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Content

The Effect of Planting Date, Row Spacing and Variety on Soybean Yield in Mississippi

The acreage and economic importance of soybean has increased rapidly in Mississippi during recent years. The increase in acreage and numbers of producers has caused some concern that available date-of-planting information is sometimes limited and not based on locally derived data. Some have observed that working days during which some soybean acreage can be planted often are available in mid-April; however, information available on the effect of early planting on yields is limited.

Some soybeans in nearly every community are planted in July each year. During the ten-year period (1969-78), 50% of the soybean acreage in Mississippi was not planted by June 1, and 33% still was not planted by June 10 (Figure 1).

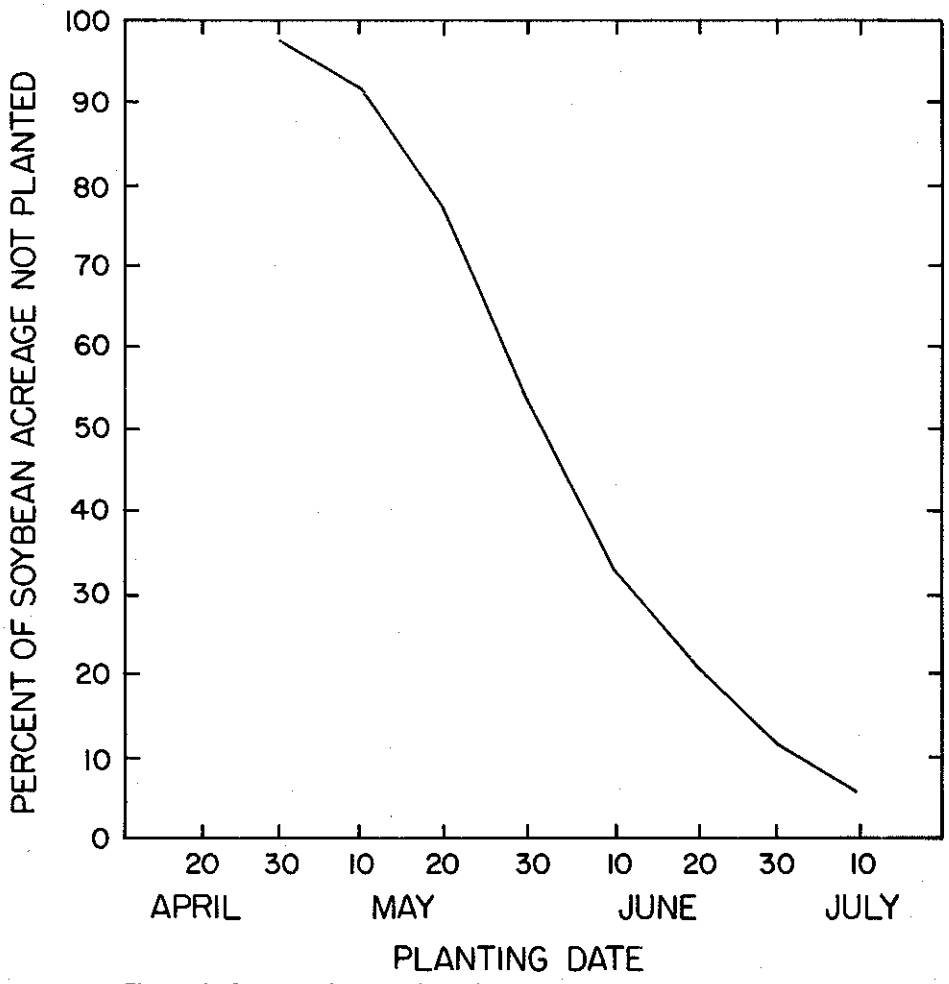

Figure 1. Percent of total Mississippi soybean acreage not planted by specified dates (1969-78 average).

Source: Mississippi Crop and Livestock Reporting Service, Mississippi Weather and Crop Report, (1969-78).

Soybeans are photoperiod sensitive and the long days of late June and early July in Mississippi prevent flowering while the shorter days of late July and August cause flowering. Planting too early causes premature flowering, and late-planted beans often are induced to flower before the "vegetative factory" is large enough to supply adequate photosynthetic materials for optimum seed production. Below-normal yields normally can be expected from beans planted too early or too late.

National magazines have reported farmer experiences and data from reputable scientists and institutions showing yield increase from narrow-row (solid-seeded) soybeans in the mid-West. Row-spacing data from Heatherly (personal communication) on Sharkey clay at Stoneville, Mississippi, suggest that the greatest differences between 20- and 40-inch rows occurred when yield levels were relatively high and in seasons in which rainfall was well distributed. Adequate rain during the pod-filling period is thought to be especially important. These results are different from the findings in Indiana, Illinois and Ohio but are similar to results found in several experiments from other southern states (Egli, 1976 and Parker and Marchant, 1981).

