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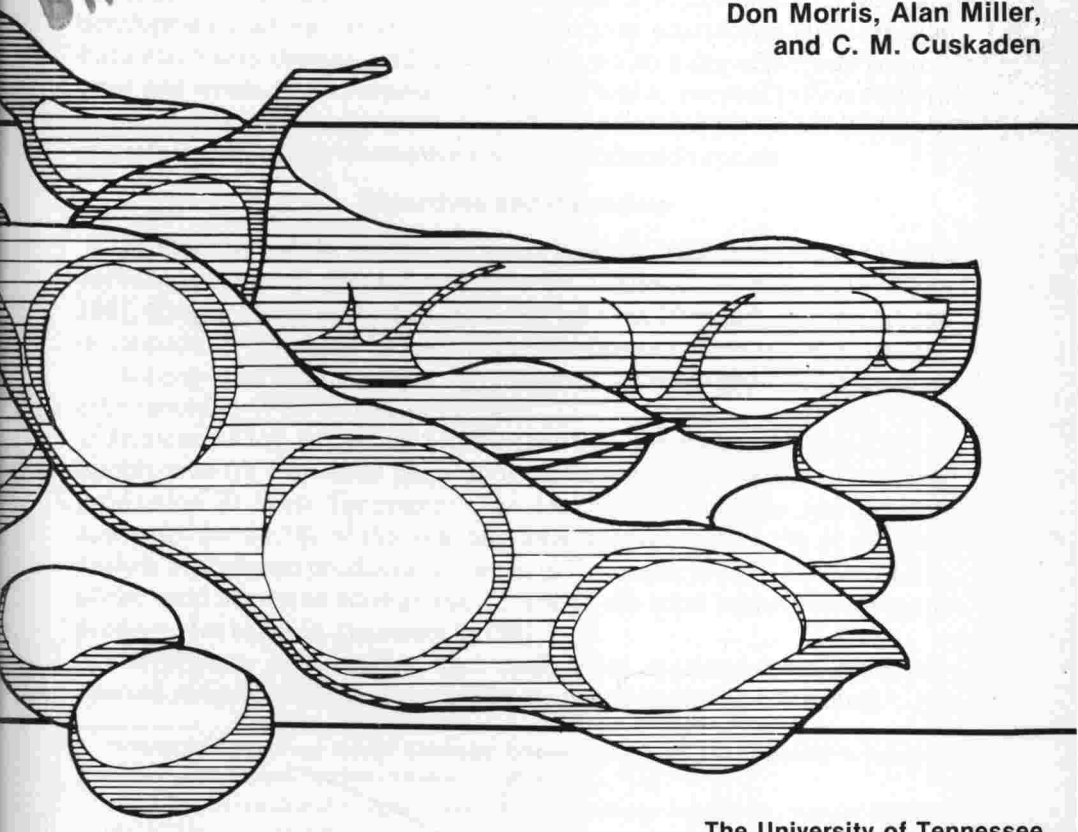
STACKS

Don Morris, Alan Miller,
and C. M. Cuskaden



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Bulletin 629
November 1983

SOYBEAN PRODUCTION SYSTEMS IN TENNESSEE

By Don Morris, Alan Miller and C. M. Cuskaden*

A soybean production system consists of a combination of cultural practices and tillage operations utilized on a soybean field. Traditionally, Tennessee soybean producers have utilized a conventional system which employs the plow-disk-harrow tillage sequence along with the row-crop planting method and mechanical cultivation.

Technical developments in recent years have increased the number of viable soybean production alternatives available to producers. Two main developments giving farmers more production alternatives are: (1) new farm machinery designs, and (2) herbicides which more effectively control grass and weeds. The purpose of this study was to provide information to farm operators and agricultural research and extension personnel which will be useful in evaluating alternative soybean production systems.

Objectives and Procedure

The objectives of the research reported in this bulletin were to: (1) identify soybean production systems used by West Tennessee farmers in 1976 and 1981, (2) analyze changes which occurred between 1976 and 1981 in soybean production systems used by West Tennessee farmers, and (3) summarize the advantages and disadvantages of changing soybean production systems experienced by West Tennessee farmers.

