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Use and Cost of Soil Conservation and Water Quality Practices in the Southeast

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ABSTRACT

The most frequently used conservation practices in the Southeast are terracing, sod waterways, permanent vegetative cover crops, and conservation tillage. Costs of terracing per acre ranged from $125 in Kentucky to $17 in South Carolina. Sod waterway costs ranged from $1,854 in Kentucky to $858 in Tennessee. Permanent vegetative cover costs ranged from a high of $121 in South Carolina to a low of $73 in North Carolina. Conservation tillage costs ranged from a high of $48 per acre in Florida to a low of $9 in Tennessee.

Keywords: Costs, trends in conservation practices, terracing, sod waterways, permanent vegetative cover, conservation tillage.

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This paper was prepared for limited distribution to the research community outside the U.S. Department of Agriculture.
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SUMMARY

Terracing, sod waterways, permanent vegetative cover crops, and conservation tillage are the most frequently used conservation practices, according to Agricultural Stabilization and Conservation Service data on cost-sharing participation for farm practices.

The cost of establishing permanent vegetative cover crops varied from a high of $122 per acre in South Carolina to a low of $74 in North Carolina.

The cost of establishing sod waterways ranged from a high of $1,530 per acre in Virginia to a low of $856 in Tennessee. If the waterway serves 20-acre drainage area, these costs would be $77 per acre served for Virginia and $42 for Tennessee.

The cost of terracing per acre served varied from a high of $125 per acre in Kentucky to a low of $17 in South Carolina. The cost per linear foot of terracing varied from 5 to 30 cents.

The cost of conservation tillage practices cost shared by ASCS ranged from a high of $39 per acre in Florida to a low of $12 in North Carolina. These costs included only the application of herbicides and tillage planting. No other costs were considered.

Data on corn and soybean costs with conventional tillage and no-till systems are presented, not to establish the exact costs, but to develop some representative information for comparison purposes. There may be some additional costs associated with both no-till and conventional tillage. Also, all types of soil will not respond similarly to either method. However, if available data indicate that costs are fairly equal and production does not vary greatly, no-till would be advantageous just to control runoff and water pollution.

Acreage in both minimum tillage and no-till systems roughly tripled in the Southeastern States between 1973 and 1982, while acreage in conventional tillage decreased approximately 12 percent. While the adopting of conservation tillage systems has increased, information on yield and cost effects beyond small area studies is very limited. As additional information becomes available from research studies and field experiences, the information base for evaluating minimum tillage and no-till systems will be greatly improved.

INTRODUCTION

This report presents information on the use of management practices for soil conservation and for the control of agricultural nonpoint source water pollution in Alabama, Florida, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, and Virginia. We specifically discuss (1) the extent and costs of conservation practices funded by the Agricultural Conservation Program (ACP) administered by the U.S. Department of Agriculture's Agricultural Stabilization and Conservation Service (ASCS); (2) trends in adoption of conservation tillage and minimum tillage systems; and (3) impacts of minimum tillage systems on production costs for corn and soybeans.

We reviewed research reports and other published data to identify trends in use and cost of selected conservation practices (2, 3, 4).[1/] We also contacted personnel in the Soil Conservation Service (SCS), Extension Service (ES), and ASCS to obtain cost data to augment limited published data.

Extensive data on the number of conservation practices installed are not available. Limited data were available on the most important practices utilized in each State from two USDA sources: Agricultural Statistics (2) and annual summaries of the ACP (1).

Information on these trends is important in the assessment of public policies designed to conserve soil and reduce agricultural nonpoint water pollution. Public Law 92-500 and other congressional actions have established goals and policies to restore lakes, rivers, and streams to conditions allowing safe fishing and swimming. Section 208 established goals of reducing nonpoint pollution and made individual States responsible for the identification and development of agricultural nonpoint source pollution controls.[2/]

Means for meeting those goals include improved management practices. Individual practices or systems of practices, while helping to reduce nonpoint pollution, may increase costs for farmers or reduce production. Many existing soil conservation practices help improve water quality and reduce agricultural nonpoint source pollution. However, not all water quality problems are due to soil erosion, so other types of practices are often needed. In the Southeastern United States such soil conservation practices include structural measures, crop rotation, less intensive cropping systems, and conservation tillage. These practices are designed to control onsite erosion rather than deal with sediment after it has been eroded from the land (1, 14).

