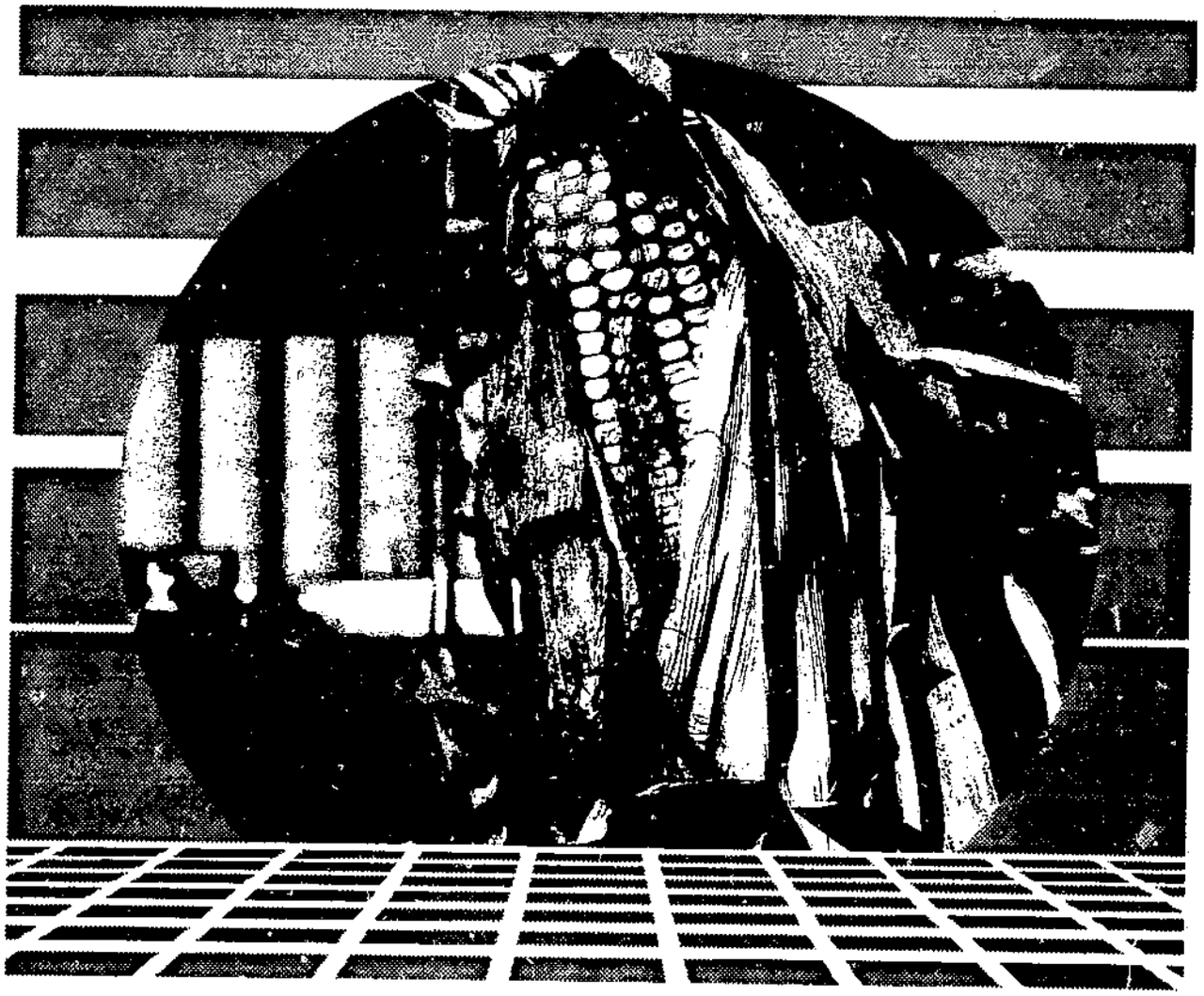
Corn

State-Level Production Costs, Characteristics, and Input Use, 1991

Mir B. Ali
William D. McBride



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Corn: State-Level Production Costs, Characteristics, and Input Use, 1991. By Mir B. Ali and William D. McBride. Agriculture and Rural Economy Division, Economic Research Service, U.S. Department of Agriculture. Statistical Bulletin Number 891.

Abstract

This report presents State-level corn production cost and return estimates for the 1991 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 corn production. Total per-acre economic costs varied from $231 in South Dakota to $381 in Colorado. Corn yields varied significantly, from about 82 bushels in Ohio to 147 bushels per planted acre in Colorado. Methods used to develop the State-level production costs and returns for 1991 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. levels 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, corn, enterprise accounts, costs and returns, production inputs, farm characteristics, Farm Costs and Returns Survey

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Washington DC 20005-4788 September 1994

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Corn: State-Level Production Costs, Characteristics, and Input Use,1991

Mir B. Ali
William D. McBride

Introduction

Corn is grown on more U.S. farms than any other crop. The value of corn production was $17.8 billion in 1991, ranking it first among all crops.

In 1991, corn for all purposes was planted on 76 million acres, up 2 percent from the 1990 acreage of 74.2 million acres. The area harvested for grain was 68.8 million acres, up by 3 percent from 1990. Production totaled 7.5 billion bushels, about 6 percent below the 1990 crop. The U.S. average yield was about 109 bushels per harvested acre, down 10 bushels from 1990. Yields were lower in 1991 than in 1990 in most major corn-producing States. Dry weather during the summer months caused the lower production. The drought affected some States more than others. The States most affected were Indiana, Ohio, Illinois, Kansas, Missouri, and Pennsylvania. These States received less than half of their normal summer rainfall. Drought-related losses in Pennsylvania equaled 41 percent of the corn crop from 1990 to 1991, with average yield dropping from 113 to 75 bushels per acre. Ohio lost nearly 22 percent, with yield dropping from 121 to 96 bushels per acre and Indiana lost nearly 30 percent, with yield dropping from 129 to 92 bushels per acre in the drought year.

Corn planting was slowed by rains early in the season, but by June 2, planting progress was 92 percent complete in the 17 major producing States, 5 points ahead of the previous year, but 3 points behind the historic average. Dry weather became a concern for Corn Belt growers during June as an expansive region from Kansas to Pennsylvania received less than half of its normal rainfall. As a result, many corn fields in the eastern Corn Belt were stressed by drought conditions. The corn crop was aided by good maturing and harvesting weather during the fall months. By November 1, 93 percent of the crop was harvested (*Crop Production, 1992).*

This report summarizes the 1991 production cost data for 10 corn-producing States. Production costs and returns along with coefficients of variation (C.V.) by State are given in tables 1 to 10. Statistical reliability of the State-level corn production cost estimates is summarized in table 11. 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 corn (app. tables 3-12).

Background

The 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 grain. Costs and returns presented in this report 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. Effects of Government programs on corn production costs and returns were considered at the U.S. and regional levels (for details refer to McBride).

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 that 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 (*Agricultural Prices, June 1992*). 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.

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, purchased irrigation water, and commercial drying. Costs of farm drying are reflected in cost estimates for fuel, repairs, and replacement.

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. Taxes are only on real estate and personal property and do not include Federal or State income taxes. Insurance is only for crop and livestock insurance other than Federal crop insurance and the farm share of motor vehicle liability and blanket insurance policies. Interest expenses include finance charges and service fees for loans on machinery, the farm share of motor vehicles, purchases of inputs, land contracts, mortgages, and any other loans secured by real estate.

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 5.44 percent in 1991. 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 3.55 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.

Corn production data were collected on the 1991 FCRS completed during February and March 1992. The corn version of the 1991 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 corn enterprise. Nineteen corn-producing States were included in the 1991 FCRS corn sample. The 708 respondents to the corn version of the 1991 FCRS represented 423,405 farms that planted corn on 71.5 million acres. 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 10 corn-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, commercial drying, 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.

1991 Corn Production Costs and Returns

Per-acre costs of producing corn in 1991 at the U.S. level were nearly the same as in 1990, mainly as a result of relatively stable prices paid for most production items (*Agricultural Prices, June 1992).* The average cash cost of producing corn in the United States was $183 per acre (or $1.66 per bushel) and economic cost was $293 per acre (or $2.65 per bushel). Production costs at the regional level varied greatly from 1990 due to dry weather affecting corn production in some regions more drastically than in others. Reduced corn yields in the Corn Belt resulted in lower per-acre costs for harvesting and drying. Conversely, improved yields in the Plains and Southeast increased per-acre production costs. For more details, refer to *Economic Indicators of the Farm Sector: Costs of Production, 1991--Major Field Crops & Livestock, and Dairy.*

Per-acre gross returns varied among States due both to differences in yields and prices received. Variations in yields were due in part to weather patterns. Dry weather in many corn-producing States resulted in reduced corn yields in 1991. Ohio corn growers reported an expected yield of 132 bushels per acre, but harvested only 82 bushels--a reduction in yield by about 40 percent. Average yield ranged from 82 bushels to 147 bushels per planted acre. Colorado corn farms reported the highest yield due primarily to irrigation. Harvest-month prices were generally higher in 1991 than 1990, ranging from $2.10 to $2.41 per bushel. Weather variations together with differences in crop prices translate into fluctuations in gross returns. Per-acre gross returns for the 1991-crop ranged from $194 in Ohio to $348 per acre in Colorado, sufficient to cover cash expenses only.