Tennessee Crop Reporting Service Districts 1 and 2 were selected as the sample area for this study because of the heavy concentration of soybean production in West Tennessee. The 18 counties in those two districts accounted for 80.7% of the total harvested acreage and 79.2% of the total bushels of soybeans produced for beans in Tennessee in 1976 and for 74.8% of the total harvested acreage and 73.6% of the total bushels of soybeans produced for beans in Tennessee in 1981.[1]

The primary data used in this study were obtained from randomly selected samples of farm operators by means of mailed questionaires.[2] All

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[1] *Tennessee Agricultural Statistics*, Tennessee Crop Reporting Service, Annual Bulletins T-14 (1977) and T-19 (1982).

[2] Questionnaires were mailed to a random sample of 2,000 farm operators in 1977 to obtain information for the 1976 crop year and to another random sample of 2,000 farm operators in 1982 to obtain information for the 1981 crop year. The sample was drawn by the Tennessee Crop Reporting Service from the Farm Universe List maintained cooperatively with the Tennessee Agricultural Extension Service. Soybeans are produced on approximately 68% of the farms in the sample area (Source: 1978 U.S. Census of Agriculture, State and County Data, Tennessee, farms with sales of $2,500 or more). Therefore, about 1,360 of the 2,000 farm operators in each sample were expected to produce soybeans. The estimated response rates of soybean producers to the surveys were 12% in 1977 and 10% in 1982.

information obtained from respondents pertained to the 1976 and 1981 crop years. Data from 166 farm operators who produced soybeans in 1976 and from 132 farm operators who produced soybeans in 1981 were used in the analyses summarized in this report. Soybean growers providing information for the 1976 crop year were more representative of all soybean growers in the survey area based on acres of soybeans produced per farm than those responding to the second survey (Table 1). However, responses from soy-

Table 1. Soybean Production in 1976 and 1981 by Survey Respondents and Soybean Production in 1978 by All Farmers Producing Soybeans in Survey Area

Soybean Producer Category	Year	Number of Farms	Soybean Acreage per Farm
Survey Respondents	1976	166	225
Survey Respondents	1981	128[a]	307
All Farmers Producing Soybeans[b]	1978	8228	191

[a]Not all respondents reported soybean acreage.

[b]Farms with sales of $2500 or more 1978 U.S. Census of Agriculture, State and County Data, Tennessee.

bean producers surveyed in 1982 were more representative of the sample area than were those of growers surveyed in 1977 in that the number of responses from a particular county was more highly correlated with the number of soybean growers in that county in 1982 than in 1977 (Table 2).

Survey respondents indicated the cropping-planting system(s) they used to produce soybeans by selecting from among eight predetermined combinations listed on the questionnaire.[3] After identifying the soybean production system(s) they used, respondents provided selected information about acreage, machinery use, and production practices for each system they utilized.[4] Growers producing soybeans in 1981 who had used a different production system(s) in 1976 were asked to identify the advantages and/or disadvantages on a predetermined list which they had experienced as a result of changing systems.

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[3]The predetermined cropping-planting alternatives were: (1) single crop-row crop, (2) single crop-grain drill, (3) single crop-no till, (4) single crop-broadcast, (5) double crop-row crop, (6) double crop-grain drill, (7) double crop-no till, and (8) double crop-broadcast. These alternatives were selected based on conversations with farmers and University of Tennessee Agricultural Experiment Station and Extension Service personnel, review of popular farm publications, and review of previous research.

[4]Soybean producers were asked to identify the implements and production practices used with each production system and to indicate the number of times each implement or practice was normally used per field.

Table 2. Distribution of Soybean Producer Survey Responses 1977 and 1982 and Farms Producing Soybeans 1978, by County