1/ Underscored numbers in parentheses refer to items in Reference section.

2/ Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) Section 208 (a) (2) (F).

Conservation practices can be very beneficial to southeastern farmers (10). The region generally receives considerable rainfall during its long growing season, but uneven distribution aggravates the water pollution problem. Heavy spring rainfall presents a water runoff and erosion potential because soils are usually high in moisture, and because it usually comes during periods of active soil tillage and heavy applications of fertilizer and pesticides.

USE AND COST OF VARIOUS PRACTICES

Numerous practices are used in the Southeast to reduce soil erosion and improve water quality. Some increase production costs or reduce crop yields, while others such as contour planting and stripcropping, do not affect costs or yields as much. USDA encourages adoption of soil conservation practices through a variety of programs. Permanent vegetative cover, sod waterways, terraces, and conservation tillage are implemented through ACP.

Generalized cost data for establishing conservation practices are very scarce. Our search of published reports found little cost data useful in developing general guidelines for the variety of operations and conditions in the Southeast. Therefore, this report uses estimates from ASCS' annual reports (1).

The ASCS annual reports provide the following type of information for each State: (1) type of practices, (2) number of participants, (3) number of acres established or number of acres served, (4) average payment per acre established and average cost per acre served. The information summarizes actual payments to farmers participating in regular term agreements. Since many farmers establish conservation practices without cost-sharing assistance, the number of practices reported is less than the total established.

Permanent Vegetative Cover

One of the most frequently used conservation practices in the Southeast is establishment of permanent vegetative cover or cover crops. Such cover is relatively simple to establish, does not take land out of production, and, once established, can be used for grazing cattle and other livestock. All States had more acres in this practice than in any other ACP practice in 1982.

While still popular in the Southeast, use of permanent cover crops declined approximately 36 percent from 1978 to 1982 (table 1). In 1982, 126,762 acres were established for conservation and pollution abatement. Tennessee had 26,403 acres planted in permanent cover crops in 1982, which was the largest acreage of any of the eight States (table 1). Kentucky was next with about 27,000 acres. The number of acres established declined in all States between 1978 and 1982. The most dramatic decrease was in Tennessee, a 46-percent decrease from the 1978 acreage.

Table 1 — Acreage established in permanent cover crops under ACP for Southeastern States[1/]

State	1978	1979	1980	1981	1982
			Acres		
Alabama	25,420	33,629	17,294	19,995	14,426
Florida	22,031	39,195	21,008	17,519	21,352
Georgia	22,702	31,525	19,660	23,475	19,410
Kentucky	46,703	70,880	32,047	29,426	26,793
North Carolina	13,683	16,683	9,656	11,585	9,019
South Carolina	7,209	9,080	3,866	4,227	3,070
Tennessee	48,801	65,449	33,670	31,798	26,403
Virginia	13,322	17,705	7,495	7,408	6,289
Total	199,871	284,146	144,696	145,433	126,762

1/ By regular ACP agreements.

Source: (1).

ACP cost-sharing authorized for establishing permanent vegetative cover includes costs of minerals, seed, seedbed preparation, and seeding. Fifty percent of the cost is normally shared. In some isolated cases, cost-sharing goes as high as 80 percent. A participant must agree to certain requirements to qualify for cost-sharing, such as maintaining the cover for a minimum of 5 years without additional payments.

Tennessee reported the greatest number of participants, 2,627 (table 2), who established 26,403 acres qualifying for cost-sharing in 1982 (table 1). Kentucky had more acreage established, but fewer participants. South Carolina had the lowest number of participants, 355.

The cost of establishing permanent vegetative cover varies from farm to farm, partly accounting for the wide cost differences between the eight Southeastern States. Costs of such items as seed and fertilizer vary considerably based on the type of cover the farmer chooses to plant.

Average total costs of establishing this practice varied from a high of $122 per acre in South Carolina to a low of $74 in North Carolina (table 2). ASCS cost-sharing paid approximately 50 percent of this cost in most cases.