Variations in production costs among States were due to differences in tillage practices, type and amount of irrigation, quantities and prices of inputs, crop rotations, and several other production factors. More than 90 percent of corn growers in Illinois, Iowa, Indiana, Michigan, Minnesota, Ohio, and Wisconsin planted corn on dryland acreage, while the majority of Colorado and Nebraska growers irrigated their corn acreage. Michigan corn growers reported using no-till on one-third of corn acres, in contrast to few acres in Wisconsin. A majority of corn growers planted corn after corn in Nebraska, Michigan, Colorado, and Wisconsin, while corn was most often planted after soybeans in other States. Wisconsin corn growers reported an inventory of dairy cattle, while beef cattle was predominant in Nebraska, South Dakota, and Colorado. About half of Iowa corn growers reported a hog inventory, highest among the States. Wisconsin corn growers were most concentrated in livestock production, as fewer corn acres were planted and nearly half of production was fed on-farm. In contrast, producers in Illinois and Nebraska planted more corn acreage, but fed no more than 15 percent of farm production (see app. tables 1 and 2 for details on production characteristics and input use).

Variable cash costs ranged from $104 in South Dakota to $195 per planted acre in Colorado. On a per-bushel basis, costs ranged from $1.00 in Iowa to more than $1.50 in Michigan and Ohio. Major variable cash items associated with corn production include seed, fertilizer, chemicals, and fuel. Together these costs comprised about three-fourths of the total variable cash costs. There was wide variations in per-acre expenses for these inputs among States. For example, per-acre seed expense

ranged from a low of $19 in South Dakota to a high of $27 in Colorado. Fuel expense varied from $11 in Ohio to $40 per acre in Colorado.

On average, one-third of the total variable cash costs were for fertilizers, ranging from $27 to $62 per acre. Fertilizer expense was above $50 per acre in Colorado, Illinois, Indiana, Michigan, and Ohio, but less than $40 in Iowa, Minnesota, South Dakota, and Wisconsin. Greater input use, primarily nitrogen, was characteristic of the high-cost States. South Dakota corn growers had the lowest fertilizer cost because they fertilized fewer acres at lower application rates.

Chemical expenses ranged from $14 in South Dakota to $28 per acre in Indiana, with costs in most States around $20. Differences in per-acre chemical expenses were due to type and amount of chemicals used and proportion of corn acres treated. All corn growers applied chemicals in Iowa, Ohio, and Minnesota as compared to three-fourths of the corn growers in Nebraska. The percentage of farms using insecticides varied among States, ranging from less than 10 percent in Minnesota to about 50 percent in Nebraska.

Colorado and Nebraska corn farms had the highest fuel expense at around $40 per acre, due primarily to irrigation-related expenses. Irrigated acreage resulted in the greatest use of diesel and electricity in these States. In contrast, most other States had fuel costs less than $15 per acre.

South Dakota corn growers had the lowest variable cash costs because of relatively low seed, fertilizer, and chemical costs, reflecting the lower levels of input use. Colorado corn growers reported the highest variable cash costs due to relatively high seed, chemicals, fuel, and hired labor costs. Input use was high on Colorado farms because of extensive irrigated acreage.

Fixed cash costs ranged from $38 to $62 per planted acre. Corn growers in Nebraska had the highest fixed cash costs, while the lowest fixed costs were estimated for Indiana. The highest fixed costs in Nebraska were due to high interest and overhead expenses at $26 and $14 per acre, respectively.

Total cash costs were highest in Colorado and Nebraska, both above $225 per planted acre, while in all other States, cash costs were less than $200. Cash costs were lowest in South Dakota at $154. Despite greater costs, Colorado farms, along with those in Iowa, had the highest returns above cash costs at about $105. Returns were highest in Colorado because of greater yields associated with irrigated corn, while in Iowa per-bushel costs were lowest. Michigan and Ohio corn farms had the lowest returns, both less than $20 per acre, reflecting the effects of drought on these States' yields.

Total economic costs ranged from $231 in South Dakota to $381 per acre in Colorado. Capital replacement ranged between $20 and $30 in most States, but was more than $45 in Colorado and Nebraska. Land cost was highest in Illinois and Iowa at more than $75 per acre. Returns to management and risk, excluding the direct effect of Government programs, were negative in most States, ranging from minus $73 in Ohio to plus $3 per acre in Wisconsin.

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 corn 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 corn in Ohio is $174.57 per acre with a coefficient of variation of 4.85. The 95-percent confidence interval for this estimate is $157.98 to $191.16 per acre. We are 95-percent confident that this interval contains the true population mean of total cash costs for producing an acre of corn in Ohio. Among all States, confidence intervals tend to narrow, and thus reliability of estimates improve, as sample size increases (table 11).

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_____. *Crop Production, 1991 Summary.* January 1992.

Figure 1

Approaches used to estimate corn cost of production components

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

Table 1a--Colorado: Corn production cash costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	347.97	na
Total, gross value of production	347.97	na
Cash expenses:		
Seed	26.70	3.94
Fertilizer	52.29	6.50
Chemicals	20.05	15.09
Custom operations	16.14	22.85
Fuel, lube, and electricity	40.46	15.65
Repairs	16.96	8.41
Hired labor	16.96	23.19
Purchased irrigation water	4.99	37.57
Commercial drying	0.26	63.85
Total, variable cash expenses	194.81	5.91
General farm overhead	14.20	22.27
Taxes and insurance	14.04	18.15
Interest	20.20	20.94
Total, fixed cash expenses	48.43	14.14
Total, cash expenses	243.24	6.16
Gross value of production less cash expenses	104.73	na
Harvest-period price (dollars per bushel)	2.36	na
Yield (bushels per planted acre)	147.44	5.44

Table 1b--Colorado: Corn production economic costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	347.97	na
Total, gross value of production	347.97	na
Economic (full-ownership) costs:		
Variable cash expenses	194.81	5.91
General farm overhead	14.20	22.27
Taxes and insurance	14.04	18.15
Capital replacement	46.55	9.38
Operating capital	5.30	5.91
Other nonland capital	17.15	7.04
Land	63.48	7.93
Unpaid labor	25.76	14.11
Total, economic (full-ownership) costs	381.27	5.19
Residual returns to management and risk	-33.30	na
Harvest-period price (dollars per bushel)	2.36	na
Yield (bushels per planted acre)	147.44	5.44

na = Not applicable.

Table 1a--Colorado: Corn production cash costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	347.97	na
Total, gross value of production	347.97	na
Cash expenses:		
Seed	26.70	3.94
Fertilizer	52.29	6.50
Chemicals	20.05	15.09
Custom operations	16.14	22.85
Fuel, lube, and electricity	40.46	15.65
Repairs	16.96	8.41
Hired labor	16.96	23.19
Purchased irrigation water	4.99	37.57
Commercial drying	0.26	63.85
Total, variable cash expenses	194.81	5.91
General farm overhead	14.20	22.27
Taxes and insurance	14.04	18.15
Interest	20.20	20.94
Total, fixed cash expenses	48.43	14.14
Total, cash expenses	243.24	6.16
Gross value of production less cash expenses	104.73	na
Harvest-period price (dollars per bushel)	2.36	na
Yield (bushels per planted acre)	147.44	5.44

Table 1b--Colorado: Corn production economic costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	347.97	na
Total, gross value of production	347.97	na
Economic (full-ownership) costs:		
Variable cash expenses	194.81	5.91
General farm overhead	14.20	22.27
Taxes and insurance	14.04	18.15
Capital replacement	46.55	9.38
Operating capital	5.30	5.91
Other nonland capital	17.15	7.04
Land	63.48	7.93
Unpaid labor	25.76	14.11
Total, economic (full-ownership) costs	381.27	5.19
Residual returns to management and risk	-33.30	na
Harvest-period price (dollars per bushel)	2.36	na
Yield (bushels per planted acre)	147.44	5.44

na = Not applicable.