County	Soybean Producer[a] Responses 1977		Soybean Producer[c] Responses 1982		Farms Producing Soybeans 1978	
	Number[b]	% Total	Number	% Total	Number[d]	% Total
Carroll	5	3.0	2	1.5	501	6.1
Chester	13	7.9	2	1.5	257	3.1
Crockett	8	4.8	3	2.3	411	5.0
Dyer	8	4.8	11	8.3	598	7.3
Fayette	9	5.5	4	3.0	381	4.6
Gibson	15	9.1	21	15.9	960	11.7
Hardeman	7	4.2	7	5.3	301	3.7
Haywood	10	6.1	6	4.5	421	5.1
Henderson	11	6.7	11	8.3	411	5.0
Henry	7	4.2	5	3.8	450	5.5
Lake	0	0.0	2	1.5	124	1.5
Lauderdale	8	4.8	5	3.8	480	5.8
McNairy	9	5.5	10	7.6	453	5.5
Madison	21	12.7	13	9.8	476	5.8
Obion	9	5.5	12	9.1	606	7.4
Shelby	7	4.2	3	2.3	248	3.0
Tipton	6	3.6	4	3.0	435	5.3
Weakley	12	7.3	11	8.3	715	8.7
TOTAL	165	99.9[e]	132	99.8[e]	8228	100.1[e]

[a]The correlation coefficient between the number of soybean growers responding to the 1977 survey in a county and the total number of soybean growers in that county in 1978 was 0.5.

[b]Soybean producer location was not reported on one questionnaire.

[c]The correlation coefficient between the number of soybean growers responding to the 1982 survey in a county and the total number of soybean growers in that county in 1978 was 0.8.

[d]Farms with sales of $2500 or more, 1978 U.S. Census of Agriculture, State and County Data, Tennessee.

[e]Total does not equal 100% due to rounding error.

Soybean Production Systems

Over 80% of the soybean producers reported utilizing only one cropping-planting system in 1976 (Table 3). However, the proportion of soybean producers using only one cropping-planting system decreased to just under 66% in 1981. The single crop-row crop system was the most frequently reported soybean production system in both 1976 and 1981.[5] It was the only production system used by 72.3% of all soybean producers in 1976. But only 44.7% of all soybean producers reported using only that system in 1981. The proportions of farmers using only the single crop-row crop system in 1976 and 1981 were significantly different (Table 4).

[5]The single crop-row crop system is characterized by soybeans being planted in a seedbed prepared by the plow-disk-harrow sequence in rows wide enough to permit cultivation.

Table 3. Number and Type of Soybean Production Systems Per Farm Reported by West Tennessee Soybean Producers, 1976 and 1981

Number and Type of Production Systems	Producers Reporting 1976		Producers Reporting 1981	
	Number	% Total	Number	% Total
One System per Farm				
Single Crop-Row Crop	120	72.3	59	44.7
Single Crop-Grain Drill	5	3.0	7	5.3
Single Crop-No Till	0	0.0	2	1.5
Single Crop-Broadcast	1	0.6	2	1.5
Double Crop-Row Crop	6	3.6	2	1.5
Double Crop-Grain Drill	0	0.0	10	7.6
Double Crop-No Till	2	1.2	4	3.0
Double Crop-Broadcast	0	0.0	1	0.8
Subtotal	134	80.7	87	65.9
Two Systems per Farm	25	15.1	35	26.5
Three Systems per Farm	6	3.6	8	6.1
Four Systems per Farm	1	0.6	2	1.5
TOTAL	166	100.0	132	100.0

Table 4. Soybean Producers in West Tennessee Using Only the Single Crop-Row Crop Soybean Production System and Other Soybean Production Systems and Combinations of Systems, 1976 and 1981

Soybean Production System by Farm[a]	Number of Producers		Chi Square Statistic
	1976	1981	
Single Crop-Row Crop Only	120	59	23.4[b]
All Other Systems and Combinations of Systems	46	73	
TOTAL	166	132	

[a]Information used to form categories obtained from Table 3.

[b]$\chi^2_{.01,1} = 6.635$.

The extent to which each soybean production system was utilized in 1976 and 1981 was measured both in terms of the total incidence of each system and the total soybean acreage planted using each system on the farms analyzed in this study.[6] The relative importance of each of the alternative systems in terms of those two measures is illustrated in Table 5.

[6]The total incidence of each soybean cropping-planting system is presented in Table 5 as opposed to the incidence of systems on farms illustrated in Table 3. Since more than one system was utilized on some farms, there were several more systems observations than farm observations.