Sod Waterways

Sod waterways are commonly used to control runoff in the Southeast. No large changes occurred between 1978 and 1982 (table 3). However, total acreage dropped 45 percent from 1981 to 1982. The eight States had 54,295 acres served in

Table 2 -- Establishment of permanent cover crops under ACP in Southeastern States, 1982

State	Participants	Average cost-share payment per acre	Average total cost per acre 1/
	Number	----- Dollars	----
Alabama	977	49.39	98.78
Florida	869	49.12	98.24
Georgia	1,798	49.26	98.52
Kentucky	2,263	46.44	92.88
North Carolina	1,495	36.87	73.74
South Carolina	355	60.77	121.54
Tennessee	2,627	40.40	80.80
Virginia	836	50.68	101.36
Total	11,220	--	--

-- = Not applicable.
1/Assumes ACP payments represent 50 percent of total cost.

Source: (1).

Table 3 -- Acreage served by sod waterways installed under ACP in Southeastern States 1/

State	1978	1979	1980	1981	1982
			Acres		
Alabama	12,557	17,655	11,256	9,464	6,135
Florida	2,317	1,817	972	1,745	1,293
Georgia	5,659	6,977	7,373	16,563	4,790
Kentucky	14,350	20,274	14,844	10,415	7,719
North Carolina	7,222	8,373	7,764	8,345	4,851
South Carolina	1,876	2,667	1,729	2,039	654
Tennessee	7,721	8,998	3,542	3,459	2,395
Virginia	2,593	3,932	2,583	3,368	2,038
Total	54,295	70,693	50,063	55,398	29,875

1/By regular ACP agreements.

Source: (1).

1978 and 30,078 in 1982. These figures are the total acres in the ASCS program each year and are not additive between years. All States showed some decrease from 1978 through 1982 in establishment of sod waterways (table 3). Alabama had the greatest absolute decrease, but Tennessee, with 69 percent, had the greatest relative decrease.

Sod waterways normally cost less to develop than open ditches or underground drain systems. Disadvantages of sod waterways include the removal of land from production and high establishment costs. These can be important factors when productive land is in short supply on a given farm. Also, installing a waterway can be expensive, especially when earth moving or grading is required.

The type and size of sod waterways and the area served vary considerably, not only within counties but within a given cultivated area. For example, a half-acre sod waterway could serve the drainage area of 10 acres in one area. But, in another, 1 acre would be needed to protect 5 acres. As with many conservation practices, the size of a sod waterway depends upon the slope and topography of the cultivated area. This study developed relationships assuming that a 1-acre sod waterway will serve approximately 20 cropland acres of 3-4 percent slope (5). However, many waterways are smaller than 1 acre.

Grading and soil moving is required in order to establish the proper area to handle the drainage. These operations significantly increase the costs of installing sod waterways as compared to the cost of developing a permanent vegetative cover.

The average cost of establishing 1 acre of sod waterway varied from a high of $1,530 in Virginia to a low of $856 in Tennessee (table 4). The costs are generally in the range estimated by SCS (5). With the assumption that a 1-acre waterway serves 20 acres of cropland, the cost per acre served for Virginia in 1982 was $77 and $42 for Tennessee (table 5).

Terraces

Terracing was one of the first conservation practices recommended by SCS when the agency was created in the thirties. There have been changes in the type of terrace from the bench type to the channel terrace, with variations from open runoff to those with pipe drainage.

Terraces are expensive to construct, particularly on steeply sloping land. However, in certain instances terraces are more effective at controlling erosion and preventing sediment loss than other alternatives. Broad-base channel terraces do not take land out of production. One reason for the high cost of terracing is because land now being terraced is steeper than that previously terraced.

Table 4 -- Establishment of sod waterways under ACP in Southeastern States, 1982

State	Particip- ipants	Acres estab- lished	Average cost share payment per acre established	Average total cost per acre established1/
	----Number---		--------Dollars-------	
Alabama	192	307	544	1,088
Florida	38	65	513	1,026
Georgia	158	240	440	880
Kentucky	383	386	739	1,478
North Carolina	373	243	616	1,232
South Carolina	28	33	721	1,442
Tennessee	149	120	428	856
Virginia	153	102	765	1,530
Total	1,474	1,496	--	--

-- = Not applicable.
1/Assumes ACP payments represent 50 percent of total cost.

Source: (1).