A row-spacing study at Holly Springs, Mississippi, in 1967 through 1970 found Lee and Bragg to yield slightly more in 20- than in 30- or 40-inch row spacings at most plantings. In 1967, the only year in which a very late planting was conducted, Lee produced 11.0, 7.4 and 5.2 bu/acre when planted in 20-, 30- and 40-inch rows, respectively.

The scarcity of information about the effect of date of planting

and row spacing on the performance of determinant-type soybeans (such as those most widely grown in Mississippi) led to initiation of this study at five locations (Verona, Starkville, Brooksville, Raymond and Poplarville) in 1976. A sixth location (near Newton) was added to the study in 1977. These locations represent a diverse group of soil and climate regions in the non-delta section of Mississippi. The general soil characteristics by study areas are as follow:

Northeast Mississippi (Verona)---Silty clay loam soil, slowly permeable to water, primarily surface drained. High water table present through much of the year.

Blackbelt (Brooksville)---Clay to clay loam soil, shallow to chalk. The experimental site varies with 18 inches to chalk on one end of the field to about 12 inches on the other. The experimental plots were arranged so that each treatment received an equal number of plots on the deep as well as on the shallow soil

MAFES Plant Science Farm (Starkville)---Sandy clay loam soil, slowly permeable to water. Some evidence of plow pan. The site was deep chiseled before the crop year. High water table present through much of the year.

Coastal Plains (Newton)---Sandy loam soil, with plow pan 8-10 inches deep under normal cultivation. The soil was deep chiseled before the 1977 crop year.

Brown Loam (Raymond)---Deep silt loam soil, minor evidence of a genetic pan 20-24 inches deep.

South Mississippi (Poplarville)---Sandy loam soil excessively well drained.

Objectives

The objectives of the study were to determine (1) the optimum time to plant soybeans at each location, (2) the relative yield reduction one should expect by planting before and after the optimum planting season, (3) the optimum row spacing and the effect of planting date upon the response of soybeans to different row spacings and (4) the interaction of different maturing varieties with these management practices.

Procedure

The general plan followed at all locations was to begin planting soybeans on April 15 and plant at two-week intervals until July 1. Soil moisture at the various locations and in different years caused the planting schedule to vary. At some locations (e.g., Newton and Poplarville) there was only limited space available, and the numbers of planting dates were restricted.

Soil moisture at each location was monitored at different depths throughout the growing season. Considerable variation in rainfall from year-to-year and among locations was an important determinant of planting schedules. Appendix Table 7 presents the rainfall distribution throughout the growing season at each location and year.

Forty-, 30- and 7-inch row spacings were evaluated at all locations except Newton and Raymond where 40- and 7-inch spacings were evaluated. The 40- and 30-inch spacings were planted with a conventional planter, and the 7-inch spacings were planted with a grain drill. Manufacturers and models of equipment varied among locations. Planting rates were about 45 lbs of seed/acre when planted in 30- and 40-inch rows and about 60 lbs/acre when planted with the grain drills. Stand establishment generally was not a problem; however, stand establishment was poor in some of the late plantings when soil moisture was low and soil surface temperatures were high. Germination of the Hill seed was low in 1978, and poor stands resulted even though seeding rates were increased. Data are reported for plots where stands were reasonable but are not included in the statistical analysis.

Plots planted with a conventional planter were four rows wide except at Raymond where plots were eight rows (20-ft wide). Plots planted with a grain drill were 8- to 10-ft wide at all locations. Length of plots varied from 25 to 50 ft.

Pests were controlled as needed, and control varied considerably among locations and years. Weed control was generally satisfactory to excellent except at Starkville in 1978, Newton in 1979 and Poplarville in 1978 and 1979. A combination of cultivation and herbicides was used on plots planted with conventional planters, and occasional hand weeding was used on plots planted with a grain drill.

The early-planted (mid and late April) beans were sprayed frequently in early May to control bean leaf beetle. Late-season insects (fall armyworm, velvet bean caterpillar, the green clover worm and the cabbage looper) were a serious problem at Brooksville and Starkville only in 1977. One insecticide treatment controlled these pests in late July and early August; however, large populations of cab-

bage loopers and velvet bean caterpillars developed in early September and seriously defoliated the late-planted soybeans at Starkville in 1977. The earlier-planted beans were damaged but not completely defoliated by these insects.