Table 5. Incidence of Soybean Cropping-Planting Systems and Soybean Acreage Planted by Cropping-Planting System in West Tennessee, 1976 and 1981

Cropping-Planting System		Incidence of Systems				Soybean Acreage Planted			
		Number[a]		% Total		Acres		% Total	
		1976	1981	1976	1981	1976	1981	1976	1981
Single Crop									
Row Crop		151	98	73.3	51.9	29,776	26,275	79.5	66.8
Grain Drill		16	20	7.8	10.6	4,929	2,325	13.2	5.9
No Till		0	4	0.0	2.1	0	422	0.0	1.1
Broadcast		4	4	1.9	2.1	87	133	0.2	0.3
	Subtotal	171	126	83.0	66.7	34,792	29,155	92.9	74.2[b]
Double Crop									
Row Crop		27	23	13.1	12.2	2,070	3,948	5.5	10.0
Grain Drill		4	19	1.9	10.1	207	1,993	0.6	5.1
No Till		4	19	1.9	10.1	364	4,171	1.0	10.6
Broadcast		0	2	0.0	1.1	0	40	0.0	0.1
	Subtotal	35	63	17.0[b]	33.3[b]	2,641	10,152	7.1	25.8
	TOTAL	206	189	100.0	100.0	37,433	39,307	100.0	100.0

[a]The number of systems exceeds the number of farmers responding to the survey because several farmers indicated the use of more than one cropping-planting system.

[b]Percentage subtotal does not equal the sum of individual category percentages due to rounding error.

The single crop-row crop system was by far the most important soybean production system utilized on the farms analyzed. It accounted for 73.3% of the 206 total systems observations for 1976 and 79.5% of the total soybean acreage planted in 1976. The relative importance of the single crop-row crop system had declined by 1981 to just over 50% of the total systems observations and about 67% of the total soybean acreage planted. Even so, it remained the most important soybean production system utilized in that year.

Two other relatively important systems in 1976 were the single crop-grain drill and double crop-row crop systems which accounted for 7.8% and 13.1% of the total number of systems observations, respectively. Although the double crop-row crop system was reported more frequently than the single crop-grain drill system in 1976, the single crop-grain drill system was used to plant approximately 2.4 times more soybean acreage in that year than was the double crop-row crop system. The single crop-grain drill and double crop-row crop systems each accounted for approximately the same percentage of total systems observations in 1981 as they had in 1976. However, the double crop-grain drill and double crop-no till systems each accounted for a greater percentage of total systems observations in 1981 than they had in 1976. The increased utilization of those two systems between 1976 and 1981 accounted for most of the decline in the relative importance of the single crop-row crop system between those two years.

Representative Implements and Production Practices

Soybean production operations and production implements and practices representative of those reported by producers using each cropping-planting system in 1976 and 1981 were determined in carrying out Objectives 1 and 2 of this study. The procedure used in identifying representative production operations, implements, and practices is presented below.

Procedure

Farmers who received the mail questionnaire were asked to indicate the number of times they used each implement and production practice on a predetermined list in the production of soybeans by each cropping-planting system they utilized. That information was used in the selection of representative production operations and representative implements and production practices for each soybean production system.[7] The selection of representative production operations and representative implements and production practices included the three steps outlined below.

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[7]The selection of representative soybean production implements and practices was based on a procedure reported by Willard F. Woolf and Patrick D. Leary, *Effects of Production Practices on Soybean Yields, Costs, and Returns, Macon Ridge Area, Louisiana,* Louisiana State University, Department of Agricultural Economics Research Report 497, December 1975.

First, representative preharvest soybean production operations were identified for each production system. Each implement and production practice on the survey questionnaire was assigned to one of seven preharvest production operations it could most appropriately be used to perform, e.g., a moldboard plow performed primary tillage. The seven preharvest production operations were:[8] (1) pre-tillage field preparation, (2) primary tillage, (3) secondary tillage, (4) seedbed conditioning, (5) cultivation, (6) herbicide application, and (7) pesticide application. If more than 50% of the farmers utilizing a given cropping-planting system reported using implements and/or practices assigned to a particular preharvest production operation, that operation was considered representative of the system being analyzed. Then the implements and/or practices which could be used to perform that operation were considered during the second step of the selection procedure. If 50% or more of the farmers utilizing a given cropping-planting system did not report using implements and/or practices assigned to a particular preharvest production operation, that operation was not considered representative of the system being analyzed and it was excluded from further consideration.

