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Characteristics and Production Costs of U.S. Soybean Farms, 1986

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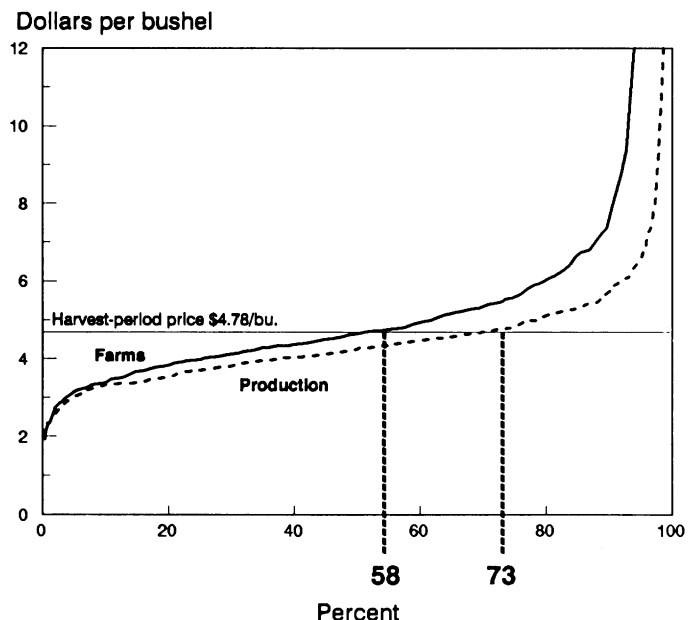
In this report... *The average economic cost of producing soybeans was \$4.53 per bushel in 1986, while individual farm costs ranged from \$1.93 to more than \$15.00 per bushel. Acreage, yields, and regional differences among farms appear to be the principal factors influencing soybean production costs. Producers with the lowest costs of production planted more acreage to soybeans and obtained higher yields than producers with higher costs. Much of the cost differences were associated with region.*

The importance of soybeans on U.S. farms declined during the 1980's: soybean acreage in 1986 had fallen by about 14 percent from 1980. However, production remained much the same due to higher average yields. U.S. dominance of world soybean and soybean meal trade also diminished, due largely to increased competition from South American oilseed producers and foreign vegetable oil exporters. Soybean production costs remained relatively stable during much of the 1980's, and 1986 costs of production were somewhat lower than costs during the early 1980's.

This report compares selected characteristics and costs of production among soybean producers. Producers are grouped on the basis of economic costs, enterprise sizes, and production regions (see Glossary). Characteristics of producers in each group are examined for sources of cost differences among groups. Data came from the 1986 Farm Costs and Returns Survey (FCRS) of U.S. soybean farms. The 1986 FCRS represented 1.94 billion bushels of soybeans grown on about 60.4 million acres by 267,669 farms. According to U.S. crop production estimates, the soybean version of the 1986 FCRS represented 71 percent of U.S. soybean production and 68 percent of soybean acreage (5).¹

The average economic cost of producing soybeans was \$155.42 per acre, or \$4.53 per bushel. Estimated total economic costs (see Glossary) were converted to a per-bushel basis and ranked from lowest to highest to form a distribution [fig. 1; see (1)]. Given the wide variation in cost levels, soybean farms were divided into groups according to costs: low-cost, mid-cost, and high-cost producers. The low-cost group, comprised of the 25 percent of farms with the lowest economic costs, and the high-cost group, comprised of the 25 percent of farms with the highest economic costs, were selected for analysis. The remaining 50 percent represented the mid-cost group. Per-bushel, rather than per-acre, costs were used as the basis for segmenting the distribution because of the importance of input costs relative to output.

Figure 1
Distribution of soybean production costs, 1986
Fifty-eight percent of farms had economic costs below the price at harvest, while 73 percent of the soybean harvest was produced with economic costs below the harvest-period price.



¹ Italicized numbers in parentheses refer to sources cited in the References section.

Some Soybean Producers Had a Distinct Cost Advantage

Soybean acreage, yield, and farm size distinguished low-cost from high-cost producers.

Twenty-five percent of farms had economic costs per bushel of \$3.98 or less. These low-cost producers accounted for about 38 percent of total soybean production (table 1). Another 25 percent had per-bushel economic costs of \$5.59 or more. These high-cost producers accounted for only 11 percent of the total soybean crop.

High-cost producers were classified as such because their per-acre costs were high, yields were low, or both. Average yield differed substantially among the cost groups. Low-cost producers yielded 43 bushels of soybeans per acre, compared with 17 bushels for the high-cost producers (table 1). Only 11 percent of high-cost producers had yields above their State's median, compared with 80 percent of the low-cost producers. Per-acre costs among the groups differed from per-bushel costs. The high-cost group produced soybeans for \$10 per acre less than the low-cost producers (table 2). Consequently, yields were of utmost importance in distinguishing high- and low-cost producers.

Enterprise size--as measured in soybean acreage--and size of the whole farm--as measured by economic class (see Glossary)--also distinguished low-cost from high-cost producers. Larger farms generally incurred lower costs because of the ability to take advantage of cost efficiencies. Average size of a soybean operation was 153 acres in 1986. Low-cost producers planted nearly 60 more acres of soybeans than did high-cost producers and operated farms at least 200 acres larger (table 1). Sixty-two percent of the high-cost group was classified in the smallest economic class of fewer than \$40,000 of annual sales.

Growers in the North Central region far outnumbered those in the other regions and thus were predominant in all cost groups. Most of Southeast and Delta producers were in the high-cost group, over 60 percent and over 50 percent, respectively (fig. 2). Less than 20 percent of producers in both regions were low-cost growers. The distribution of cost groups in each region was related to yields, which, in the South, were influenced by a drought during 1986.

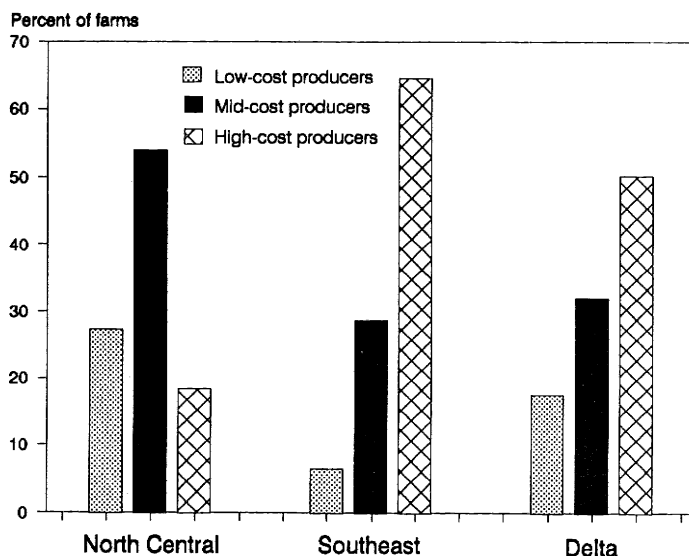
A comparison of per-acre costs among the groups reveals differences in input use and asset values (table 2). Variable expenses were nearly \$15 per

acre lower for the low-cost group. Higher input use, primarily for fertilizer, chemicals, and field operations, was characteristic of the high-cost producers. The difference between the groups narrowed when fixed cash expenses were added. Low-cost producers incurred higher overhead and interest costs, particularly for real estate interest. The high-cost group produced soybeans for a total economic cost of \$10 per acre less than the low-cost group. Low-cost producers incurred \$30 per acre more in land charges than high-cost producers. This difference is a result of the higher yields, and thus higher land rents.