The plots at Verona, Starkville, Brooksville and Newton were harvested by hand in 1976 and with a small-plot combine in 1977-79. Harvest at Poplarville was with a small commercial combine in 1976 and by hand in the other years. The plots at Raymond were harvested with a field combine each year. Beans from all hand-harvested plots were threshed with a small stationary thresher. The two center rows of plots planted with a conventional planter and a strip 5-ft wide from plots planted with a grain drill were combined.

The plots were laid out in a randomized three-split block design with planting date the first split, row spacing the second split and variety the third split. The Raymond trial was replicated three times, and trials at the other locations were replicated four times.

The data were summarized by years and subjected to Duncan's New Multiple Range Test. The over-years summaries were subjected to Student Newman Kuel's Test.

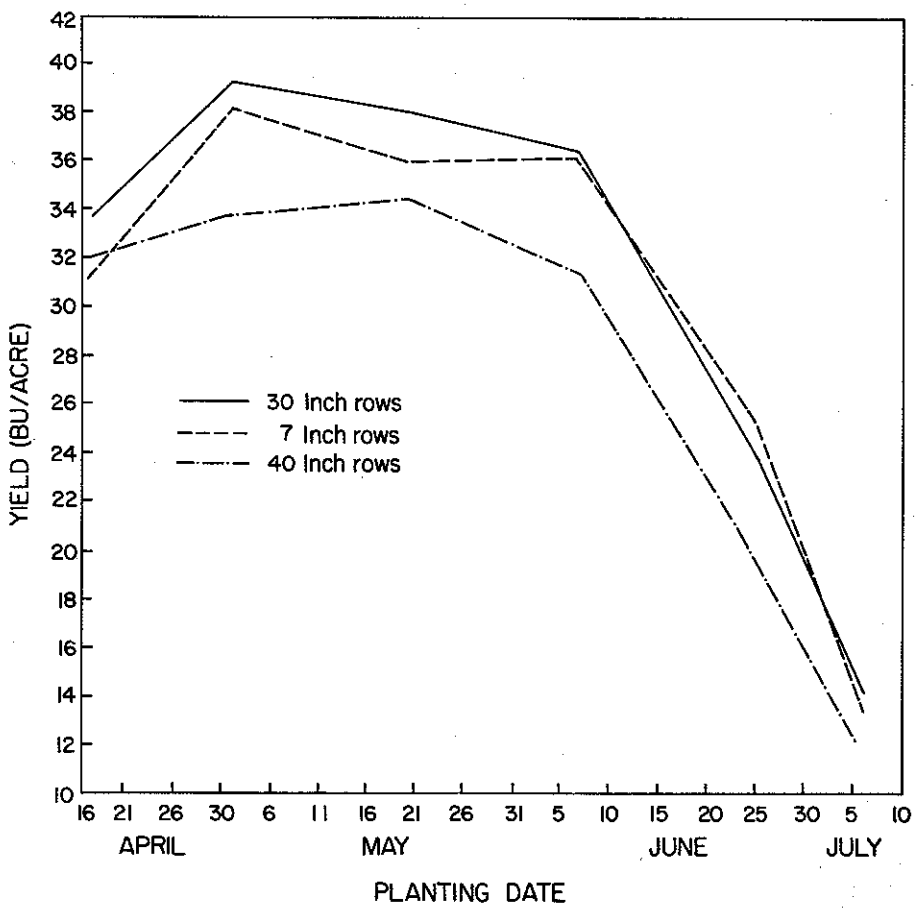

Figure 2. Four-year (1976-79) average yields of soybeans at Verona and Starkville (averages of Centennial, Forrest and Tracy, by row spacings and planting dates).

Results

Date of Planting

Data were summarized across all row spacings and varieties, but data for some years were excluded from the averages because of year-to-year variations in planting dates. There was little interaction of row spacings and planting dates or varieties and planting dates.

The highest yields at Verona, Starkville and Brooksville were from the late-April or early May plantings. The average reduction in yield observed for mid-April plantings compared to the optimum date (May planting) was about 15%. In contrast, mid- to late-June planting had an average yield reduction of 33%. Yields from beans planted in June and July were lower with each delay in planting date. A typical yield response to different planting dates is illustrated in Figure 2. Yields were highest from plantings in May and early June. Each day of delay in planting on 30-inch rows after June 10 resulted in a yield decrease of about 0.7 bu/acre/day. Yields of beans planted on 30-inch rows on June 10, 15 and 25 averaged 34, 30 and 24 bu/acre, respectively. However, beans planted on 30-inch rows in mid- and late-April produced 34 bu/acre or more.