Table 5 -- Acreage served by the ACP payment and total cost per acre of sod waterways in Southeastern States, 1982

State	Acres served	Average cost share payment per acre served1/	Average total cost per acre served2/
	Number	--------Dollars-------	
Alabama	6,135	27	54
Florida	1,293	26	52
Georgia	4,790	22	44
Kentucky	7,719	37	74
North Carolina	4,851	31	62
South Carolina	654	36	72
Tennessee	2,395	21	42
Virginia	2,038	38	76
Total	29,875	--	--

-- = Not applicable.
1/Assumes 1 acre of waterway serves 20 acres of cropland.
2/Assumes ACP payments represent 50 percent of total cost.

Source: (1).

The eight Southeastern States had 30,214 acres served by terraces installed in 1982, down by 17 percent from 1978 (table 6). The number of acres served in 1979 was 52,422. This was the leading year for terrace installations for the 5-year period.

Table 6 -- Acres served by terraces installed under ACP in Southeastern States[1/]

State	1978	1979	1980	1981	1982
			Acres served [2/]		
Alabama	14,509	20,097	15,076	12,619	8,656
Florida	4,077	6,823	2,095	2,386	1,559
Georgia	11,734	15,487	16,734	18,744	14,304
Kentucky	35	76	490	670	268
North Carolina	397	536	752	552	293
South Carolina	2,241	3,958	2,243	1,905	901
Tennessee	3,234	5,379	4,556	5,303	4,191
Virginia	23	66	116	72	42
Total	36,250	52,422	42,062	42,251	30,214

1/By ACP regular agreements.
2/Acres served represent annual installation, not cumulative.

Source: (1).

Cost of constructing terraces depends upon the type of terrace and topography of the land. Costs for a normal channel type terrace constructed on land with a 2-4 percent slope vary from a low of 5 cents per linear foot to a high of 30 cents (5). Systems installed with underground outlets can cost twice as much. Terraces constructed on land with 5-8 percent slope could cost as much as 30 cents per foot. We assumed a cost of 15 cents per linear foot to estimate the cost of terracing for each State. The amount of linear terracing constructed per acre served would depend upon the slope and topography of the land; land with a 2-4 percent slope would require approximately 420 linear feet of a channel type terrace per acre (5).

ASCS cost-sharing data from each State was used to show the differences in construction costs (1). The total cost of constructing terraces in each State was calculated using the relationship of ASCS payments to the total cost (table 7). For example, if a State received $20,000 as ASCS cost sharing on terraces in 1982 and this payment was for 1,000 acres served, then the payment would have averaged $20 per acre served. If this payment by ASCS was 75 percent of total cost, then the total estimated cost would be $30 per acre served.

Table 7 -- Participation and cost of terraces established under ACP in Southeastern States, 1982

States	Participants	Average cost-share payment per acre served1/	Average total cost per acre served2/
	Number	---------Dollars------	
Alabama	338	34	45
Florida	60	30	40
Georgia	356	29	39
Kentucky	21	94	125
North Carolina	27	35	47
South Carolina	33	13	17
Tennessee	271	50	67
Virginia	5	29	39
Total	1,111	--	--

-- = Not applicable.
1/Based on 420 linear feet of terrace per acre and 2- to 4-percent slope.
2/Assumes ACP payments represent 75 percent of total costs.

Source: (1).

The average total terrace cost in the Southeast varied from a high of $125 per acre served in Kentucky to a low of $17 in South Carolina (table 7).

Conservation Tillage

There has been increasing adoption of farming systems which reduce the stirring of the soil and leave increased amounts of surface residue. This residue subsequently helps reduce soil erosion and the movement of associated pollutants. These conservation tillage practices, which are given a variety of labels, include both minimum tillage and no-till (for definitions see table 8). Planting is the primary tillage activity with no-till; herbicides are used in place of mechanical weed control. No-till is used in the Southeast mostly for corn and soybeans (11).

There have been dramatic increases in the use of minimum tillage and no-till systems in the Southeast between 1973 and 1982. Minimum tillage acreage increased 231 percent and the acreage in no-till systems increased 197 percent (table 8). Acreage in conventional systems decreased by approximately 12

Table 8 -- Trends in acreage in minimum, no-till, and conventional tillage systems in Southeastern States