Second, the implement or practice used most often by producers to perform each production operation selected as representative of a given cropping-planting system was included in the representative set of implements and production practices for that system. If two or more implements or practices which could be used to perform a given production operation in a given cropping-planting system were reported by an equal number of soybean producers, the implement or practice used in the production of the largest total acreage of soybeans produced using the system under consideration was chosen as representative of that system.

Third, the number of times each representative implement or practice was normally used per field for soybean production was determined. The modal number of times each representative implement or practice was used per field by soybean producers using a given cropping-planting system was selected as representative of the number of times that implement or practice was used with that system. If the representative number of times a representative implement or practice was used per field was bimodal, the number of times that implement or practice was used in the production of the largest total acreage of soybeans produced using the system under consideration was chosen as representative of that system.

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[8]All seven production operations were not applicable for each soybean production system analyzed. For example, primary tillage would not be performed in the production of soybeans by a no-till system.

Results

The implements and practices selected as representative of those used by West Tennessee farmers to perform preharvest production operations in 1976 and 1981 for eight soybean production systems are presented in Tables 6-9. Representative production operations, implements, and practices for the single crop-no till, single crop-broadcast, double crop-grain drill, double crop-no till, and double crop-broadcast systems should be interpreted with caution because of the limited number of observations in one or both years (Table 5).

The representative operations performed and the representative implements and practices used to perform those operations in the production of single crop-row crop soybeans were almost identical in 1976 and 1981. Representative production operations performed and the implements and practices used to perform them in 1976 and 1981 were also very similar for the single crop-grain drill system. The principle difference between the two years analyzed for both of those production systems was the number of times certain production operations were performed. Both secondary tillage and cultivation were performed less frequently in the production of single crop-row crop soybeans in 1981 than in 1976. Secondary tillage was also performed less frequently in 1981 with the single crop-grain drill system than in 1976. Spreading a herbicide-fertilizer combination replaced other herbicide application methods as a representative production practice between 1976 and 1981 for both the single crop-row crop and single crop-grain drill systems.

Representative production operations performed by farmers growing double crop-row crop soybeans did not change between 1976 and 1981. However, changes were observed in the implements and practices most commonly used in performing those operations and in the modal number of times representative implements and practices were used in those two years. The chisel plow replaced the moldboard plow between 1976 and 1981 as the most commonly used primary tillage implement for double crop-row crop soybean production. And post-emergence herbicides replaced preplant herbicides between 1976 and 1981 as the herbicide most frequently applied to double crop-row crop soybeans. The modal frequency of use of both the tandem disk for secondary tillage and the row-crop cultivator for cultivation declined from twice per field in 1976 to once per field in 1981.

Table 6. Representative Implements and Practices Used by West Tennessee Soybean Producers for Single-Crop Soybeans by Planting Method, 1976[a]

Type of Operation	Planting Method					
	Row Crop		Grain Drill		Broadcast	
	Implement or Practice	Times Used per Field	Implement or Practice	Times Used per Field	Implement or Practice	Times Used per Field
Pre-Tillage Preparation	NR		NR		NR	
Primary Tillage	Chisel Plow	1	Chisel Plow	1	Moldboard Plow	1
Secondary Tillage	Tandem Disk	2	Tandem Disk	3	Tandem Disk	2
Seedbed Conditioning	Cultimulcher	1	Cultimulcher	1	Cultimulcher	1
Cultivation	Row Crop	2	NA		NA	
Herbicide Application	Preplant	1	Preemergence	1	Fertilizer Combination	1
Pesticide Application	NR		NR		NR	

[a]The single crop-no till soybean system was not used in 1976 by any farmers responding to the survey.

NR: Production operation not representative for soybean production system indicated.

NA: Production operation not applicable for soybean production system indicated.

Table 7. Representative Implements and Practices Used by West Tennessee Soybean Producers for Single-Crop Soybeans by Planting Method, 1981

Type of Operation	Planting Method							
	Row Crop		Grain Drill		No Till		Broadcast	
	Implement or Practice	Times Used per Field	Implement or Practice	Times Used per Field	Implement or Practice	Times Used per Field	Implement or Practice	Times Used Per Field
Pre-Tillage Preparation	NR		NR		NA		NR	
Primary Tillage	Chisel Plow	1	Chisel Plow	1	NA		Chisel Plow	1
Secondary Tillage	Tandem Disk	1	Tandem Disk	1	NA		Tandem Disk	1
Seedbed Conditioning	Cultimulcher	1	Cultimulcher	1	NA		Cultimulcher	1
Cultivation	Row Crop	1	NA		NA		NA	
Herbicide Application	Fertilizer Combination	1	Fertilizer Combination	1	Post-Emergence[a]	1	Fertilizer Combination	1
Pesticide Application	NR		NR		NR		NR	

[a]This result is contrary to apriori expectations. The small number of observations (4) for this system may be the reason this unexpected result was obtained.