Other facts:

- Low-cost producers were highly specialized in cash grain production, mostly corn and soybeans. High-cost producers sold a much wider variety of crops, including cotton, peanuts, and tobacco, which is characteristic of farms in the Southeast and Delta.
- High-cost producers made wider use of double-cropped soybeans than did the other groups. Lower yields on the double-cropped acreage likely contributed to lower yields for the high-cost growers.
- Because 1986 yields were abnormally low for some areas, individuals in one cost group may

Figure 2
Distribution of cost groups by region
The majority of Southeast and Delta soybean growers were high-cost producers in 1986.



not have been in the same group in past years. Little difference existed in the financial position of each group. High (low) production costs on an annual basis would likely be reflected in a poor (good) financial standing (see Glossary).

- High-cost farms had characteristics similar to those of small farms, such as: low per-farm sales, debt, and asset levels; a higher incidence of operators with major occupations off the farm; lower Government payments; and a higher proportion of older operators.

Table 1--Characteristics of soybean farms by cost group, 1986

Yield and size were important factors distinguishing low- from high-cost soybean producers.

Item	Unit	Economic cost group		All farms
		Low-cost producers	High-cost producers	
Share of U.S.:				
Soybean farms	Percent	25	25	100
Soybean production	Percent	38	11	100
Soybean yield	Bushels/acre	43	17	34
Size:				
Total operated acreage	Acres	599	376	471
Planted soybean acreage	Acres	186	128	153
Economic class--				
\$250,000 or more	Percent of farms	18	4	8
\$100,000-\$249,999	Percent of farms	43	18	29
\$40,000-\$99,999	Percent of farms	18	16	26
\$0-\$39,999	Percent of farms	21	62	37

Table 2--U.S. soybean production costs by cost group, 1986

Low-cost producers had a significant cost advantage for most variable inputs, but paid more for farm overhead, interest, and land.

Item	Economic cost group		All farms
	Low-cost producers	High-cost producers	
		<i>Dollars</i>	
Costs per bushel:			
Variable cash expenses	0.98	3.19	1.40
Fixed cash expenses	.86	1.74	1.06
Total cash expenses	1.84	4.93	2.46
Total economic costs	3.45	7.90	4.53
Costs per acre: ¹			
Variable cash expenses	41.74	55.43	48.03
Seed	10.81	10.51	10.81
Fertilizer	3.59	9.68	5.51
Chemicals	10.81	12.35	12.14
Custom operations	1.97	2.55	2.89
Fuel, lube, and electricity	4.57	6.16	5.55
Repairs	5.69	7.52	6.50
Hired labor	4.26	6.59	4.60
Technical services	.02	.06	.04
Fixed cash expenses	36.78	30.19	36.40
General farm overhead	8.81	7.42	9.81
Interest on operating loans	6.06	5.17	6.14
Interest on real estate	11.53	6.42	9.53
Land	62.90	31.20	57.93
Total cash expenses	78.52	85.62	84.43
Total economic costs	147.19	137.12	155.42

¹ The corresponding data are selected listings only and do not necessarily add to totals. For complete listing, see appendix table 2.

Farm Characteristics and Production Costs Varied by Enterprise Size

Per-acre cash and economic production costs declined as soybean acreage increased. Larger soybean farms were more specialized and were able to spread fixed input costs over more acreage.

Enterprise size affected soybean costs of production. Characteristics and costs of production, therefore, were examined by four sizes of soybean operations defined by soybean acreage. About 15 percent of the soybean-producing farms had fewer than 25 acres, while 55 percent had fewer than 100 acres. Farms with fewer than 100 acres of soybeans accounted for less than 20 percent of total production. Only 5 percent of farms had 500 or more soybean acres, yet these farms produced nearly 25 percent of the 1986 U.S. soybean crop (table 3).

The percentage of farms reporting cash grains as the production specialty was directly related to the size of soybean acreage. Nearly 87 percent of the largest soybean growers reported cash grains as the production specialty, compared with only 37 percent of the smallest producers (table 3). Likewise, characteristics such as farm sales, Government program payments and participation rates, assets, and debt increased with size of soybean acreage. Farmers in the larger acreage categories (100 acres or more) were more likely to be financially vulnerable. Debt/asset ratios were also higher for these two largest groups than for the smaller soybean growers (app. table 3).

The majority of North Central and Southeast producers had fewer than 100 soybean acres, about 57 percent and 64 percent, respectively. Less than 10 percent of Southeast and North Central growers had 500 or more soybean acres. In contrast, only about 12 percent of Delta growers had fewer than 100 soybean acres, while 88 percent had more than 100 acres. Large soybean farms were prevalent in the Delta. Over 25 percent of Delta soybean growers had 500 or more soybean acres.

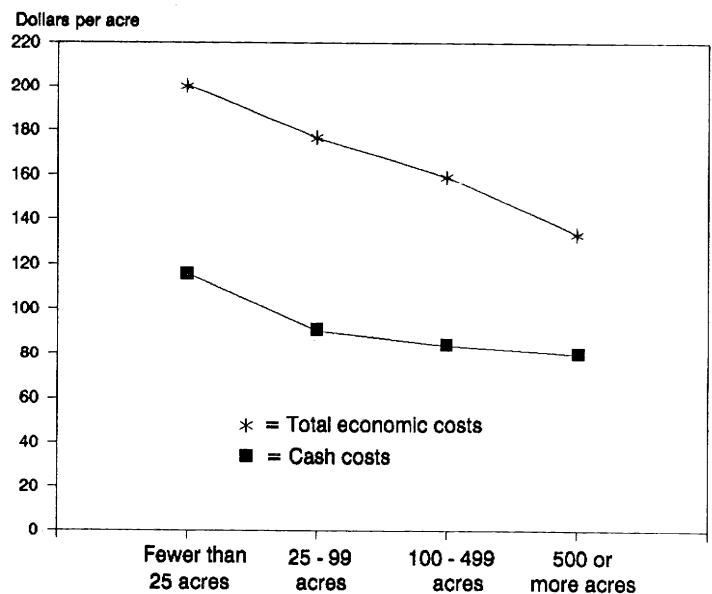
On a per-acre basis, both cash and economic costs declined as size increased (fig. 3). Total cash expenses ranged from \$115.77 for the smallest soybean farms to \$79.99 for the largest. Total economic costs were more than \$65 per acre lower for the largest than for the smallest soybean growers (\$133.73 versus \$200.40). Per-acre costs for variable inputs such as fertilizer, chemicals, custom operations, and machinery were highest for the smallest farms (table 4). Only hired labor was greatest on the largest farms. The

charges for farm overhead, nonland capital, and unpaid labor were much higher for the smallest than for the larger farms, because costs of fixed units of these resources were spread over more acreage on the larger farms.