State and[1/] tillage system	1973	1977	1981	1982
			1,000 acres	
Minimum:				
Alabama	16.5	194.6	814.0	1,174.8
Florida	34.0	20.0	91.0	217.6
Georgia	50.6	1,745.0	3,810.0	3,510.0
Kentucky	1,552.2	1,943.2	1,021.0	1,387.5
North Carolina	578.4	625.9	1,487.0	2,638.0
South Carolina	783.5	1,455.0	991.0	890.0
Tennessee	--	533.0	716.0	741.0
Virginia	370.0	383.8	520.0	642.5
Total	3,385.2	6,900.5	9,450.0	11,201.4
No-till:				
Alabama	17.6	147.8	335.1	430.4
Florida	.6	7.1	11.7	25.5
Georgia	39.5	113.0	436.4	465.4
Kentucky	837.6	988.7	1,170.0	1,475.5
North Carolina	160.5	362.0	370.0	467.0
South Carolina	12.0	21.7	135.4	161.2
Tennessee	44.7	195.7	419.0	449.2
Virginia	258.2	343.2	591.0	594.5
Total	1,370.7	2,179.2	3,468.6	4,068.7
Conventional:				
Alabama	2,705.0	3,652.6	3,080.0	2,632.0
Florida	1,078.8	1,186.5	933.5	803.6
Georgia	3,571.5	3,601.0	839.0	1,400.0
Kentucky	539.5	884.8	2,437.0	1,360.0
North Carolina	3,079.3	3,277.2	3,162.0	2,560.0
South Carolina	1,568.5	1,271.0	1,815.0	1,959.0
Tennessee	3,222.5	1,979.0	2,944.0	2,702.0
Virginia	1,518.7	1,077.1	1,001.3	833.0
Total	17,283.8	16,929.2	16,211.8	15,249.6

-- = No data.

[1/] Definitions used are: Minimum tillage - limited tillage, but where the total field surface is still worked by tillage equipment. No-till - where only the intermediate seed zone is prepared. Up to 25 percent of the surface area could be worked. Could be no-till, till-plant, chisel-plant, rotary strip tillage, etc. Includes many forms of conservation tillage and mulch tillage. Conventional tillage - where 100 percent of the topsoil is mixed or inverted, by plowing, power tiller, or multiple diskings.

Source: No-Till Farmer, March 1974, 1978, 1982, 1983.

percent. All States showed increases in the use of minimum tillage and no-till systems, with the largest increases in Georgia and Alabama. The dramatic decline in acreage in conventional tillage systems in Georgia reflects a rapid shift to minimum and no-till systems.

Relatively few farmers received cost sharing for conservation tillage in 1982. The greatest participation was in North Carolina (table 9). The acreage of conservation tillage in the ASCS costsharing program in 1982 was probably a very small percentage of the total in conservation tillage as it was a new program in 1979 and many farmers that would have qualified did not apply.

The average total cost of conservation tillage discussed here includes only tillage planting and herbicide costs. These costs varied from a high of $39 per acre in Florida to a low of $12 per acre in North Carolina (table 9).

Table 9 -- Participation and costs of conservation tillage, reduced tillage, and no-till systems implemented under ACP in Southeastern States, 1982

State	Participants	Acres	Average ACP payment per acre	Average per acre cost of planting and herbicides 1/
	Number		Dollars	
Alabama	600	37,631	14	19
Florida	31	2,028	29	39
Georgia	188	11,261	25	33
Kentucky	644	25,594	10	13
North Carolina	869	42,310	9	12
South Carolina	498	27,289	20	27
Tennessee	525	31,375	11	15
Virginia	207	10,881	12	16
Total	3,562	188,369	--	--

-- = Not applicable.
1/Assumes ACP payments represent 75 percent of total costs for herbicides and planting.

Source: (1).

Conservation tillage is most applicable for use on land with steeper slopes. More level land with less erosion normally produces more with conventional tillage. Some reports also indicate that conservation tillage can only be practiced on the same land area 2 to 3 years in succession without creating weed problems and soil compaction (8).

Increased use of herbicides and insecticides is necessary when conservation tillage is used. The volume and types of pesticide used depends upon the type of weed growth or insect to be controlled.

No-tillage is a conservation practice that appears to have great promise for preventing soil erosion and water pollution. No-till farming may be defined as the introduction of seed into untilled soil by opening a narrow slot, trench, or band wide and deep enough to obtain seed coverage and soil contact, eliminating plowing, conventional methods of cultivating, and land preparation (9). This practice is a major step forward in conserving both soil and energy. It reduces the number of field operations and per acre energy requirements (10). An additional advantage of no-till over conventional tillage is that row crops can be grown on sloping land previously considered to be unsuitable or marginal for conventional tillage. Disadvantages of no-till include insect and weed problems. The major insect threat to no-till corn in Kentucky is the corn root aphid; a greater probability of insect problems is associated with corn following fescue and other sod types or crop residue (5). Weed control problems are developing in continuous no-till fields. Crop rotations and the use of proper herbicides will help alleviate these problems (10).