NR: Production operation not representative for soybean production system indicated.

NA: Production operation not applicable for soybean production system indicated.

Table 8. Representative Implements and Practices Used by West Tennessee Soybean Producers for Double-Crop Soybeans by Planting Method 1976[a]

Type of Operation	Planting Method					
	Row Crop		Grain Drill		No Till	
	Implement or Practice	Times Used per Field	Implement or Practice	Times Used per Field	Implement or Practice	Times Used per Field
Pre-Tillage Preparation	Burn Straw	1	Burn Straw	1	NR	
Primary Tillage	Moldboard Plow	1	NR		NA	
Secondary Tillage	Tandem Disk	2	Tandem Disk	2	NA	
Seedbed Conditioning	Cultimulcher	1	NR		NA	
Cultivation	Row Crop	2	NA		NA	
Herbicide Application	Preplant	1	Preplant	1	Burndown	1
Pesticide Application	NR		NR		NR	

[a]The double crop-broadcast system was not used in 1976 by any farmers responding to the survey.

NR: Production operation not representative for soybean production system indicated.

NA: Production operation not applicable for soybean production system indicated.

Table 9. Representative Implements and Practices Used by West Tennessee Soybean Producers for Double-Crop Soybeans by Planting Method, 1981

Type of Operation	Planting Method							
	Row Crop		Grain Drill		No Till		Broadcast	
	Implement or Practice	Times Used per Field	Implement or Practice	Times Used per Field	Implement or Practice	Times Used per Field	Implement or Practice	Times Used per Field
Pre-Tillage Preparation	Remove Straw[a]	1	Remove Straw[a]	1	NR		NR	
Primary Tillage	Chisel Plow	1	NR		NA		NR	
Secondary Tillage	Tandem Disk	1	Tandem Disk	2	NA		Tandem Disk	1
Seedbed Conditioning	Cultimulcher	1	Cultimulcher	1	NA		NR	
Cultivation	Row Crop	1	NA		NA		NA	
Herbicide Application	Post-Emergence	1	Post-Emergence	1	Post-Emergence	1	Fertilizer Combination	1
Pesticide Application	NR		NR		NR		NR	

[a]Straw removal accomplished by either burning or baling. Specific method of removal not ascertained in this year.

NR: Production operation not representative for soybean production system indicated.

NA: Production operation applicable for soybean production system indicated.

Soybean Production Systems Changes: 1976-1981

The farmers surveyed who produced soybeans in 1981 were asked to indicate which of the eight specified soybean production systems they had used in 1976 in order to assess the changes they had made in production systems during that period. Additionally, growers who changed soybean production systems were asked to indicate any advantages and/or disadvantages which they had experienced as a result of the change.

The same system(s) was used in both 1976 and 1981 by about 40% of the farmers producing soybeans in 1981. Approximately 35% of the farmers producing soybeans in 1981 reported using different systems in 1976 and 1981 and 25.8% of them had not produced soybeans in 1976 (Table 10).

The majority of the soybean growers who changed production systems between 1976 and 1981 instituted changes which involved discontinuing one system and adopting another (Table 11). A change from the single crop-row crop system in 1976 to some other system in 1981 was the most common one reported by soybean growers. Over 54% of the farmers reporting production system changes between 1976 and 1981 made such a change. More farmers changed from the single crop-row crop to the double crop-no till system than from any other one production system to another. That change was made by 17.4% of all farmers reporting changing production systems between 1976 and 1981.

Table 10. Soybean Production System Changes Reported by West Tennessee Soybean Producers, 1976-1981

	Producers Reporting	
Soybean Producers in 1981	Number	% Total
Using Same System(s) as in 1976	52	39.4
Using Different System(s) Than in 1976[a]	46	34.8
Not Producing Soybeans in 1976	34	25.8
TOTAL	132	100.0

[a]All systems used in 1981 by a producer in this category were not necessarily different from those used in 1976. However, all producers in this category reported using at least one system in 1981 which they had not used in 1976.