Table 2a--Illinois: Corn production cash costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	260.26	na
Total, gross value of production	260.26	na
Cash expenses:		
Seed	20.72	3.48
Fertilizer	52.19	6.61
Chemicals	23.14	7.06
Custom operations	7.56	18.82
Fuel, lube, and electricity	11.64	5.01
Repairs	11.35	3.21
Hired labor	6.16	28.68
Purchased irrigation water	0.00	na
Commercial drying	1.49	26.15
Total, variable cash expenses	134.25	2.78
General farm overhead	10.32	11.64
Taxes and insurance	20.89	7.80
Interest	15.36	18.04
Total, fixed cash expenses	46.58	7.14
Total, cash expenses	180.83	3.00
Gross value of production less cash expenses	79.42	na
Harvest-period price (dollars per bushel)	2.41	na
Yield (bushels per planted acre)	107.99	6.74

Table 2b--Illinois: Corn production economic costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	260.26	na
Total, gross value of production	260.26	na
Economic (full-ownership) costs:		
Variable cash expenses	134.25	2.78
General farm overhead	10.32	11.64
Taxes and insurance	20.89	7.80
Capital replacement	20.81	3.67
Operating capital	3.65	2.78
Other nonland capital	7.86	2.78
Land	77.26	10.16
Unpaid labor	24.88	10.93
Total, economic (full-ownership) costs	299.93	2.69
Residual returns to management and risk	-39.68	na
Harvest-period price (dollars per bushel)	2.41	na
Yield (bushels per planted acre)	107.99	6.74

na = Not applicable.

Table 3a--Indiana: Corn production cash costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	258.17	4.39
Total, gross value of production	258.17	4.39
Cash expenses:		
Seed	20.25	7.69
Fertilizer	54.06	9.02
Chemicals	27.70	11.02
Custom operations	5.82	20.76
Fuel, lube, and electricity	13.14	12.82
Repairs	13.75	6.21
Hired labor	6.35	39.36
Purchased irrigation water	0.03	109.44
Commercial drying	1.79	69.30
Total, variable cash expenses	142.90	5.35
General farm overhead	8.99	13.15
Taxes and insurance	17.21	8.53
Interest	12.28	17.34
Total, fixed cash expenses	38.47	7.47
Total, cash expenses	181.37	4.93
Gross value of production less cash expenses	76.80	12.38
Harvest-period price (dollars per bushel)	2.36	na
Yield (bushels per planted acre)	109.40	4.39

Table 3b--Indiana: Corn production economic costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	258.17	na
Total, gross value of production	258.17	na
Economic (full-ownership) costs:		
Variable cash expenses	142.90	5.35
General farm overhead	8.99	13.15
Taxes and insurance	17.21	8.53
Capital replacement	26.98	11.89
Operating capital	3.89	5.35
Other nonland capital	9.98	7.37
Land	72.43	13.45
Unpaid labor	25.21	12.86
Total, economic (full-ownership) costs	307.57	5.72
Residual returns to management and risk	-49.40	na
Harvest-period price (dollars per bushel)	2.36	na
Yield (bushels per planted acre)	109.40	4.39

na = Not applicable.

Table 4a--Iowa: Corn production cash costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	267.31	na
Total, gross value of production	267.31	na
Cash expenses:		
Seed	22.06	5.27
Fertilizer	36.32	6.68
Chemicals	23.96	5.27
Custom operations	6.70	18.75
Fuel, lube, and electricity	11.33	6.63
Repairs	11.48	4.15
Hired labor	4.05	32.40
Purchased irrigation water	0.00	na
Commercial drying	2.46	30.44
Total, variable cash expenses	118.37	3.57
General farm overhead	9.81	11.04
Taxes and insurance	19.03	6.09
Interest	14.54	26.06
Total, fixed cash expenses	43.37	10.06
Total, cash expenses	161.74	4.11
Gross value of production less cash expenses	105.57	na
Harvest-period price (dollars per bushel)	2.23	na
Yield (bushels per planted acre)	119.87	1.99

Table 4b-- Iowa: Corn production economic costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	267.31	na
Total, gross value of production	267.31	na
Economic (full-ownership) costs:		
Variable cash expenses	118.37	3.57
General farm overhead	9.81	11.04
Taxes and insurance	19.03	6.09
Capital replacement	22.05	4.75
Operating capital	3.22	3.57
Other nonland capital	8.59	3.90
Land	78.22	5.46
Unpaid labor	27.30	9.97
Total, economic (full-ownership) costs	286.58	3.00
Residual returns to management and risk	-19.28	na
Harvest-period price (dollars per bushel)	2.23	na
Yield (bushels per planted acre)	119.87	1.99

na = Not applicable.

Table 5a--Michigan: Corn production cash costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	208.67	na
Total, gross value of production	208.67	na
Cash expenses:		
Seed	21.34	1.99
Fertilizer	61.88	11.13
Chemicals	20.97	4.96
Custom operations	4.07	15.45
Fuel, lube, and electricity	14.95	15.50
Repairs	12.24	3.34
Hired labor	6.10	55.06
Purchased irrigation water	0.00	na
Commercial drying	2.35	39.42
Total, variable cash expenses	143.91	3.68
General farm overhead	9.56	16.27
Taxes and insurance	28.33	7.54
Interest	16.86	36.71
Total, fixed cash expenses	54.75	10.46
Total, cash expenses	198.66	5.33
Gross value of production less cash expenses	10.01	na
Harvest-period price (dollars per bushel)	2.28	na
Yield (bushels per planted acre)	91.52	6.52

Table 5b--Michigan: Corn production economic costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	208.67	na
Total, gross value of production	208.67	na
Economic (full-ownership) costs:		
Variable cash expenses	143.91	3.68
General farm overhead	9.56	16.27
Taxes and insurance	28.33	7.54
Capital replacement	22.94	9.28
Operating capital	3.91	3.68
Other nonland capital	9.47	8.63
Land	22.71	14.71
Unpaid labor	31.14	11.01
Total, economic (full-ownership) costs	271.97	3.02
Residual returns to management and risk	-63.30	10.19
Harvest-period price (dollars per bushel)	2.28	na
Yield (bushels per planted acre)	91.52	6.52

na = Not applicable.

Table 6a--Minnesota: Corn production cash costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	243.49	na
Total, gross value of production	243.49	na
Cash expenses:		
Seed	23.30	3.43
Fertilizer	35.16	10.48
Chemicals	20.65	12.99
Custom operations	5.40	32.63
Fuel, lube, and electricity	12.42	7.81
Repairs	12.56	2.59
Hired labor	4.77	64.06
Purchased irrigation water	0.00	na
Commercial drying	2.04	43.63
Total, variable cash expenses	116.30	5.66
General farm overhead	10.71	11.17
Taxes and insurance	13.86	11.96
Interest	18.03	21.53
Total, fixed cash expenses	42.60	9.19
Total, cash expenses	158.91	4.44
Gross value of production less cash expenses	84.58	na
Harvest-period price (dollars per bushel)	2.14	na
Yield (bushels per planted acre)	113.78	4.66

Table 6b--Minnesota: Corn production economic costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	243.49	na
Total, gross value of production	243.49	na
Economic (full-ownership) costs:		
Variable cash expenses	116.30	5.66
General farm overhead	10.71	11.17
Taxes and insurance	13.86	11.96
Capital replacement	24.12	5.13
Operating capital	3.16	5.66
Other nonland capital	9.82	3.12
Land	66.17	10.41
Unpaid labor	24.46	15.10
Total, economic (full-ownership) costs	268.62	4.44
Residual returns to management and risk	-25.13	na
Harvest-period price (dollars per bushel)	2.14	na
Yield (bushels per planted acre)	113.78	4.66

na = Not applicable.

Table 7a--Nebraska: Corn production cash costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	302.85	na
Total, gross value of production	302.85	na
Cash expenses:		
Seed	24.32	7.59
Fertilizer	44.86	16.51
Chemicals	22.78	11.29
Custom operations	5.75	27.60
Fuel, lube, and electricity	38.56	13.70
Repairs	17.37	7.51
Hired labor	8.42	37.59
Purchased irrigation water	1.80	38.34
Commercial drying	1.94	75.04
Total, variable cash expenses	165.80	9.57
General farm overhead	14.01	26.28
Taxes and insurance	21.53	12.00
Interest	26.28	31.64
Total, fixed cash expenses	61.82	16.50
Total, cash expenses	227.62	9.00
Gross value of production less cash expenses	75.23	na
Harvest-period price (dollars per bushel)	2.29	na
Yield (bushels per planted acre)	132.25	4.23

Table 7b--Nebraska: Corn production economic costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	302.85	na
Total, gross value of production	302.85	na
Economic (full-ownership) costs:		
Variable cash expenses	165.80	9.57
General farm overhead	14.01	26.28
Taxes and insurance	21.53	12.00
Capital replacement	45.48	8.90
Operating capital	4.51	9.57
Other nonland capital	15.87	8.41
Land	56.38	9.14
Unpaid labor	22.56	13.78
Total, economic (full-ownership) costs	346.13	6.35
Residual returns to management and risk	-43.28	na
Harvest-period price (dollars per bushel)	2.29	na
Yield (bushels per planted acre)	132.25	4.23

na = Not applicable.