No-till farming has not been used on traditional Southeastern crops, such as peanuts, tobacco, or cotton. However, no-till cultivation for corn and soybeans has increased in the Southeast. Initial studies in Kentucky and Virginia estimated about 25 percent of the corn acreage in no-till (12, 13). In 1976, Kentucky and Virginia had an estimated 350,000 and 127,000 acres, respectively, in no-till soybeans (10). No other specific crop data on the extent of no-till farming were found, but given the overall increase in use of no-till, increases in major crop acreage may be inferred.

Stripcropping

Stripcropping is not a widely used conservation practice in the Southeast. In most cases, it is established on land used for such row crops as tobacco, peanuts, and cotton. In 1982, about 2,000 acres of stripcropping were established with ASCS assistance in four of the eight States (table 10). Alabama, Florida, and Georgia reported no stripcropping for 1978-1982. Kentucky, North Carolina, and Virginia had some stripcropping each year.

Stream Protection

Very little use of stream protection occurred in the eight Southeastern States during 1978-1982 (table 11). There were 177 acres in 1978 increasing slowly to 261 acres in 1979 served by this practice under regular ACP agreements. Florida and South Carolina reported no stream protection efforts for the 5-year period.

Sediment Retention Structures

There was a slight increase in conservation and pollution abatement by sediment retention, erosion, or water control structures for these States from 1978 through 1982 (table

12). During this period, Tennessee accounted for approximately 50 percent of the total structures each year except for 1978. Only 13 structures were developed in South Carolina.

Table 10 -- Acreage in stripcropping established under ACP in Southeastern States1/

State	1978	1979	1980	1981	1982
			Acres		
Alabama	-	-	-	-	-
Florida	-	-	-	-	-
Georgia	-	-	-	-	-
Kentucky	364	695	138	515	522
North Carolina	695	703	210	591	353
South Carolina	-	113	240	51	424
Tennessee	-	11	12	-	-
Virginia	305	771	510	623	721
Total	1,364	2,293	1,110	1,780	2,020

-- = no participation.
1/By regular ACP agreements.

Source: (1).

Table 11 -- Acreage served by stream protection under the ACP in Southeastern States1/

State	1978	1979	1980	1981	1982
			Acres		
Alabama	150	225	380	63	90
Florida	--	--	--	--	--
Georgia	10	15	27	3	--
Kentucky	5	10	--	--	11
North Carolina	10	9	18	43	74
South Carolina	--	--	--	--	--
Tennessee	--	--	10	35	--
Virginia	2	2	--	--	10
Total	177	261	435	144	185

-- = no participation.
1/ By regular ACP agreements.

Source: (1).

Table 12 -- Number of structures for sediment retention, erosion, or water runoff control installed under ACP in Southeastern States[1/]

State	1978	1979	1980	1981	1982
			Acres		
Alabama	40	62	50	43	43
Florida	438	723	92	68	73
Georgia	6	8	1	3	3
Kentucky	71	97	118	128	96
North Carolina	10	11	31	17	18
South Carolina	2	2	8	1	--
Tennessee	336	702	820	785	871
Virginia	5	10	22	7	10
Total	908	1,615	1,142	1,052	1,114

-- = no participation.
[1/] By ACP regular agreements.

Source: (1).

COST ESTIMATES FOR ALTERNATIVE TILLAGE SYSTEMS

A partial budgeting approach can be used to compare and evaluate alternative tillage systems when data are available. Costs and revenues can be estimated which reflect the associated crop yield and production inputs for each tillage system. A comparison of the net revenues from the alternative systems would then show which is the most profitable.

Information needed for an economic comparison of no-till and conventional tillage systems in the Southeast is limited. Extensive research results on yield effects and other factors are just becoming available. Thus, this discussion is limited to changes in tillage practices for corn and soybean production. A partial budgeting format was used to organize the production input data.