Advantages and Disadvantages of Soybean Production System Changes

Advantages and disadvantages of soybean production system changes reported by farm operators were analyzed only for a change from the single crop-row crop system to another production system. The analysis of advantages and disadvantages of changing production systems was restricted to only that one type of change in order to directly link producer responses

to a specific change in production systems. In addition, production system changes from the traditional single crop-row crop system to the single crop-grain drill, double crop-row crop, double crop-grain drill, or double crop-no till systems accounted for over 54% of the changes reported by producers (Table 11).[9]

The most frequently cited advantages of changing from the single crop-row crop to a single crop-grain drill production system were "reduced soil erosion" and "less labor required" (Table 12). Both "fewer weed problems" and "lower capital investment" were also cited as advantages of that change by over 50% of the farmers who made it.

Farmers who had changed from the single crop-row crop system to the single crop-grain drill system reported experiencing fewer disadvantages than advantages as a result of the change. The most frequently cited disadvantage of that change in production systems was "more weed problems" (Table 13).

Table 11. Soybean Production System Changes Reported by West Tennessee Soybean Producers Using Different System(s) in 1981 than in 1976

Production System Change (s)[a]		Producers Reporting	
		Number	% Total
One System 1976 to Another System 1981			
System Used 1976	System Used 1981		
SC-RC	SC-GD	5	10.9
SC-RC	DC-RC	6	13.0
SC-RC	DC-GD	6	13.0
SC-RC	DC-NT	8	17.4
SC-GD	SC-RC	2	4.3
DC-GD	SC-RC	2	4.3
SC-BC	SC-RC	1	2.2
DC-NT	SC-RC	1	2.2
SC-BC	DC-BC	1	2.2
SC-GD	DC-GC	1	2.2
DC-RC	DC-GD	1	2.2
SC-GD	DC-NT	1	2.2
	Subtotal	35	76.1
One System 1976 to Two Systems 1981		8	17.4
One System 1976 to Three Systems 1981		1	2.2
Two Systems 1976 to One System 1981		2	4.3
	TOTAL	46	100.0

[a]Each combination consists of one cropping practice and one planting method. The codes for designating cropping practices are: SC = single crop, DC = double crop. The codes for designating planting methods are RC = row crop, GD = grain drill, BC = broadcast, NT = no till. Thus, the code SC-RC represents a single crop-row crop system.

[9]This analysis of advantages and disadvantages of soybean production system changes should be considered as only tentative. The number of farmers reporting any one of the four changes discussed was relatively small. Additional observation should be obtained before inferences are made about the advantages and disadvantages soybean growers are likely to experience as a result of a given change in production systems.

Table 12. Advantages Experienced by West Tennessee Soybean Producers as a Result of Changing from Single Crop-Row Crop Production System in 1976 to Another Soybean Production System in 1981

Producer Responses	System Used Following Change[a]			
	SC-GD	DC-RC	DC-GD	DC-NT
	—Producers Reporting—			
Change in System	5	6	6	8
Advantages of Change				
Reduced Cost/Acre	2	3	3	3
Increased Yield	2	2	2	3
Reduced Soil Erosion	4	4	4	4
Fewer Weed Problems	3	0	3	2
Less Labor Required	4	1	3	5
Less Yield Variability	0	1	0	1
Lower Capital Investment	3	2	3	2
Other	0	3	0	1

[a]Each system consists of one cropping practice and one planting method. The codes for designating cropping practices are: SC = single crop, DC = double crop. The codes for designating planting methods are: RC = row crop, GD = grain drill, BC = broadcast, NT = no till. Thus, the code SC-GD represents a single crop-grain drill system.