Other facts:

- The largest soybean farms made the greatest use of double-cropping. Similarly, the acreage of soybeans drilled, as opposed to row-planted, increased with size of farm. Both double-cropping and planting method are related to the regional composite of each size group, with most of Delta farms in the largest size groups.
- Farm sales obtained from livestock were higher than crop sales on the smallest farms, but were lower on the larger farms. Among crop sales, farms with the smallest soybean acreage depended most heavily on corn, soybeans, and tobacco. Larger soybean farms grew cotton and rice, typical of large farms in the Delta.
- Most of the farms with small soybean acreage also were small farms. These farm operators were less likely to have farming as the major

Figure 3
Economic and cash costs by acreage of soybeans
Per-acre cash and economic costs declined as size of soybean acreage increased.



occupation and were more likely to be sole proprietorships. Farm incomes of the smallest group were low, and off-farm incomes were

high. Assets, debt, and net worth of the smallest farms were all low relative to farms with larger soybean acreage.

Table 3--Characteristics of soybean farm operations by enterprise size, 1986

Only 5 percent of farms had 500 or more soybean acres, but produced nearly 25 percent of total production.

Item	Unit	Enterprise size (acres)				All farms
		Fewer than 25	25-99	100-499	500 or more	
Share of U.S.:						
Soybean farms	Percent	15	40	40	5	100
Soybean production	Percent	1	16	59	24	100
Soybean yield	Bushels/acre	37	36	37	29	34
Size:						
Total operated acreage	Acres	199	296	587	1,766	471
Planted soybean acreage	Acres	13	59	213	855	153
Production specialty:						
Cash grains	Percent of farms	37	55	76	87	62
Other crops	Percent of farms	51	33	21	12	30
Livestock	Percent of farms	12	12	3	1	8

Table 4--U.S. soybean production costs per bushel and per acre by enterprise size, 1986

Per-acre costs of most inputs declined as soybean acreage increased, particularly charges for fixed inputs such as farm overhead, nonland capital, and unpaid labor.

Item	Enterprise size (acres)				All farms
	Fewer than 25	25-99	100-499	500 or more	
<i>Dollars</i>					
Costs per bushel:					
Variable cash expenses	1.70	1.40	1.26	1.73	1.40
Fixed cash expenses	1.42	1.13	1.03	1.06	1.06
Total cash expenses	3.12	2.53	2.30	2.80	2.46
Total economic costs	5.40	4.93	4.34	4.68	4.53
Costs per acre:¹					
Variable cash expenses	62.97	50.17	46.30	49.61	48.03
Seed	11.46	11.67	10.82	10.27	10.81
Fertilizer	6.47	4.74	5.85	5.23	5.51
Chemicals	18.79	13.79	11.62	11.95	12.14
Custom operations	6.83	6.26	2.28	2.04	2.89
Fuel, lube, and electricity	9.49	6.07	5.60	4.96	5.55
Repairs	8.14	5.92	6.54	6.69	6.50
Hired labor	1.76	1.59	3.56	8.50	4.60
Technical services	.02	.13	.03	0	.04
Fixed cash expenses	52.80	40.36	37.95	30.37	36.40
General farm overhead	17.89	13.54	9.86	7.24	9.81
Nonland capital	12.01	11.31	7.33	5.23	7.42
Unpaid labor	25.21	13.47	10.65	4.83	9.65
Total cash expenses	115.77	90.53	84.25	79.99	84.43
Total economic costs	200.40	176.46	159.38	133.73	155.42

¹ The corresponding data are selected listings only and do not necessarily add to totals. For complete listing, see appendix table 4.

Soybean Production Costs Varied Among Regions

The cost of producing soybeans varied by region due to differences in yield, acreage, and production practices.

Regional differences among soybean growers exist because of peculiarities in the climate and resource endowments. In the South, for example, climatic and resource conditions allow soybeans to be double-cropped with wheat. Government programs also influence locations of soybean production. The relative profitability of soybeans compared with corn, cotton, and wheat changes as Government programs for these crops change.

North Central States have always dominated U.S. soybean production. Soybean production in the

South, however, has constituted an increased portion of national acreage and production since the 1950's. During the mid-1980's, as much as 50 percent of the principal crop acreage in the Delta was planted to soybeans. About 35 percent of North Central and Southeast crop acreage was planted to soybeans.

Soybeans are usually grown in rotation with other crops. Corn and soybeans are often planted in rotation throughout the North Central. Wheat followed by soybeans is a common double-crop

Table 5--Characteristics of soybean farm operations by production region, 1986

Delta producers planted more soybeans, Southeast producers were more likely to double-crop soybeans, but North Central producers obtained the highest yields.

Item	Unit	Region			All farms
		North Central	Southeast	Delta	
Share of U.S.:					
Soybean farms	Percent	83	11	6	100
Soybean production	Percent	83	8	9	100
Soybean yield	Bushels/acre	40	23	19	34
Size:					
Total operated acreage	Acres	430	540	916	471
Planted soybean acreage	Acres	132	163	437	153
Economic class--					
\$250,000 or more	Percent of farms	8	10	9	8
\$100,000-\$249,000	Percent of farms	30	19	26	29
\$40,000-\$99,999	Percent of farms	27	12	35	26
\$0-\$39,999	Percent of farms	35	59	30	37
Cultural practices:					
Single crop, row planting	Percent of acreage	80	62	56	73
Single crop, drill planting	Percent of acreage	20	11	30	20
Double crop, row planting	Percent of acreage	0	19	6	4
Double crop, drill planting	Percent of acreage	0	8	8	3
Financial position:					
Favorable	Percent of farms	49	47	35	48
Marginal income	Percent of farms	16	31	9	17
Marginal solvency	Percent of farms	18	11	16	17
Vulnerable	Percent of farms	17	11	40	18
Per farm:					
Sales	Dollars	77,537	100,661	83,910	80,492
Government payments	Dollars	12,184	6,866	17,388	11,887
Net cash income	Dollars	25,027	6,193	10,561	22,088
Net farm income	Dollars	10,677	-32,424	-5,429	4,927
Off-farm income	Dollars	25,392	18,337	13,698	23,932
Government payments	Percent of farms	80	55	60	76

practice in the Southeast. Most of the production and harvesting equipment for corn and wheat can be used for soybeans, making soybeans an important rotation crop. The use of cotton in rotation with soybeans has increased in the Delta. In contrast to crop rotation, specialization is much less common in soybean production. Few farmers outside of the Delta specialize in soybean production.