Table 8a--Ohio: Corn production cash costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	193.90	na
Total, gross value of production	193.90	na
Cash expenses:		
Seed	21.86	11.96
Fertilizer	53.65	11.35
Chemicals	21.03	9.55
Custom operations	4.79	33.28
Fuel, lube, and electricity	11.05	13.38
Repairs	12.24	10.51
Hired labor	8.93	24.72
Purchased irrigation water	0.00	na
Commercial drying	1.19	87.30
Total, variable cash expenses	134.74	6.01
General farm overhead	6.51	24.74
Taxes and insurance	11.89	5.26
Interest	21.44	43.93
Total, fixed cash expenses	39.83	21.38
Total, cash expenses	174.57	4.85
Gross value of production less cash expenses	19.32	na
Harvest-period price (dollars per bushel)	2.37	na
Yield (bushels per planted acre)	81.81	8.42

Table 8b--Ohio: Corn production economic costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	193.90	na
Total, gross value of production	193.90	na
Economic (full-ownership) costs:		
Variable cash expenses	134.74	6.01
General farm overhead	6.51	24.74
Taxes and insurance	11.89	5.26
Capital replacement	22.16	9.79
Operating capital	3.66	6.01
Other nonland capital	7.95	5.57
Land	64.61	7.09
Unpaid labor	15.18	11.63
Total, economic (full-ownership) costs	266.70	5.55
Residual returns to management and risk	-72.80	na
Harvest-period price (dollars per bushel)	2.37	na
Yield (bushels per planted acre)	81.81	8.42

na = Not applicable.

Table 9a--South Dakota: Corn production cash costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	196.30	na
Total, gross value of production	196.30	na
Cash expenses:		
Seed	19.41	12.84
Fertilizer	26.57	13.18
Chemicals	14.49	19.29
Custom operations	4.00	25.18
Fuel, lube, and electricity	18.59	38.38
Repairs	14.06	12.35
Hired labor	4.77	62.53
Purchased irrigation water	1.99	72.22
Commercial drying	0.04	36.11
Total, variable cash expenses	103.92	15.38
General farm overhead	13.41	58.40
Taxes and insurance	16.87	39.77
Interest	20.08	48.68
Total, fixed cash expenses	50.37	48.01
Total, cash expenses	154.29	25.11
Gross value of production less cash expenses	42.01	na
Harvest-period price (dollars per bushel)	2.10	na
Yield (bushels per planted acre)	93.48	14.62

Table 9b--South Dakota: Corn production economic costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	196.30	na
Total, gross value of production	196.30	na
Economic (full-ownership) costs:		
Variable cash expenses	103.92	15.38
General farm overhead	13.41	58.40
Taxes and insurance	16.87	39.77
Capital replacement	30.61	27.37
Operating capital	2.83	15.38
Other nonland capital	9.92	18.17
Land	39.89	11.02
Unpaid labor	13.16	17.53
Total, economic (full-ownership) costs	230.61	19.00
Residual returns to management and risk	-34.31	na
Harvest-period price (dollars per bushel)	2.10	na
Yield (bushels per planted acre)	93.48	14.62

na = Not applicable.

Table 10a--Wisconsin: Corn production cash costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	258.56	na
Total, gross value of production	258.56	na
Cash expenses:		
Seed	20.59	8.64
Fertilizer	37.27	10.97
Chemicals	21.18	38.00
Custom operations	16.48	23.11
Fuel, lube, and electricity	17.32	15.51
Repairs	13.56	15.83
Hired labor	11.80	41.46
Purchased irrigation water	0.00	na
Commercial drying	1.42	40.91
Total, variable cash expenses	139.61	8.60
General farm overhead	10.80	29.69
Taxes and insurance	22.21	3.92
Interest	12.79	32.54
Total, fixed cash expenses	45.80	14.57
Total, cash expenses	185.41	8.51
Gross value of production less cash expenses	73.16	na
Harvest-period price (dollars per bushel)	2.24	na
Yield (bushels per planted acre)	115.43	6.22

Table 10b--Wisconsin: Corn production economic costs and returns per planted acre with coefficients of variation, 1991

Item	1991	C.V.
	Dollars	Percent
Gross value of production:		
Corn grain	258.56	na
Total, gross value of production	258.56	na
Economic (full-ownership) costs:		
Variable cash expenses	139.61	8.60
General farm overhead	10.80	29.69
Taxes and insurance	22.21	3.92
Capital replacement	19.87	11.87
Operating capital	3.80	8.60
Other nonland capital	8.35	7.28
Land	25.35	13.53
Unpaid labor	25.21	17.03
Total, economic (full-ownership) costs	255.20	4.07
Residual returns to management and risk	3.37	na
Harvest-period price (dollars per bushel)	2.24	na
Yield (bushels per planted acre)	115.43	6.22

na = Not applicable.

Table 11--Statistical reliability of corn production cost estimates, by State, 1991

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					
Colorado	30	213.87	243.24	272.61	342.49	381.27	420.05
Illinois	85	170.20	180.83	191.46	284.12	299.93	315.74
Indiana	60	163.84	181.37	198.90	272.69	307.57	342.05
Iowa	74	148.71	161.74	174.77	269.73	286.58	303.43
Michigan	43	177.91	198.66	219.41	255.87	271.97	288.07
Minnesota	55	145.08	158.91	172.74	245.24	268.62	292.00
Nebraska	49	187.47	227.62	267.77	303.05	346.13	389.21
Ohio	51	157.98	174.57	191.16	237.69	266.70	295.71
South Dakota	36	78.36	154.29	230.22	144.73	230.61	316.49
Wisconsin	55	154.48	185.41	216.34	234.84	255.20	275.56

Appendix table 1--Characteristics of FCRS corn farms, by State, 1991

Item	Unit	Colorado	Illinois	Indiana	Iowa	Michigan
Share of corn-FCRS:						
Sample size	number	30	85	60	74	43
All farms	percent	*	16	8	25	4
Total corn production	percent	*	18	9	24	*
Acreage and yields:						
Total operated acreage	acres	2,858	525	468	401	475
Corn planted	acres	203	205	198	155	181
Corn harvested for grain	acres	195	204	195	153	160
Corn yield	actual bu/ac	147	108	109	120	92
Corn yield	expected bu/ac	162	139	137	134	114
Corn acreage-tenure:						
Percent owned	percent of acres	64	31	41	32	39
Percent cash rented	percent of acres	22	10	23	42	56
Percent share rented	percent of acres	14	57	36	26	*
Corn acreage-use:						
Irrigated	percent of acres	95	0	8	0	9
Dryland	percent of acres	5	100	92	100	91
No-till	percent of acres	8	16	6	10	32
Crop previously on corn acres:						
Corn	percent of farms	65	22	38	30	62
Soybeans	percent of farms	0	65	51	61	16
Wheat	percent of farms	10	9	6	0	5
Oats	percent of farms	0	0	0	0	0
Sorghum	percent of farms	*	0	0	7	0
Sugarbeets	percent of farms	8	0	0	0	0
Alfalfa	percent of farms	8	*	*	*	*
Other hay	percent of farms	0	*	*	0	5
Other	percent of farms	6	0	0	*	9
Livestock inventory:						
Beef cattle	percent of farms	79	41	38	51	24
Dairy cattle	percent of farms	*	6	7	9	49
Hogs	percent of farms	5	25	35	45	21
Poultry	percent of farms	5	5	6	*	9
Sheep	percent of farms	15	*	5	12	0
Other livestock	percent of farms	5	8	*	*	7
Corn for farm use	percent of production	25	12	21	24	28

Continued--

See footnotes at end of table.