Yield Estimates

Yield effects of alternative tillage systems depend heavily upon soil type, drainage, and level of management. Belvins found higher yields with no-till systems compared with conventional tillage on silt loam soils and attributed this mostly to more efficient use of soil moisture (table 13) (3). Lepper found yields with no-till to be higher on coarse, sandy, and some loam soils, but lower on clay soils (8).

Management is critical with no-till. More management ability is needed with a no-tillage system than with conventional methods, because there are fewer opportunities to correct errors (9). A University of Florida agronomist suggests that no-till should be thought of as a "packaged" approach to farming.

Table 13 -- Corn yields on different soils under no-tillage vs. conventional tillage

Soil	Soil texture	Slope	Parent material	Corn yield: No-tillage	Corn yield: Conventional tillage
1969:		Pct.		- -Bushels/acre- -	
Crider	silt loam	3	Loess over limestone	142	127
Donerail	silt loam	3	Phosphatic limestone	135	117
Faywood	silt cl. l.	7	Limestone	131	132
Grenada	silt loam	2	Loess over acid sandstone and shale	104	104
Loradale	silt loam	6	Phosphatic limestone	129	110
Lowell	silt loam	8	Limestone	148	131
			Average	132	120
1970:					
Loradale	silt loam	6	Phosphatic limestone	116	115
Maury	silt loam	3	Phosphatic limestone	104	90
Shelbyville	silt loam	4	Limestone and calcareous shale	129	126
Tilsit	silt loam	2	Acid sandstone and shale	104	80
			Average	113	103

Source: (3).

Cost Comparisons

Little generalized information exists on the costs of production with no-till systems in the Southeast. Estimates of no-till production costs were made by adjusting existing USDA-FEDS crop budgets for soybeans and corn using conventional tillage to reflect the omission of the preharvest operations of plowing, harrowing, and cultivation, and the use of additional pesticide.

In Alabama, the cost of these preharvest operations is about $25.00 (table 14 and 15). Adopting a no-till system could thus be expected to reduce operations costs by that amount. However, offsetting these reductions would be increased herbicide costs and possibly higher planting costs.

This analysis stops after estimating costs of producing soybeans and corn in the Southeast as yield data for estimating revenues are not available for all States. Emphasis is on presenting cost rather than net revenue differences between tillage systems. This is reasonable, as the limited data available does not suggest that no-till causes any drastic change in soybean yields. Since data suggest that production costs per acre are less with no-till than with conventional till (tables 16 and 18), no-till is a feasible alternative when the yields are comparable.

Table 14 -- Land preparation and cultivation costs per acre of corn with conventional tillage, Alabama, 1981

Operation and type of equipment	Performance rate	Fixed cost	Variable cost	Total cost per hour	Times over	Total cost per acre
	Hours/acre	---------Dollars/hour-------			No.	Dollars
Break land:						
Plow (4-16M.B)	0.573	1.532	0.520	2.052	1.0	1.18
Tractor (70-79 Hp)	.573	2.566	5.964	8.530	1.0	4.89
Labor	.573	N/A	N/A	3.500	1.0	2.00
Subtotal						8.07
Harrow land:						
Tandem (12 ft)	.208	4.300	.635	4.765	1.8	1.78
Tractor (70-79 Hp)	.208	2.566	5.964	8.530	1.8	3.19
Labor	.208	N/A	N/A	2.650	1.8	1.31
Subtotal						6.28
Cultivate:						
Cultivator (4-R)	.403	1.397	.329	1.726	2.0	1.39
Tractor(70-79 Hp)	.403	2.566	5.964	8.530	2.0	6.87
Labor	.403	N/A	N/A	3.500	2.0	2.82
Subtotal						11.08
Total for all three operations						25.43

N/A = not applicable .

Source: Commodity Economics Division, Economic Research Service, United States Department of Agriculture, Firm Enterprise Data System Crop budgets. Oklahoma State University, Stillwater.

Soybean Production Costs

Average cost of producing soybeans in the Southeast with conventional tillage practices ranged from $156 per acre in Alabama to $118 per acre in North Carolina and Virginia (table 16). With no-till, the reduction in preharvest activities resulted in cost reductions of about $21 per acre for the region. Total production costs for no-till averaged $111 per acre compared with $132 per acre for the conventional practices reflected in table 16. The difference between costs reflects omitted tillage operations. No-till costs are probably low as identical costs for pesticides are assumed for both conventional and no-till systems. The cost difference between the two systems then provides a rough indicator of the amount that could be spent on additional pesticides without increasing total production costs.