Table 13. Disadvantages Experienced by West Tennessee Soybean Producers as a Result of Changing from Single Crop-Row Crop Production System in 1976 to Another Soybean Production System in 1981

Producer Responses	System Used Following Change[a]			
	SC-GD	DC-RC	DC-GD	DC-NT
	—Producers Reporting—			
Change in System	5	6	6	8
Disadvantages of Change				
Increased Cost/Acre	0	1	1	1
Decreased Yield	1	1	0	1
Increased Soil Erosion	0	0	0	0
More Weed Problems	2	1	3	3
More Labor Required	0	1	1	0
More Yield Variability	0	0	1	0
Higher Capital Investment	0	2	1	0
Other	0	0	0	0

[a]Each system consists of one cropping practice and one planting method. The codes for designating cropping practices are: SC = single crop, DC = double crop. The codes for designating planting methods are RC = row crop, GD = grain drill, BC = broadcast, NT = no till. Thus, the code SC-GD represents a single crop-grain drill system.

The fact that some farmers experienced "fewer weed problems" while others experienced "more weed problems" after changing from the single crop-row crop to the single crop-grain drill system indicates that uniform results with respect to weed problems should not be expected from that change.

The advantage experienced most often by soybean producers making a change from a single crop-row crop to a double crop-row crop production system was "reduced soil erosion." "Reduced cost/acre" was also cited as an advantage by 50% of the producers involved in this type of production system change. The disadvantage most frequently reported in conjunction with changing from the single crop-row crop to the double crop-row crop system was "higher capital investment."

"Reduced soil erosion" was the advantage experienced most often by operators making a change from a single crop-row crop to a double crop-grain drill system. Other advantages reported by at least 50% of those farmers instituting that change were "reduced cost/acre," "fewer weed problems," "less labor required," and "lower capital investment." The disadvantage farmers most frequently experienced after changing from the single crop-row crop to the double crop-grain drill system was "more weed problems." Contradictory experiences were reported with respect to "weed problems" by farmers making that production system change.

Operators changing from a single crop-row crop to a double crop-no till production system reported the advantage of "less labor required" most frequently. "Reduced soil erosion" was the second leading advantage experienced by farmers making that change. The disadvantage experienced most frequently by farmers changing from the single crop-row crop system to the double crop-no till system was "more weed problems."

Summary

The purpose of this study was to provide information to farm operators and agricultural research and extension personnel which will be useful in evaluating alternative soybean production systems. The objectives of this study were to: (1) identify soybean production systems used by West Tennessee farmers in 1976 and 1981, (2) analyze changes which occurred between 1976 and 1981 in the soybean production systems used by West Tennessee farmers, and (3) summarize the advantages and disadvantages of changing soybean production systems experienced by West Tennessee farmers.

The principal data sources for this study were mail surveys of two random samples of farm operators in Tennessee Crop Reporting Service Districts 1 and 2. Information about soybean production in 1976 was obtained in the first survey conducted in 1977 and a second survey in 1982 was the source of soybean production information for the 1981 crop year. Respondents to both surveys indicated which one(s) of eight predetermined soybean production systems they used and the number of times per field

they used selected production implements and/or cultural practices with each production system they used. Respondents to the 1982 survey also indicated the soybean production system(s) they had used in 1976. If the respondents changed production systems between 1976 and 1981, they identified the advantages and/or disadvantages they experienced as a result of the change.

Soybean producers used double-crop systems more widely in 1981 than they had in 1976, but the single crop-row crop system was the most important production method in both years. It was the only system used by 72.3% of the farmers in 1976 and by 44.7% of the farmers in 1981. Although the percentage of total soybean acreage planted by the single crop-row crop system declined between 1976 and 1981, 66.8% of the soybean acreage was still planted by that system in 1981.

Representative production operations performed in 1976 and 1981 by soybean growers using a given production system were almost identical. However, several changes occurred between 1976 and 1981 in the implements and practices which were representative of those used to perform various production operations by farmers producing soybeans by a given system. And the modal number of times several representative implements and practices were used per field in the production of soybeans by a given system declined between 1976 and 1981.

Approximately 35 percent of the farmers producing soybeans in 1981 had changed soybean production systems between 1976 and 1981. The majority of those changes were from the single crop-row crop system in 1976 to one of four other systems in 1981: single crop-grain drill, double crop-row crop, double crop-grain drill, and double crop-no till. The advantages experienced most frequently by farmers making one of those four changes were: "reduced soil erosion," "decreased labor," "reduced cost per acre," and "reduced capital investment." The disadvantage experienced most frequently by growers changing from a single crop-row crop system to one of those four systems was "more weed problems."

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