Appendix table 1--Characteristics of FCRS corn farms, by State, 1991--continued

Item	Unit	Minnesota	Nebraska	Ohio	South Dakota	Wisconsin
Share of corn-FCRS:						
Sample size	number	55	49	51	36	55
All farms	percent	14	9	7	5	11
Total corn production	percent	11	16	5	5	7
Acreage and yields:						
Total operated acreage	acres	391	1,323	434	1,175	358
Corn planted	acres	138	265	163	241	103
Corn harvested for grain	acres	128	257	151	234	93
Corn yield	actual bu/ac	114	132	82	93	115
Corn yield	expected bu/ac	130	135	132	100	129
Corn acreage-tenure:						
Percent owned	percent of acres	50	40	39	60	58
Percent cash rented	percent of acres	38	27	36	21	42
Percent share rented	percent of acres	12	33	26	19	0
Corn acreage-use:						
Irrigated	percent of acres	*	76	0	29	5
Dryland	percent of acres	99	24	100	71	95
No-till	percent of acres	5	22	10	16	*
Crop previously on corn acres:						
Corn	percent of farms	24	61	28	29	61
Soybeans	percent of farms	65	18	46	31	*
Wheat	percent of farms	*	6	9	16	0
Oats	percent of farms	6	*	*	16	0
Sorghum	percent of farms	0	*	0	8	*
Sugarbeets	percent of farms	0	*	0	0	0
Alfalfa	percent of farms	*	6	0	0	32
Other hay	percent of farms	*	0	15	0	0
Other	percent of farms	0	*	0	0	5
Livestock inventory:						
Beef cattle	percent of farms	36	78	31	64	38
Dairy cattle	percent of farms	35	*	31	12	78
Hogs	percent of farms	29	28	11	38	17
Poultry	percent of farms	*	*	12	6	15
Sheep	percent of farms	6	12	7	8	5
Other livestock	percent of farms	*	11	11	12	0
Corn for farm use	percent of production	28	15	16	26	48

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

Appendix table 2--Input use of FCRS corn farms, by State, 1991

Item	Unit	Colorado	Illinois	Indiana	Iowa	Michigan
Seed:						
Rate-total	seeds/acre	30,955	25,384	24,827	25,150	25,275
Fertilizer use:						
Any fertilizer	percent of farms	98	99	99	100	100
Nitrogen	percent of farms	98	99	96	100	100
Phosphorus	percent of farms	80	95	96	88	100
Potassium	percent of farms	28	92	96	84	100
Lime	percent of farms	0	18	24	11	10
Manure	percent of farms	17	15	21	22	55
Fertilizer use:						
Nitrogen	lbs/acre	126	156	143	119	127
Phosphorus	lbs/acre	28	78	64	47	47
Potassium	lbs/acre	12	90	108	49	63
Lime	tons/acre	0	0.24	0.17	0.14	0.34
Manure	tons/acre	1.87	0.24	0.23	0.70	1.67
Chemical use:						
Any chemicals	percent of farms	92	100	93	100	90
Herbicides	percent of farms	88	94	93	100	90
Insecticides	percent of farms	43	43	17	31	26
Herbicide treatments	times-over	1.16	1.36	1.02	1.54	1.45
Insecticide treatments	times-over	0.53	0.22	0.24	0.19	0.27
Custom operations:						
Any custom operations	percent of farms	87	86	79	80	31
Land prep/cultivation	percent of farms	22	6	8	5	*
Planting	percent of farms	7	7	8	7	*
Fert/chem application	percent of farms	65	84	78	78	29
Harvesting	percent of farms	35	17	24	21	7
Fuel use:						
Diesel	gallons per acre	8.36	4.46	5.11	4.44	6.90
Gasoline	gallons per acre	3.93	3.51	3.56	3.41	3.10
LP gas	gallons per acre	0.00	2.11	2.12	4.67	3.18
Natural gas	1000 cubic feet per acre	0.17	0.06	0.01	0.00	0.05
Electricity	kilowatt hours per acre	388.72	12.37	28.20	5.33	10.66
Drying use:						
Dried	percent of production	13	50	46	65	61
Commercially dried	percent of production	*	12	14	18	13
Farm dried	percent of production	11	38	31	47	48
Moisture removed	percentage points	0.80	2.23	2.49	3.82	2.66
Irrigation use:						
Irrigation water	inches per acre	8.83	0.00	0.60	0.00	0.38
Labor use:						
Unpaid labor	hours per acre	4.16	3.67	3.85	4.47	4.97

Continued--

See footnotes at end of table.

Appendix table 2--Input use of FCRS corn farms, by State, 1991 -- Continued

Item	Unit	Minnesota	Nebraska	Ohio	South Dakota	Wisconsin
Seed:						
Rate-total	seeds/acre	26,804	26,546	26,185	22,115	26,310
Fertilizer use:						
Any fertilizer	percent of farms	97	90	100	79	100
Nitrogen	percent of farms	95	84	100	83	97
Phosphorus	percent of farms	83	59	100	64	97
Potassium	percent of farms	80	23	97	45	97
Lime	percent of farms	*	0	9	0	5
Manure	percent of farms	50	19	46	11	73
Fertilizer use:						
Nitrogen	lbs/acre	79	142	122	68	107
Phosphorus	lbs/acre	55	23	59	26	45
Potassium	lbs/acre	57	3	91	11	63
Lime	tons/acre	0.02	0.00	0.07	0.00	0.06
Manure	tons/acre	1.35	0.67	0.81	0.16	4.47
Chemical use:						
Any chemicals	percent of farms	98	86	97	92	96
Herbicides	percent of farms	98	75	97	92	89
Insecticides	percent of farms	8	54	21	17	18
Herbicide treatments	times-over	1.63	1.05	1.25	1.40	1.54
Insecticide treatments	times-over	0.06	0.86	0.22	0.28	0.14
Custom operations:						
Any custom operations	percent of farms	60	54	70	60	65
Land prep/cultivation	percent of farms	5	*	0	*	6
Planting	percent of farms	*	*	0	9	7
Fert/chem application	percent of farms	55	52	61	50	60
Harvesting	percent of farms	15	*	23	25	46
Fuel use:						
Diesel	gallons per acre	4.72	17.89	4.50	6.11	7.62
Gasoline	gallons per acre	2.88	4.47	2.62	3.05	2.55
LP gas	gallons per acre	4.28	3.56	3.65	4.90	1.96
Natural gas	1000 cubic feet per acre	0.00	1.61	0.01	0.00	0.10
Electricity	kilowatt hours per acre	27.85	96.75	9.77	86.11	68.88
Drying use:						
Dried	percent of production	72	34	69	54	55
Commercially dried	percent of production	14	23	12	*	8
Farm dried	percent of production	58	11	57	53	47
Moisture removed	percentage points	4.15	0.89	1.68	2.47	0.89
Irrigation use:						
Irrigation water	inches per acre	0.03	6.94	0.00	2.92	0.13
Labor use:						
Unpaid labor	hours per acre	3.96	3.94	2.60	2.58	4.99

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

Appendix table 3--Colorado corn: Average machinery use per planted acre, 1991

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.10	20	168
Coulter-chisel plow	0.18	24	182
Disk plow	0.06	12	175
Moldboard plow, regular	0.05	5	134
Moldboard plow, two-way	0.33	6	163
Stubble-mulch plow	0.06	30	272
Subsoil chisel plow	0.28	17	162
Disk chisel (mulch tiller)	0.40	23	160
Offset disk, heavy duty	0.31	16	146
Offset disk, light duty	0.01	18	145
One-way (disk tiller)	0.04	19	161
Tandem disk, plowing	0.02	18	153
Tandem disk, regular	0.55	20	147
Field cultivator	0.82	19	137
Furrow-out cultivator	0.37	14	94
Rotary hoe	0.05	19	92
Row cultivator	0.13	19	121
Rolling cultivator	0.05	20	160
Duckfoot cultivator	0.44	17	123
Marker (cultivator)	0.01	20	80
Field conditioner (scratcher)	0.02	20	90
Culti-mulcher (roller)	0.12	17	151
Spike tooth harrow	0.01	22	100
Spring tooth harrow	0.09	22	193
Culti-packer (pulverizer)	0.20	20	153
Roller packer attachment	0.08	10	70
Mulch treader	0.13	14	123
Soil finisher	0.02	24	150
Fertilizer attachment to implement	0.37	22	23
Manure spreader	0.06	20	112
Fertilizer spreader, self-propelled	0.02	15	--
Anhydrous applicator, tractor	0.24	21	153
Dry fertilizer spreader, tractor	0.08	17	132
Liquid fertilizer applicator, tractor	0.05	28	91
Anhydrous applicator, trailer	0.13	21	77
Dry fertilizer spreader, trailer	0.02	15	70
Liquid fertilizer applicator, trailer	0.02	32	--
Chemical attachment to implement	0.34	17	15
Chemical applicator, self-propelled	0.03	40	--
Chemical applicator, tractor	0.65	22	44
Chemical applicator, trailer	0.07	41	127
Bed-shaper planter	0.22	15	134
Lister-bedder planter	0.02	15	135
Planter (no-till), 6 row	0.02	20	160
Planter (regular), 8 row	0.56	19	141
Planter (air-delivery), 6 row	0.11	10	114
Planter (ridge till), 6 row	0.01	16	95
Combine, self-propelled, hillside	0.24	16	--
Combine, self-propelled, 2WD	0.44	15	--
Ditcher (vee or rotary)	0.01	15	135
Float	0.14	16	160
Land plane-leveler	0.14	19	131
Laser planer	0.02	24	245
Shredder, flail	0.01	8	135
Stalk shredder	0.04	15	136

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: 1991 Farm Costs and Returns Survey, USDA.