Table 15 -- Costs of operations normally omitted in no-till soybeans in the Southeast, 1981

State	Break land	Harrow land	Culti- vate	Total
	Dollars per acre			
Alabama	6.68	6.25	7.86	20.79
Florida	1/	1/	1/	1/
Georgia	5.72	6.11	7.47	19.00
Kentucky	6.29	5.86	7.31	19.46
North Carolina	7.88	7.61	8.38	23.87
South Carolina	5.82	6.29	7.00	19.11
Tennessee	6.38	6.31	9.11	21.80
Virginia	7.32	6.37	6.75	20.44
Average 2/	6.54	6.40	7.69	20.63

1/ No data available on soybeans for Florida.
2/ Seven-State average.

Source: Calculated from Commodity Economics Division, Economic Research Service, United States Department of Agriculture, Firm Enterprise Data System Crop budgets. Oklahoma State University, Stillwater.

Corn Production Costs

Costs of producing corn for grain in the Southeast were estimated using the same procedure as for soybeans. The same practices omitted from conventional till budgets for soybeans were also omitted from corn production budgets to establish the no-till cost estimates (table 17). The highest cost of these omitted practices was in Alabama, $25 per acre; the lowest cost, $20, was in South Carolina. The average for the eight States was $23 (table 18).

The total cost of producing corn for grain in the Southeast averaged $201 per acre for conventional tillage and $178 for notill, a difference of $23 per acre (table 18). Total no-till costs ranged from $147 per acre in Alabama to $197 in North Carolina.

Table 16 -- Costs of producing soybeans under conventional and no-till systems in the Southeast, excluding land cost, 1981

State	Conventional tillage cost	Cost reduction by no-tillage1/	No-till cost2/
		Dollars per acre	
Alabama	156.26	20.79	135.47
Florida	3/	3/	3/
Georgia	152.39	19.00	133.39
Kentucky	118.11	19.46	98.65
North Carolina	119.61	23.87	95.74
South Carolina	134.44	19.11	115.33
Tennessee	122.77	21.80	100.97
Virginia	117.73	20.44	97.29
Average	131.62	20.63	110.97

1/Costs of conventional tillage practices excluded with no-till.
2/This does not include additional pesticide costs which may be associated with no-till.
3/No data available on soybeans for Florida.

Source: Calculated from Commodity Economics Division, Economic Research Service, United States Department of Agriculture, Firm Enterprise Data System Crop budgets. Oklahoma State University, Stillwater.

Table 17 -- Costs of operations normally omitted in no-till corn in the Southeast, 1981

State	Break land	Harrow land	Culti-vate	Total
			Dollars per acre	
Alabama	8.07	6.28	11.08	25.43
Florida	6.82	5.71	8.04	20.57
Georgia	6.74	6.35	8.50	21.59
Kentucky	8.63	5.51	8.30	22.44
North Carolina	8.35	6.21	8.14	22.70
South Carolina	6.80	5.64	7.48	19.92
Tennessee	8.74	6.64	9.84	25.22
Virginia	7.32	5.47	10.79	23.36
Average	7.68	5.98	9.09	22.68

Source: Calculated from Commodity Economics Division, Economic Research Service, United States Department of Agriculture, Firm Enterprise Data System Crop budgets. Oklahoma State University, Stillwater.

Table 18 -- Costs of producing corn for grain with conventional and no-till systems in the Southeast, excluding land cost, 1981

State	Conventional tillage cost	Cost reduction by no-till[1/]	No-till cost[2/]
		Dollars per acre	
Alabama	172.70	25.43	147.27
Florida	177.15	20.57	156.58
Georgia	205.81	21.59	184.22
Kentucky	203.78	22.44	181.34
North Carolina	217.88	22.70	195.18
South Carolina	217.31	19.92	197.39
Tennessee	213.81	25.22	188.59
Virginia	199.74	23.58	176.16
Average	201.02	22.68	178.34

[1/] Costs of conventional tillage practices excluded with no-till.
[2/] This does not include additional pesticides which may be associated with no-till.

Source: Calculated from Commodity Economics Division, Economic Research Service, United States Department of Agriculture, Firm Enterprise Data System Crop budgets. Oklahoma State University, Stillwater.

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