In this report, States were grouped into production regions according to the production practices most prevalent in raising soybeans (see Glossary). More than 83 percent of the soybean farms and production were located in the North Central region. About 11 and 6 percent of the farms were in the Southeast and Delta regions, respectively. Southeast soybean growers accounted for only 8 percent of national production, while Delta farms accounted for 9 percent (table 5).

Table 6--Soybean production costs by region, 1986

North Central producers had the highest per-acre production costs, but had significantly lower per-bushel costs relative to the other regions.

Item	Region			All farms
	North Central	Southeast	Delta	
	<i>Dollars</i>			
Costs per bushel:				
Variable cash expenses	1.18	2.53	2.38	1.40
Fixed cash expenses	1.06	1.12	1.02	1.06
Total cash expenses	2.24	3.66	3.40	2.46
Total economic costs	4.27	5.59	5.94	4.53
Cash costs per acre: ¹				
Variable cash expenses	46.90	58.88	45.10	48.03
Seed	11.16	9.66	10.08	10.81
Fertilizer	4.61	11.58	5.09	5.51
Chemicals	12.58	14.57	8.46	12.14
Custom operations	3.19	3.65	1.02	2.89
Fuel, lube, and electricity	5.59	5.76	5.17	5.55
Repairs	6.15	6.76	7.85	6.50
Hired labor	3.58	6.88	7.40	4.60
Technical services	.04	0	.07	.04
Fixed cash expenses	42.04	26.09	19.23	36.40
General farm overhead	11.32	5.79	6.10	9.81
Taxes and insurance	11.91	10.10	7.19	10.92
Interest on operating loans	6.84	4.62	4.19	6.14
Interest on real estate	11.97	5.58	1.77	9.53
Total cash expenses	88.94	84.97	64.34	84.43
Economic costs per acre: ¹				
Total economic costs	169.50	129.91	112.44	155.42
Capital replacement	10.63	10.51	11.63	10.78
Operating capital	.84	1.06	.81	.86
Nonland capital	7.86	6.80	5.99	7.42
Land	70.24	28.93	25.20	57.93
Unpaid labor	9.79	7.85	10.36	9.65

¹ The corresponding data are selected listings only and do not necessarily add to totals. For complete listing, see appendix table 6.

North Central Soybean Production

North Central soybean producers had higher per-acre costs, yet high yields resulted in the lowest per-bushel costs.

The North Central region was by far the largest soybean producing region. More than 220,000 North Central farms produced about 1.2 billion bushels of soybeans on nearly 29.3 million acres in 1986, according to the FCRS. Soybean growers in this region tended to be highly specialized in corn and soybean production. Nearly 90 percent of 1986 sales on North Central soybean farms came from these two crops.

Growing conditions during 1986 were generally good in most of the North Central region, particularly in the western area. Yield increases of over 3 bushels per acre above record 1985 levels were recorded in Iowa, Minnesota, and Nebraska. Soybean yields in other States were somewhat lower or remained at 1985 levels (5).

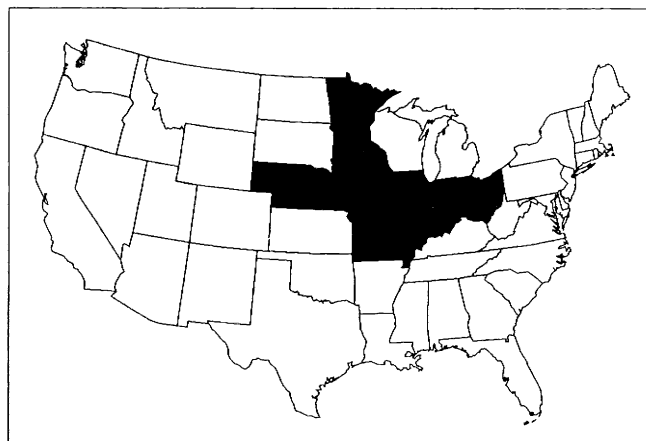
Per-bushel production costs, at \$4.27, were more than \$1.25 below costs in the other regions (table 6). Costs per acre, however, were highest in the North Central. Total economic costs, at nearly \$170 per acre, were over \$40 higher than in the other regions. Most of this difference resulted from greater land costs. The land charge reflected cash and share rental values for land in each region. Greater yields in the North Central raised the value of share-rented land relative to other regions. Likewise, greater yields caused lower per-bushel costs. Even with the highest per-acre costs, yields were significantly greater in the North Central as to lower per-bushel costs relative to the other regions.

Other facts:

- Soybean yield, at 40 bushels per acre, was more than 15 bushels higher than in the other regions.
- Soybean acreage per farm was smaller than in the other regions. For example, North Central growers planted an average of 300 fewer soybean acres than Delta growers.
- Livestock production was important on North Central soybean farms. Two-thirds of the farms

reported a livestock inventory, higher than in the other regions. About 8 percent of North Central farms specialized in livestock production.

- North Central soybean farms were smaller relative to the other regions. Per-farm acreage and sales were lowest among the regions. More than a third of soybean farms in this region were in the smallest economic class.
- About 80 percent of North Central soybean growers received Government program payments, with an average of more than \$12,000 per farm. Soybeans were often produced with corn, the leading program commodity on North Central farms.
- Nearly 50 percent of North Central farms reported a favorable financial position, the highest among all regions. About 17 percent of farms were financially vulnerable, second among the regions.
- Only in the North Central region did soybean growers obtain a positive net farm income in 1986. Net cash and farm incomes, in addition to off-farm income, were the highest of the regions.



Delta Soybean Production

Per-acre costs were lowest in the Delta where soybeans were produced on large farm operations. However, severe drought caused per-bushel costs to be highest.

The Delta had the fewest soybean farms, but ranked second in both 1986 acreage and production. FCRS reports included over 15,000 Delta farms that produced about 125.3 million bushels on 6.7 million acres. A variety of crops were produced on soybean farms in this region. Cotton, rice, and sorghum, in addition to soybeans, constituted roughly 84 percent of sales.

The 1986 drought was severe in the Delta. Average yield in Mississippi fell 9 bushels from 1985, and average yield in Arkansas fell 5.5 bushels. Delta soybean yields during 1986 were the lowest recorded since 1980 (5).