Appendix table 4--Illinois corn: Average machinery use per planted acre, 1991

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.16	11	153
Coulter-chisel plow	0.09	12	160
Deep ripper-subsoiler	0.04	15	273
Disk plow	0.02	12	125
Moldboard plow, regular	0.10	6	134
Subsoil chisel plow	0.04	13	170
Disk chisel (mulch tiller)	0.05	14	144
Offset disk, heavy duty	0.03	21	144
One-way (disk tiller)	0.03	24	185
Single disk	0.01	21	170
Tandem disk, plowing	0.09	20	141
Tandem disk, regular	0.41	18	126
Field cultivator	0.73	23	145
Rotary hoe	0.04	18	113
Row cultivator	0.42	16	99
Duckfoot cultivator	0.07	22	163
Finishing harrow	0.01	17	88
Flex-tine harrow (coil)	0.06	22	--
Spike tooth harrow	0.03	22	111
Culti-packer (pulverizer)	0.01	18	188
Lendall, do-all	0.09	20	190
Soil finisher	0.04	23	175
Fertilizer attachment to implement	0.08	20	59
Manure spreader	0.01	16	90
Fertilizer spreader, trailer	0.02	40	150
Anhydrous applicator, tractor	0.17	22	144
Dry fertilizer spreader, tractor	0.13	34	97
Anhydrous applicator, trailer	0.26	23	146
Dry fertilizer spreader, trailer	0.22	40	101
Liquid fertilizer applicator,trailer	0.06	27	134
Chemical attachment to implement	0.30	18	21
Chemical applicator, self-propelled	0.02	60	--
Chemical applicator, tractor	0.27	30	162
Chemical applicator, trailer	0.30	31	115
Planter (no-till), 6 row	0.20	17	98
Planter (regular), 8 row	0.51	17	97
Planter (air-delivery), 6 row	0.27	21	111
Combine, self-propelled, hillside	0.04	11	--
Combine, self-propelled, 2WD	0.75	12	--
Combine, self-propelled, 4WD	0.11	22	--
Corn picker	0.01	5	69
Rotary mower	0.01	15	138
Grain/hay wagon	0.08	28	64
Shredder, flail	0.01	15	125
Shredder, rotary	0.01	10	100
Gravity wagon	0.37	27	105

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: 1991 Farm Costs and Returns Survey, USDA.

Appendix table 5--Indiana corn: Average machinery use per planted acre, 1991

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.20	11	155
Coulter-chisel plow	0.17	9	159
Deep ripper-subsoiler	0.01	12	200
Moldboard plow, regular	0.08	6	98
Disk chisel (mulch tiller)	0.22	11	164
Offset disk, heavy duty	0.08	14	109
One-way (disk tiller)	0.01	13	90
Single disk	0.01	12	65
Tandem disk, plowing	0.28	19	163
Tandem disk, regular	0.44	19	140
Paraplow	0.01	10	123
Field cultivator	0.53	21	149
Row cultivator	0.40	19	114
Rolling cultivator	0.08	29	19
Duckfoot cultivator	0.05	15	121
Field conditioner (scratcher)	0.10	30	300
Culti-mulcher (roller)	0.01	14	90
Landall, do-all	0.03	24	180
Fertilizer attachment to implement	0.50	17	14
Manure spreader	0.02	18	70
Fertilizer spreader, self-propelled	0.10	23	--
Fertilizer spreader, trailer	0.06	32	195
Anhydrous applicator, tractor	0.16	23	152
Dry fertilizer spreader, tractor	0.01	60	140
Liquid fertilizer applicator, tractor	0.12	35	180
Anhydrous applicator, trailer	0.49	21	127
Dry fertilizer spreader, trailer	0.09	29	91
Liquid fertilizer applicator, trailer	0.03	16	128
Chemical attachment to implement	0.27	20	7
Chemical applicator, self-propelled	0.07	23	--
Chemical applicator, self-propelled	0.02	30	--
Chemical applicator, tractor	0.06	32	136
Chemical applicator, trailer	0.38	39	102
Planter (no-till), 6 row	0.15	16	110
Planter (regular), 8 row	0.77	17	88
Planter (air-delivery), 6 row	0.07	13	94
Combine, self-propelled, hillside	0.07	13	--
Combine, self-propelled, 2WD	0.54	12	--
Combine, self-propelled, 4WD	0.27	10	--
Stalk shredder	0.01	13	110
Gravity wagon	0.41	30	102

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: 1991 Farm Costs and Returns Survey, USDA.

Appendix table 6--Iowa corn: Average machinery use per planted acre, 1991

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.16	12	157
Coulter-chisel plow	0.04	11	162
Disk plow	0.01	18	350
Moldboard plow, regular	0.06	6	127
Subsoil chisel plow	0.01	16	250
Disk chisel (mulch tiller)	0.07	14	151
Single disk	0.03	20	135
Tandem disk, plowing	0.03	19	127
Tandem disk, regular	0.47	19	124
Field cultivator	0.79	24	153
Rotary hoe	0.11	19	101
Row cultivator	0.64	17	111
Rolling cultivator	0.02	10	80
Duckfoot cultivator	0.06	31	170
Field conditioner (scratcher)	0.03	20	118
Spike tooth harrow	0.05	21	90
Landall, do-all	0.04	18	155
Soil finisher	0.01	15	120
Fertilizer attachment to implement	0.24	21	--
Manure spreader	0.07	20	110
Anhydrous applicator, tractor	0.25	26	150
Dry fertilizer spreader, tractor	0.05	43	108
Anhydrous applicator, trailer	0.28	26	134
Dry fertilizer spreader, trailer	0.17	41	112
Liquid fertilizer applicator, trailer	0.03	40	120
Chemical attachment to implement	0.46	23	5
Chemical applicator, self-propelled	0.13	40	--
Chemical applicator, tractor	0.26	31	109
Chemical applicator, trailer	0.26	33	91
Planter (no-till), 6 row	0.12	21	118
Planter (regular), 8 row	0.58	17	104
Planter (air-delivery), 6 row	0.29	21	108
Combine, self-propelled, hillside	0.06	10	--
Combine, self-propelled, 2WD	0.81	12	--
Corn picker	0.01	5	73
Grain/hay wagon	0.10	24	111
Shredder, flail	0.02	15	145
Stalk shredder	0.04	12	132
Gravity wagon	0.71	31	117

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: 1991 Farm Costs and Returns Survey, USDA.

Appendix table 7--Michigan corn: Average machinery use per planted acre, 1991

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.11	12	147
Coulter-chisel plow	0.22	13	173
Moldboard plow, regular	0.21	6	113
Disk chisel (mulch tiller)	0.02	11	108
Offset disk, heavy duty	0.09	13	93
Offset disk, light duty	0.01	15	116
Tandem disk, plowing	0.10	27	200
Tandem disk, regular	0.54	17	122
Field cultivator	0.19	18	106
Rotary hoe	0.01	14	73
Row cultivator	0.16	13	67
Duckfoot cultivator	0.03	13	82
Culti-mulcher (roller)	0.02	15	123
Spike tooth harrow	0.01	16	--
Spring tooth harrow	0.07	17	96
Bedder (disk)	0.01	30	140
Culti-packer (pulverizer)	0.02	13	--
Roller packer attachment	0.05	20	146
Landall, do-all	0.03	16	225
Fertilizer attachment to implement	0.47	15	--
Manure spreader	0.18	18	84
Anhydrous applicator, tractor	0.13	16	119
Dry fertilizer spreader, tractor	0.01	11	58
Anhydrous applicator, trailer	0.39	23	153
Dry fertilizer spreader, trailer	0.10	29	92
Liquid fertilizer applicator, trailer	0.03	24	115
Chemical attachment to implement	0.55	22	11
Chemical applicator, tractor	0.05	25	81
Chemical applicator, trailer	0.51	27	55
Planter (no-till), 6 row	0.32	14	112
Planter (regular), 8 row	0.66	14	86
Planter (air-delivery), 6 row	0.02	16	90
Planter (ridge-till), 6 row	0.01	10	150
Combine, self-propelled, hillside	0.01	10	--
Combine, self-propelled, 2WD	0.67	11	--
Combine, self-propelled, 4WD	0.14	14	--
Corn picker	0.05	4	86
Front end loader	0.04	21	108
Grain/hay wagon	0.01	27	30
Hay wagon	0.01	20	50
Stalk shredder	0.01	6	83
Gravity wagon	0.32	25	71

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: 1991 Farm Costs and Returns Survey, USDA.