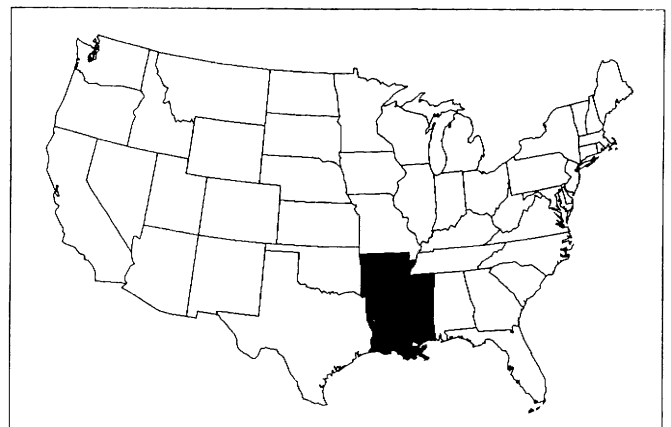
Per-bushel production costs, at \$5.94, were highest in the Delta (table 6). The drought in 1986 severely limited yields and thus raised per-bushel costs. If per-bushel costs were high on a regular basis, we would expect the higher costs to be reflected in the financial position of farms. The poor financial condition of Delta farms is an indicator that high per-bushel costs may be typical, rather than the sole result of low yields in 1986.

Production costs per acre were about \$112 in the Delta, the lowest among the regions. Likewise, variable expenses were lowest in the Delta. The lower per-acre costs, however, were more than offset by low yields so that per-bushel costs in the Delta were high relative to the other regions.

Other facts:

- Soybean yield of only 19 bushels per acre was less than half that in the North Central and slightly lower than in the Southeast.
- Delta farms planted many more acres of soybeans than in the other regions. Soybean producers averaged 437 acres, more than 2.5 times greater than in the North Central and the Southeast.
- Delta growers were more likely to drill soybeans, as opposed to planting in conventional row spacings, than were producers in the other regions. About 38 percent of the soybean acreage in the Delta was planted with a drill, compared with around 20 percent in the other regions.

- Per-farm Government program payments were highest in the Delta region, even though the participation rate was only around 60 percent. Soybeans were produced on large farming operations that typically had a large acreage of program crops, including rice and cotton.
- Soybeans were produced on large farms in the Delta. About 70 percent of Delta farms were classified in economic classes exceeding \$40,000 in annual receipts, the highest share among the regions. Other characteristics indicating the presence of larger farms were the greater whole-farm and soybean acreage and higher Government payments. The Delta also contained the greatest proportion of partnerships and corporations. Farmers in this region were more likely to list farming, rather than off-farm jobs, as their major occupation.
- Soybean producers in the Delta were in the least favorable financial condition of any region. About 40 percent of Delta farms were classified as financially vulnerable, compared with less than 20 percent in the other regions. While asset levels were similar among the regions, farm debt was much higher in the Delta. Debt/asset ratios ranged from only 0.25 in the Southeast to above 0.50 in the Delta. In contrast to the Southeast, a higher percentage of younger farmers produced soybeans in the Delta. Young, less established farmers tend to be less financially secure.
- Net farm income was negative in the Delta, but less so than in the Southeast. The fewest farmers worked off the farm in the Delta, and off-farm income was lowest among the regions.



Southeast Soybean Production

Smaller operations, double-cropped soybeans, and drought conditions caused lower yields and higher per-bushel production costs in the Southeast. However, southeastern soybean farmers were in the best financial position.

The Southeast ranked second in number of soybean farms, but trailed both the North Central and Delta in 1986 soybean acreage and production. Nearly 30,000 Southeast farms produced about 111.9 million bushels of soybeans on 4.9 million acres, as reported in the FCRS. Unlike the North Central growers, soybean growers in this region produced a variety of crops. Sales from corn, soybeans, peanuts, and tobacco accounted for roughly 90 percent of sales on Southeast soybean farms.

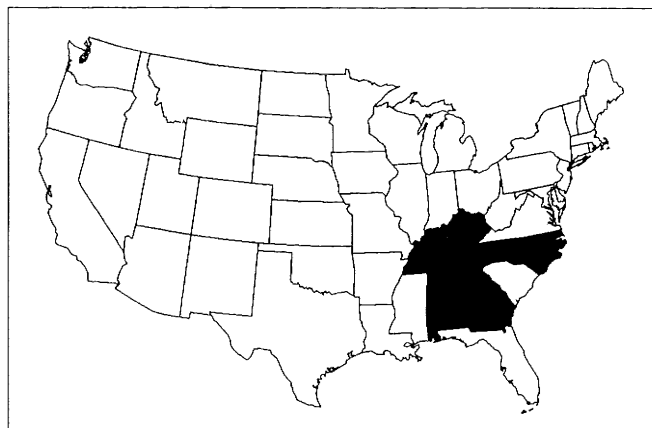
Southern drought conditions during 1986 limited yield potential in the Southeast. The Georgia soybean crop was severely affected, with 400,000 acres abandoned and a yield reduction of 5 bushels per acre. Average yield in Tennessee dropped 6 bushels from 1985 levels. Effects of the drought were less severe in other Southeastern States (5).

Costs per bushel in the Southeast, at \$5.59, were higher than in the North Central, but were \$0.35 below costs in the Delta (table 6). Much of the higher costs can be attributed to the regional effects of the drought during 1986. The Southeast, however, also had a higher proportion of small soybean farms. Production costs generally decline as farm size increases. We would expect, therefore, that Southeast producers have higher costs even during "normal" years.

Southeast soybean growers had per-acre production costs of about \$130, the second highest among the regions. Variable expenses, however, were highest in the Southeast. Increased fertilizer and chemical costs accounted for most of the differences. Fertilizer expenses were more than \$6 per acre higher than in the other regions. Greater fertilizer use was likely to compensate for the region's poorer soils. Similarly, weed and insect pressures are typically high in the Southeast, so greater pesticide use is often necessary.

Other facts:

- Per-acre average soybean yield of 23 bushels was well below the North Central region, but was about 4 bushels above the Delta.
- Per-farm soybean acreage was much lower than in the Delta. However, Southeast growers had a larger average soybean acreage than North Central growers.
- Southeast growers made significant use of double-cropping. More than 25 percent of the soybean acreage was double-cropped, compared with 7 percent nationally.
- A majority of Southeast soybean farms were classified as small farms. Nearly 60 percent of farms were in the smallest economic class, compared with 35 percent or less in the other regions. However, a higher percentage of Southeast soybean farms were in the largest economic class than in the other regions. Average sales per farm were also highest in the Southeast.
- Southeast soybean growers received the lowest per-farm Government payments. This is partly due to the lowest program participation rate, 55 percent, of any region.



- Southeast soybean farms were in the best financial condition. About 78 percent of farms were in the favorable and marginal income financial categories, and only 11 percent were financially vulnerable. The debt/asset ratio was also lowest for Southeast farms. The good financial standing reflects the age of many Southeast growers. The Southeast had the

highest concentration of older, more established soybean farmers, who are more likely to be financially secure.

- Net farm income on Southeast soybean farms was negative and much lower than in the other regions. Off-farm income, above \$18,000 per farm, ranked second among the regions.

Glossary

Soybean farms represent those selected in the 1986 Farm Costs and Returns Survey, Soybean Cost of Production version. Soybean farms are defined as farm operations which planted soybeans in 1986 with the intent of harvesting beans.

Soybean production regions are groups of States with common cultural practices in raising soybeans: The North Central includes IL, IN, IA, MN, MO, NE, and OH; the Southeast includes AL, GA, KY, NC, and TN; and the Delta includes AK, LA, and MS.

Total economic costs represent the costs that, in the long run, must be paid to retain resources in soybean production. Included are variable cash expenses, fixed cash expenses (less interest expenses), and imputed costs of owned inputs used in production.

Low-cost producers are the 25 percent of soybean producers with the lowest per-bushel total economic costs. Those producers have economic costs per bushel of \$3.98 or less:

High-cost producers are the 25 percent of soybean producers with the highest per-bushel total economic costs. Those producers have economic costs per bushel of \$5.59 or more.

Enterprise size categories are specified as farms with under 25 soybean acres, 25 to 99 acres, 100 to 499 acres, and 500 or more acres.

Production specialty is the farm production classification that represents the largest portion of gross commodity receipts from the farm operation.

Financial position describes the financial health of a farm business from a combination of income (net farm income) and solvency (debt/asset ratio) measures. Farms are categorized into one of four classes:

- **Favorable**--positive income and debt/asset ratio less than 0.40. These farms are generally considered financially stable.

- **Marginal income**--negative income and a debt/asset ratio less than 0.40. Periods of negative income may not pose financial difficulties if these farms are carrying a low debt load and can either borrow against equity or have outside income sources.

- **Marginal solvency**--positive income and a debt/asset ratio above 0.40. A high debt/asset ratio may be acceptable if these farms can generate enough income to service their debt and meet other financial obligations.

- **Vulnerable**--negative income and a debt/asset ratio above 0.40. These farms are generally considered financially unstable.

Economic class is an economic classification of farm size. The classification is based on the gross receipts, including gross annual sales of crops; livestock, poultry, and products; miscellaneous agricultural products; and all Government payments of the farm operation.

Net cash income is gross cash operating income from farming less total operating expenses. Cash operating income from farming includes livestock and crop sales, Government payments (including premiums from payment-in-kind certificates), income from custom work, income from rented land, and net change in Commodity Credit Corporation loans. Total operating expenses do not include interest paid.

Net farm income is gross farm income less total farm expenses. Gross farm income includes cash operating income from farming, net change in total inventories, value of home consumption, and an imputed rental value of the farm operator dwelling. Total farm expenses include operating expenses (including interest paid), depreciation, and noncash benefits provided to hired workers.

Capital replacement, or economic depreciation, represents a charge sufficient to maintain a machinery or equipment investment and production capacity through time. Included are replacement costs for machinery, vehicles, and irrigation equipment.

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Appendix 1: About the Accounting System

The accounting of costs and returns presented here follows Economic Research Service methods and format. Three characteristics distinguish the estimates from other cost accounting systems. In this report, costs and returns exclude the direct effects of Government programs, combine operation and landlord costs and returns, and separate production and marketing costs.

The costs and returns presented in this report vary slightly from those published in the *Economic Indicators of the Farm Sector* series published by USDA's Economic Research Service (ERS). The information in this report is from a new system, called the Farm-Level Budget Model (FLBM). The data published in the *Economic Indicators* series are from a version of the Firm Enterprise Data System (FEDS). Under the FLBM, the costs and returns are calculated for each farm observation, and then farms are weighted to provide State, regional, and national estimates. Under the FEDS, cost and return estimates are calculated as if all production for a commodity is produced on a single average acre in the State. The FLBM allows for the distributional analysis presented in this report, but the FEDS does not. Differences in estimates can arise under the two systems due to the assumptions in FEDS about average practices in States.

The accounting of costs and returns follows the ERS methods and format. The methods and format have been developed over time with input from the National Agricultural Cost of Production Standards Review Board, which was established under the Agricultural and Food Act of 1981. This format was revised in the early 1980's after reviews by commodity groups, land-grant university economists, and farmers.

Economic costs are designed to account for the value of all inputs in production. An estimated cost is calculated for all inputs--whether owned, rented, or financed--in a consistent manner. That is, economic costs represent the production situation as if the operation and landlord fully own the production inputs. Therefore, the economic costs section does not include any interest payments for loans. This full ownership assumption allows comparisons among producers without regard to the actual ownership and debt positions of producers.

There are three underlying characteristics of the ERS estimates of crop costs and returns that distinguish them from other cost accounting systems:

- **Government programs.** ERS estimates exclude the direct effects of Government programs where possible. Thus, policymakers may be informed as to production costs and returns in the absence of programs. Participants in an income-support program must set aside or conserve a portion of their acreage that would have been planted to a particular crop. In return, participants receive direct Government payments based on production of the crop on the remaining acreage. Participants may also be required to incur costs by maintaining a cover crop or by controlling weeds on set-aside acreage. ERS does not include either of these costs or direct payments for participating in the Government commodity-based income-support programs. If ERS included the direct effects of Government programs on costs, the greatest effect would generally be on the cost for land (see 3).

However, exclusion of all effects from Government programs is not possible. For example, participants forgo current income from their acreage that is set aside, which may lead to increased output on the acreage in following years because the land has been fallowed or planted to legumes. For another example, both participants and nonparticipants are affected when the supply of a crop is restricted and prices rise. Also, prices of specialized inputs, particularly cropland, tend to increase as expected income increases either from higher output prices or direct Government commodity program payments.

- **Combined operation-landlord costs and returns.** The estimates of costs and returns are for the farm operation and landlord combined, as if they were one business. Thus, each line item is for both the farm operation and landlord. The combined operation-landlord account also means that estimates of cash expenses do not include an expense for cash- and share-rent expenses paid by the farm operation to the landlord. A rental expense to the farm business is exactly canceled as an income to the landlord. Estimates of cash expenses include

an interest expense, however, because the interest is paid to those other than the combined operation-landlord entity.

- **Separation of production and marketing costs.** To separate the costs of production from the costs of marketing, the production costs are

incurred to the point of first sale, or storage if the commodity is not sold immediately after harvest. Costs of drying and costs of hauling the crop to the elevator or processor are included. Because storage costs are excluded, the commodity is valued at its time of harvest.