Appendix table 8--Minnesota corn: Average machinery use per planted acre, 1991

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.31	13	152
Coulter-chisel plow	0.09	12	122
Deep ripper-subsoiler	0.13	30	275
Disk plow	0.02	16	170
Moldboard plow, regular	0.24	6	103
Disk chisel (mulch tiller)	0.02	11	150
Offset disk, heavy duty	0.02	16	108
Single disk	0.01	14	80
Tandem disk, plowing	0.01	15	90
Tandem disk, regular	0.36	17	92
Field cultivator	1.08	23	143
Rotary hoe	0.11	19	100
Row cultivator	0.86	19	107
Rolling cultivator	0.01	5	27
Field conditioner (scratcher)	0.01	18	80
Finishing harrow	0.02	20	135
Flex-tine harrow	0.01	24	129
Multi-weeder	0.04	20	95
Spike tooth harrow	0.02	18	65
Spring tooth harrow	0.10	24	30
Fertilizer attachment to implement	0.61	16	--
Manure spreader	0.09	33	88
Anhydrous applicator, tractor	0.12	25	121
Dry fertilizer spreader, tractor	0.03	23	67
Anhydrous applicator, trailer	0.05	22	89
Dry fertilizer spreader, trailer	0.17	39	100
Liquid fertilizer applicator, trailer	0.13	23	140
Chemical attachment to implement	0.35	19	6
Chemical applicator, tractor	0.27	32	95
Chemical applicator, trailer	0.59	31	68
Planter (no-till), 6 row	0.01	15	110
Planter (regular), 8 row	0.65	16	89
Planter (air-delivery), 6 row	0.28	22	110
Planter (ridge-till), 6 row	0.04	20	130
Combine, self-propelled, hillside	0.03	8	--
Combine, self-propelled, 2WD	0.78	12	--
Corn picker	0.05	5	68
Grain/hay wagon	0.27	24	72
Hay wagon	0.03	8	75
Stalk shredder	0.02	14	101
Gravity wagon	0.57	28	97

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: 1991 Farm Costs and Returns Survey, USDA.

Appendix table 9--Nebraska corn: Average machinery use per planted acre, 1991

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.03	12	121
Moldboard plow, regular	0.02	6	112
Subsoil chisel plow	0.12	20	174
Disk chisel (mulch tiller)	0.03	15	181
Offset disk, heavy duty	0.15	22	170
Tandem disk, regular	1.04	21	139
Field cultivator	0.66	19	112
Furrow-out cultivator	0.14	15	129
Rotary hoe	0.09	16	100
Row cultivator	0.41	14	105
Rolling cultivator	0.20	14	116
Duckfoot cultivator	0.19	19	147
Field conditioner (scratcher)	0.03	18	160
Rod weeder	0.03	36	90
Spring tooth harrow	0.01	30	115
Seedbed roller	0.01	18	125
Culti-packer (pulverizer)	0.01	15	135
Fertilizer attachment to implement	0.51	17	39
Manure spreader	0.03	8	95
Fertilizer spreader, self-propelled	0.06	18	--
Anhydrous applicator,tractor	0.33	22	111
Anhydrous applicator, trailer	0.08	25	146
Dry fertilizer spreader, trailer	0.17	34	119
Liquid fertilizer applicator, trailer	0.09	19	85
Chemical attachment to implement	0.37	16	--
Chemical applicator, self-propelled	0.03	55	--
Chemical applicator, tractor	0.45	21	75
Chemical applicator, trailer	0.09	39	122
Planter (no-till), 6 row	0.21	18	120
Planter (regular), 8 row	0.46	14	97
Planter (air-delivery), 6 row	0.27	19	134
Planter (ridge till), 6 row	0.05	16	134
Combine, self-propelled, hillside	0.15	14	--
Combine, self-propelled, 2WD	0.78	14	--
Corn picker	0.02	5	68
Ditcher (vee or rotary)	0.10	14	110
Grain/hay wagon	0.03	14	48
Shredder, flail	0.13	16	132
Shredder, rotary	0.01	9	61
Stalk shredder	0.09	17	134
Gravity wagon	0.05	29	111

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: 1991 Farm Costs and Returns Survey, USDA.

Appendix table 10--Ohio corn: Average machinery use per planted acre, 1991

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.13	11	163
Coulter-chisel plow	0.25	12	226
Deep ripper-subsoiler	0.05	15	256
Moldboard plow, regular	0.26	6	110
Offset disk, light duty	0.05	11	69
Single disk	0.06	13	100
Tandem disk, regular	0.12	13	98
Field cultivator	0.96	20	158
Rotary hoe	0.18	24	92
Row cultivator	0.42	19	90
Duckfoot cultivator	0.02	16	106
Field conditioner (scratcher)	0.01	24	160
Multi-weeder	0.01	14	85
Culti-mulcher (roller)	0.04	12	95
Spring tooth harrow	0.03	13	8
Culti-packer (pulverizer)	0.05	12	27
Landall, do-all	0.10	28	238
Fertilizer attachment to implement	0.39	22	30
Manure spreader	0.04	13	104
Anhydrous applicator, tractor	0.16	26	155
Dry fertilizer spreader, tractor	0.02	32	90
Liquid fertilizer applicator, tractor	0.03	12	--
Anhydrous applicator, trailer	0.38	20	101
Dry fertilizer spreader, trailer	0.13	43	83
Liquid fertilizer applicator, trailer	0.04	21	86
Chemical attachment to implement	0.60	26	28
Chemical applicator, truck	0.01	40	--
Chemical applicator, tractor	0.10	26	69
Chemical applicator, trailer	0.17	38	70
Lister-bedder planter	0.01	15	95
Planter (no-till), 6 row	0.49	17	107
Planter (regular), 8 row	0.46	12	69
Planter (air-delivery), 6 row	0.05	20	86
Combine, self-propelled, hillside	0.10	15	--
Combine, self-propelled, 2WD	0.49	11	--
Combine, self-propelled, 4WD	0.24	15	--
Corn picker	0.04	5	79
Gravity wagon	0.80	32	71

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: 1991 Farm Costs and Returns Survey, USDA.

Appendix table 11--South Dakota corn: Average machinery use per planted acre, 1991

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.06	15	141
Coulter-chisel plow	0.02	19	328
Moldboard plow, regular	0.08	7	127
Moldboard plow, two-way	0.07	5	125
Disk chisel (mulch tiller)	0.01	24	200
Offset disk, heavy duty	0.02	15	106
Tandem disk, plowing	0.01	21	106
Tandem disk, regular	0.76	22	156
Field cultivator	0.45	21	130
Furrow-out cultivator	0.16	15	125
Rotary hoe	0.08	27	103
Row cultivator	1.18	16	114
Rolling cultivator	0.01	10	67
Duckfoot cultivator	0.54	34	273
Flex-tine harrow	0.13	29	67
Spike tooth harrow	0.01	17	24
Spring tooth harrow	0.01	16	--
Spike tooth harrow	0.01	25	58
Culti-packer (pulverizer)	0.08	18	160
Fertilizer attachment to implement	0.36	21	2
Manure spreader	0.01	14	71
Anhydrous applicator, tractor	0.01	20	130
Dry fertilizer spreader, tractor	0.08	39	84
Anhydrous applicator, trailer	0.22	34	205
Dry fertilizer spreader, trailer	0.14	45	104
Liquid fertilizer applicator, trailer	0.10	20	128
Chemical attachment to implement	0.36	20	6
Chemical applicator, self-propelled	0.08	55	--
Chemical applicator, truck skid	0.06	48	--
Chemical applicator, tractor	0.38	33	83
Chemical applicator, trailer	0.16	38	121
Planter (no-till), 6 row	0.20	21	156
Planter (regular), 8 row	0.66	17	103
Planter (air-delivery), 6 row	0.12	17	97
Combine, self-propelled, hillside	0.07	10	--
Combine, self-propelled, 2WD	0.56	12	--
Combine, self-propelled, 4WD	0.21	20	--
Corn picker	0.01	5	95
Grain/hay wagon	0.04	15	87
Rock picker	0.02	8	138
Gravity wagon	0.08	27	55

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: 1991 Farm Costs and Returns Survey, USDA.