Appendix table 1--Characteristics of soybean farm operations by economic cost class, 1986

Item	Unit	Economic cost group			All farms
		Low-cost producers	Mid-cost producers	High-cost producers	
Share of U.S.:					
Soybean farms	Percent	25	50	25	100
Soybean production	Percent	38	51	11	100
Soybean yield	Bushels/acre	43	37	17	34
Size:					
Total operated acreage	Acres	599	456	376	471
Planted soybean acreage	Acres	186	149	128	153
Economic class--					
\$250,000 or more	Percent of farms	18	5	4	8
\$100,000-\$249,999	Percent of farms	43	28	18	29
\$40,000-\$99,999	Percent of farms	18	34	16	26
\$0-\$39,999	Percent of farms	21	33	62	37
Cultural practices:					
Single crop, row planting	Percent of acreage	69	80	64	73
Single crop, drill planting	Percent of acreage	27	16	18	20
Double crop, row planting	Percent of acreage	2	2	12	4
Double crop, drill planting	Percent of acreage	2	2	6	3
Production specialty:					
Cash grains	Percent of farms	67	69	44	62
Other crops	Percent of farms	27	25	42	30
Livestock	Percent of farms	6	6	14	8
Livestock inventory	Percent of farms	69	59	61	62
Financial position:					
Favorable	Percent of farms	48	47	50	48
Marginal income	Percent of farms	16	16	21	17
Marginal solvency	Percent of farms	17	19	14	17
Vulnerable	Percent of farms	19	18	15	18
Age distribution:					
Fewer than 25 years	Percent of farms	1	3	0	2
26-49 years	Percent of farms	59	52	56	55
50-65 years	Percent of farms	36	32	30	32
Greater than 65 years	Percent of farms	4	13	14	11
Major occupation:					
Farming	Percent of farms	81	87	69	81
Other	Percent of farms	19	13	31	19
Farm organization:					
Partnership	Percent of farms	12	7	8	9
Individual	Percent of farms	82	91	90	88
Corporations and cooperatives	Percent of farms	6	2	2	3
Per farm:					
Sales	Dollars	126,068	71,604	54,037	80,492
Government payments	Dollars	17,767	11,395	7,193	11,887
Net cash income	Dollars	46,063	19,862	3,375	22,088
Net farm income	Dollars	13,683	9,287	-12,044	4,927
Off-farm income	Dollars	27,853	23,870	20,280	23,932
Assets	Dollars	454,598	315,422	242,609	331,014
Debt	Dollars	142,557	102,689	74,808	105,365
Debt/asset	Ratio	.31	.33	.31	.32
Government payments	Percent of farms	86	80	58	76

Appendix table 2--U.S. soybean production costs per acre by economic cost class, 1986

Item	Economic cost group			All farms
	Low-cost producers	Mid-cost producers	High-cost producers	
<i>Dollars per acre</i>				
Gross value of production	206.07	177.61	85.81	166.58
Total cash expenses	78.52	87.54	85.62	84.43
Variable cash expenses	41.74	48.66	55.43	48.03
Seed	10.81	10.93	10.51	10.81
Fertilizer	3.59	4.88	9.68	5.51
Chemicals	10.81	12.86	12.35	12.14
Custom operations	1.97	3.60	2.55	2.89
Fuel, lube, and electricity	4.57	5.88	6.16	5.55
Repairs	5.69	6.55	7.52	6.50
Hired labor	4.26	3.94	6.59	4.60
Technical services	.02	.04	.06	.04
Fixed cash expenses	36.78	38.88	30.19	36.40
General farm overhead	8.81	11.46	7.42	9.81
Taxes and insurance	10.39	11.14	11.17	10.92
Interest on operating loans	6.06	6.61	5.17	6.14
Interest on real estate	11.53	9.67	6.42	9.53
Total economic costs	147.19	168.45	137.12	155.42
Variable cash expenses	41.74	48.66	55.43	48.03
General farm overhead	8.81	11.46	7.42	9.81
Taxes and insurance	10.39	11.14	11.17	10.92
Capital replacement	9.97	10.86	11.75	10.78
Opportunity costs of owned inputs:				
Operating capital	.75	.88	1.00	.86
Nonland capital	6.19	7.88	8.10	7.42
Land	62.90	66.55	31.20	57.93
Unpaid labor	6.45	11.01	11.04	9.65
Net returns:				
Value of production less cash expenses	127.55	90.06	.19	82.15
Value of production less economic costs	58.87	9.15	-51.31	11.16

Appendix table 3--Characteristics of soybean farm operations by enterprise size, 1986

Item	Unit	Enterprise size (acres)				All farms
		Fewer than 25	25-99	100-499	500 or more	
Share of U.S.:						
Soybean farms	Percent	15	40	40	5	100
Soybean production	Percent	1	16	59	24	100
Soybean yield	Bushels/acre	37	36	37	29	34
Size:						
Total operated acreage	Acres	199	296	587	1,766	471
Planted soybean acreage	Acres	13	59	213	855	153
Economic class--						
\$250,000 or more	Percent of farms	3	4	11	37	8
\$100,000-\$249,999	Percent of farms	13	21	40	52	29
\$40,000-\$99,999	Percent of farms	13	21	37	10	26
\$0-39,999	Percent of farms	71	56	12	1	37
Cultural practices:						
Single crop, row planting	Percent of acreage	86	82	77	61	73
Single crop, drill planting	Percent of acreage	9	14	20	24	20
Double crop, row planting	Percent of acreage	5	4	2	8	4
Double crop, drill planting	Percent of acreage	0	0	1	7	3
Production specialty:						
Cash grains	Percent of farms	37	55	76	87	62
Other crops	Percent of farms	51	33	21	12	30
Livestock	Percent of farms	12	12	3	1	8
Livestock inventory	Percent of farms	72	68	53	56	62
Financial position:						
Favorable	Percent of farms	57	57	36	40	48
Marginal income	Percent of farms	23	18	14	26	17
Marginal solvency	Percent of farms	14	13	23	12	17
Vulnerable	Percent of farms	6	12	27	22	18
Age distribution:						
Fewer than 25 years	Percent of farms	0	3	2	0	2
26-49 years	Percent of farms	66	42	63	58	55
50-65 years	Percent of farms	24	37	30	39	32
Greater than 65 years	Percent of farms	10	18	5	3	11
Major occupation:						
Farming	Percent of farms	54	81	89	97	81
Other	Percent of farms	46	19	11	3	19
Farm organization:						
Partnership	Percent of farms	1	6	11	34	9
Individual	Percent of farms	99	94	84	52	88
Corporations and cooperatives	Percent of farms	0	0	5	14	3
Per farm:						
Sales	Dollars	46,700	57,931	98,242	222,729	80,492
Government payments	Dollars	4,648	8,311	15,475	33,777	11,887
Net cash income	Dollars	8,174	14,654	34,073	28,031	22,088
Net farm income	Dollars	-10,891	10,058	10,563	-35,680	4,927
Off-farm income	Dollars	21,022	24,658	25,302	15,576	23,932
Assets	Dollars	163,776	285,197	383,583	777,796	331,014
Debt	Dollars	43,360	68,447	147,745	251,129	105,365
Debt/asset	Ratio	.26	.24	.39	.32	.32
Government payments	Percent of farms	54	72	86	89	76