Appendix table 12--Wisconsin corn: Average machinery use per planted acre, 1991

Machinery	Times-over	Width	Tractor
	Number	Feet	Horsepower
Chisel plow	0.23	12	147
Coulter-chisel plow	0.10	8	129
Moldboard plow, regular	0.48	6	120
Subsoil chisel plow	0.04	12	200
Disk chisel (mulch tiller)	0.03	9	104
Offset disk, heavy duty	0.09	18	270
Single disk	0.02	16	89
Tandem disk, plowing	0.01	12	100
Tandem disk, regular	0.94	14	113
Field cultivator	0.93	13	117
Rotary hoe	0.04	22	135
Row cultivator	0.09	9	82
Field conditioner (scratcher)	0.27	24	140
Finishing harrow	0.01	20	90
Rail, pipe, log, plank	0.01	15	65
Culti-mulcher (roller)	0.06	12	85
Spike tooth harrow	0.09	16	26
Spring tooth harrow	0.18	19	112
Culti-packer (pulverizer)	0.06	13	121
Roterra	0.01	12	95
Fertilizer attachment to implement	0.67	12	2
Manure spreader	0.31	22	98
Fertilizer spreader, trailer	0.16	30	--
Anhydrous applicator, tractor	0.01	18	100
Dry fertilizer spreader, tractor	0.30	33	184
Anhydrous applicator, trailer	0.05	19	88
Dry fertilizer spreader, trailer	0.16	38	86
Chemical attachment to implement	0.16	23	34
Chemical applicator, truck	0.11	46	--
Chemical applicator, tractor	0.10	21	149
Chemical applicator, trailer	0.29	28	66
Planter (regular), 8 row	0.80	10	90
Planter (air-delivery), 6 row	0.16	11	114
Combine, self-propelled, 2WD	0.12	9	--
Combine, self-propelled, 4WD	0.40	15	--
Combine	0.01	5	73
Corn picker	0.12	4	97
Grain/hay wagon	0.03	15	62
Hay wagon	0.04	8	80
Shredder, flail	0.01	6	80
Stalk shredder	0.08	14	145
Gravity wagon	0.35	19	68

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: 1991 Farm Costs and Returns Survey, USDA.

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SUMMARY OF REPORT #AIB-701

Government Programs Raise Both Costs and Returns for Corn Growers

June 1994

Contact: William D. McBride, (202) 219-0801

Gross value of production, production costs, and net returns for corn are all higher when Government programs are taken into account in cost and return estimates. A new report, *Effects of Government Programs on Corn Costs and Returns, 1991 and 1992*, just released from USDA's Economic Research Service, examines the extent to which Government programs enhanced the profitability of corn production in 1991 and 1992. It also identifies factors that most influenced corn costs and returns.

Including Government programs in cost and return estimates raised net returns after cash expenses by $24 per planted acre in 1991. Greater yields and higher deficiency payments in 1992 added nearly $44 to net cash returns. North Central and Plains corn growers are most affected by Government programs since they participate to a much greater extent in the programs than growers in the Southeast and Northeast. Producer participation and annual price and yield conditions have the greatest influence on the extent to which Government programs enhance returns to corn production.

To receive Government payments under any of the commodity income programs, producers must put some of their land into conserving-use acres and maintain those "set-aside" acres in specific ways. Farmers incur costs to meet these program requirements. Since 1973, Congress has required USDA to estimate costs and returns for major crops and dairy. Costs and returns that include the direct effects of Government programs can be used to gauge the profitability of competing and alternative commodities. On the other hand, the direct effects of Government programs are excluded when costs and returns estimates are used to officially establish support levels.

USDA cost and return estimates have traditionally been used to inform policymakers about costs and returns without including the direct effects of Government programs. Cost and return estimates have deliberately excluded the direct effects of farm programs to avoid the escalating effect program benefits would have on production and program costs. For example, the cost of land is determined by the ability of land to generate income. Because programs generate income for those who control land, programs increase the cost of land. Farm price and income supports established according to the higher costs would rise. As the cycle repeats, production and program costs would continually escalate. However, not all the effects of programs can be removed from cost and return estimates. Indirect effects result from the influence farm programs have on markets for production inputs, on the market value of commodities, and on producer behavior.

If enterprise cost and return estimates are to be used to examine the profitability of producing individual commodities, the direct effects of government programs must be included. Comparative analysis of net returns for competing and alternative crops and the financial position of producers of these commodities required consideration of Government program effects. These effects are more critical for some commodities than others due to variations in program support levels and producer participation.

To Order These Reports...

This information is excerpted from ***Effects of Government Programs on Corn Costs and Returns, 1991 and 1992,*** AIB-701, by William D. McBride. Similar reports on other commodities have also been published: ***Effects of Government Programs on Rice Production Costs and Returns, 1988,*** AIB-597, by Michael Salassi, Mary Ahearn, Mir Ali, and Robert Dismukes, and ***Effects of Government Programs on Sorghum Costs and Returns, 1990,*** AIB-689, by Nora L. Brooks. The cost is $7.50 per report.

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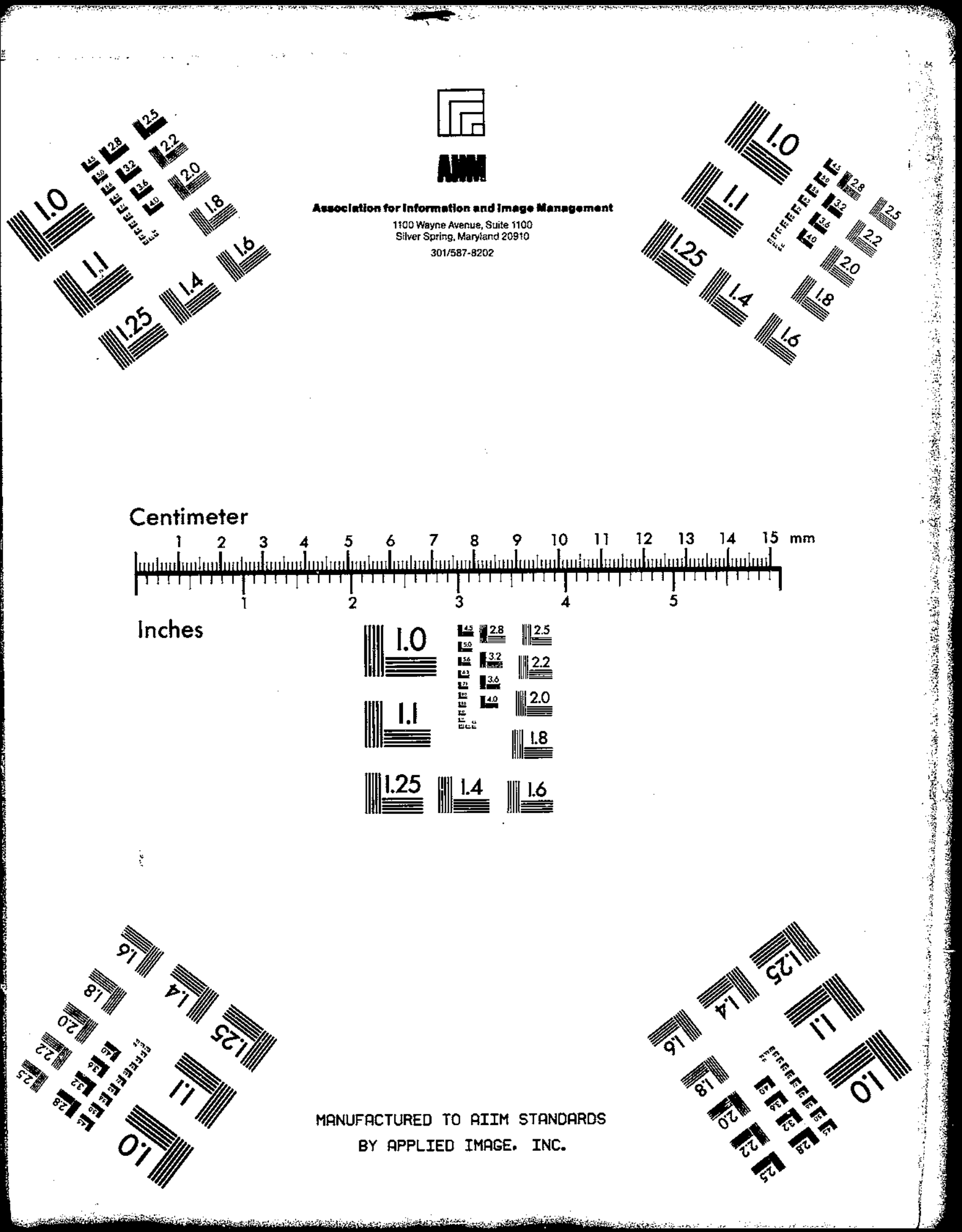
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