Appendix table 4--U.S. soybean production costs per acre by enterprise size, 1986

Item	Enterprise size (acres)				All farms
	Fewer than 25	25-99	100-499	500 or more	
	<i>Dollars per acre</i>				
Gross value of production	179.71	172.87	177.75	140.19	166.58
Total cash expenses	115.77	90.53	84.25	79.99	84.43
Variable cash expenses	62.97	50.17	46.30	49.61	48.03
Seed	11.46	11.67	10.82	10.27	10.81
Fertilizer	6.47	4.74	5.85	5.23	5.51
Chemicals	18.79	13.79	11.62	11.95	12.14
Custom operations	6.83	6.26	2.28	2.04	2.89
Fuel, lube, and electricity	9.49	6.07	5.60	4.96	5.55
Repairs	8.14	5.92	6.54	6.69	6.50
Hired labor	1.76	1.59	3.56	8.50	4.60
Technical services	.02	.13	.03	0	.04
Fixed cash expenses	52.80	40.36	37.95	30.37	36.40
General farm overhead	17.89	13.54	9.86	7.24	9.81
Taxes and insurance	15.40	13.64	10.82	9.41	10.92
Interest on operating loans	3.88	5.76	6.17	6.39	6.14
Interest on real estate	15.63	7.42	11.09	7.35	9.53
Total economic costs	200.40	176.46	159.38	133.73	155.42
Variable cash expenses	62.97	50.17	46.30	49.61	48.03
General farm overhead	17.89	13.54	9.86	7.24	9.81
Taxes and insurance	15.40	13.64	10.82	9.41	10.92
Capital replacement	12.74	10.32	10.90	10.71	10.78
Opportunity costs of owned inputs:					
Operating capital	1.13	.90	.83	.89	.86
Nonland capital	12.01	11.31	7.33	5.23	7.42
Land	53.06	63.11	62.68	45.77	57.93
Unpaid labor	25.21	13.47	10.65	4.83	9.65
Net returns:					
Value of production					
less cash expenses	63.94	82.34	93.50	60.20	82.15
Value of production					
less economic costs	-20.69	-3.59	18.36	6.46	11.16

Appendix table 5--Characteristics of soybean farm operations by production region, 1986

Item	Unit	Region			All farms
		North Central	Southeast	Delta	
Share of U.S.:					
Soybean farms	Percent	83	11	6	100
Soybean production	Percent	83	8	9	100
Soybean yield	Bushels/acre	40	23	19	34
Size:					
Total operated acreage	Percent of farms	430	540	916	471
Planted soybean acreage	Percent of farms	132	163	437	153
Economic class--					
\$250,000 or more	Percent of farms	8	10	9	8
\$100,000-\$249,000	Percent of farms	30	19	26	29
\$40,000-\$99,999	Percent of farms	27	12	35	26
\$0-\$39,999	Percent of farms	35	59	30	37
Cultural practices:					
Single crop, row planting	Percent of acreage	80	62	56	73
Single crop, drill planting	Percent of acreage	20	11	30	20
Double crop, row planting	Percent of acreage	0	19	6	4
Double crop, drill planting	Percent of acreage	0	8	8	3
Production specialty:					
Cash grains	Percent of farms	64	39	79	62
Other crops	Percent of farms	27	57	21	30
Livestock	Percent of farms	9	4	0	8
Livestock inventory	Percent of farms	66	52	21	62
Financial position:					
Favorable	Percent of farms	49	47	35	48
Marginal income	Percent of farms	16	31	9	17
Marginal solvency	Percent of farms	18	11	16	17
Vulnerable	Percent of farms	17	11	40	18
Age distribution:					
Fewer than 25 years	Percent of farms	1	0	14	2
26-49 years	Percent of farms	57	45	34	55
50-65 years	Percent of farms	31	34	49	32
Greater than 65 years	Percent of farms	10	21	2	11
Major occupation:					
Farming	Percent of farms	80	82	91	81
Other	Percent of farms	20	18	9	19
Farm organization:					
Partnership	Percent of farms	7	13	30	9
Individual	Percent of farms	90	85	65	88
Corporations and cooperatives	Percent of farms	3	2	4	3
Per farm:					
Sales	Dollars	77,537	100,661	83,910	80,492
Government payments	Dollars	12,184	6,866	17,388	11,887
Net cash income	Dollars	25,027	6,193	10,561	22,088
Net farm income	Dollars	10,677	-32,424	-5,429	4,927
Off-farm income	Dollars	25,392	18,337	13,698	23,932
Assets	Dollars	329,203	356,885	306,743	331,014
Debt	Dollars	104,080	89,390	155,160	105,365
Debt/asset	Ratio	.32	.25	.51	.32
Government payments	Percent	80	55	60	76

Appendix table 6--U.S. soybean production costs per acre by region, 1986

Item	Region			All farms
	North Central	Southeast	Delta	
	<i>Dollars per acre</i>			
Gross value of production	191.65	115.05	94.46	166.58
Total cash expenses	88.94	84.97	64.34	84.43
Variable cash expenses	46.90	58.88	45.10	48.03
Seed	11.16	9.66	10.08	10.81
Fertilizer	4.61	11.58	5.09	5.51
Chemicals	12.58	14.57	8.46	12.14
Custom operations	3.19	3.65	1.02	2.89
Fuel, lube, and electricity	5.59	5.76	5.17	5.55
Repairs	6.15	6.76	7.85	6.50
Hired labor	3.58	6.88	7.40	4.60
Technical services	.04	0	.07	.04
Fixed cash expenses	42.04	26.09	19.23	36.40
General farm overhead	11.32	5.79	6.10	9.81
Taxes and insurance	11.91	10.10	7.19	10.92
Interest on operating loans	6.84	4.62	4.19	6.14
Interest on real estate	11.97	5.58	1.77	9.53
Total economic costs	169.50	129.91	112.44	155.42
Variable cash expenses	46.90	58.88	45.10	48.03
General farm overhead	11.32	5.79	6.10	9.81
Taxes and insurance	11.91	10.10	7.19	10.92
Capital replacement	10.63	10.51	11.63	10.78
Opportunity costs of owned inputs:				
Operating capital	.84	1.06	.81	.86
Nonland capital	7.86	6.80	5.99	7.42
Land	70.24	28.93	25.20	57.93
Unpaid labor	9.79	7.85	10.36	9.65
Net returns:				
Value of production less cash expenses	102.70	30.08	30.13	82.15
Value of production less economic costs	22.15	-14.86	-17.97	11.16

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