Results at Newton and Raymond were inconsistent (Table 1). Yields at Newton were lowest for beans planted in mid-April, but the highest average yield at Raymond was in plots planted April 19. Yield reduction from planting through May and until June 4 ranged from 1-17%, and reductions after June 4 were relatively steep with progressively later planting dates.

The limited data available from South Mississippi show results similar to those observed in North Mississippi. Days available for planting during any particular time period are limited because of the low water-holding capacity of the sandy soils at that location. Hence, there were fewer planting dates at Poplarville than at other locations.

Table 1. The effect of planting date on soybean yields, averages of all varieties and row spacings, by location, 1976-79.

Location																	
Verona			Starkville			Brooksville			Newton[1]			Raymond			Poplarville		
Planting Date	Bu/A	% Max.[2]	Planting Date	Bu/A	% Max.	Planting Date	Bu/A	% Max.	Planting Date	Bu/A	% Max.	Planting Date	Bu/A	% Max.	Planting Date	Bu/A	% Max.
April 16-20	29.9 C[3]	85	April 14-16	29.3 C	85	April 14-20	20.4 C	83	April 15-21	19.1 D	60	April 19	37.6 A	100	April 17-28	24.5 B	83
April 29-30	35.0 A	100	April 28-May 2	33.9 A	99	April 28-30	24.6A	100	May 2-3	23.2 C	73	April 27-May 5	32.9 B	88	May 11-18	29.6 A	100
May 19-24	32.8 B	94	May 16-24	34.3 A	100	May 15-20	22.9 B	93	May 16-28	31.9 A	100	May 19-24	37.2 A	99	June 6-18	25.2 B	85
June 6-13	32.6 B	93	May 30-June 8	31.1 B	91	June 1-5	20.8 C	85	June 6-14	27.1 B	85	May 28-June 14	31.1 B	83			
June 28-July 26	27.3 D	78	June 15-18	19.1 D	56	June 14-15	16.1 D	66				June 21-22	27.9 C	74			
			June 30-July 12	10.2 E	30	June 29-July 2	9.3 E	38				June 29-July 6	25.3 D	67			
						July 14-18	4.2 F	17				July 12-20	15.3 D	41			

[1] Results are from only three years of data (1977-79).

[2] Percent maximum yield at each location is percent of yield at the planting date with the highest average.

[3] Within each column, values followed by the same letter are not different at a probability level equal to or less than 0.05 as determined by the Student-Newman-Keul's Test.

Row Spacing

The row-spacing results are presented as averages over all planting dates, varieties and years (Table 2). Generally, there was no difference between the average yield of soybeans seeded with a grain drill in 7-inch rows and those planted in 30-inch rows. However, yields from the narrower spacings usually were greater than for beans planted in 40-inch rows.

The yield response (averages of the three highest-yielding varieties) to different row spacings at different planting dates at Verona and Starkville is presented in Figure 2. The data were summarized in this way because we suspected that the narrow row spacings would improve yields only in high-yielding situations. The 7- and 30-inch row spacings were generally higher yielding than the 40-inch row spacings. There was little interaction between row spacings and planting dates; however, the greatest differences among the row spacings were for May and June plantings, the least for April and July plantings.

Table 2. The effect of row spacing on soybean yields, averages of all varieties and planting dates, by location, 1976-79.

Row spacing	Location					
	Verona	Starkville	Brooksville	Newton[1]	Raymond	Poplarville
(inches)	Bushels/Acre					
40	31.2 AB[2]	25.0 B	15.7 B	27.4 A	28.3 A	26.5 B
30	32.1 A	29.0 A	18.1 A	----	----	25.0 B
7	29.9 B	29.1 A	18.5 A	25.9 A	29.2 A	29.9 A

[1] Data for 1977-79 only.

[2] Within each column, numbers followed by the same letter are not significantly different at the 0.05 probability level as determined by the Student Newman Kuel Test.

The effect of planting date or variety on soybean yield response to row spacing was slight. There was a tendency for the latest-planted beans to yield better in the 7-inch spacing than in 30- or 40-inch spacings.

Varieties

Our data show that the interaction between row spacings and planting dates was small. The later-maturing varieties, Tracy and Centennial, usually were the

Table 3. The effect of varieties on soybean yields, averages of all planting dates, row spacings and years, by location, 1976-79.

Variety	Location					
	Verona	Starkville	Brooksville	Newton[1]	Raymond	Poplarville
	bushels/acre					
Hill	28.9 C[3]	22.9 C	14.8 B	23.9 B	24.1 B	19.8 E
Forrest	32.3 B	24.9 C	15.3 B	27.8 A	29.9 A	23.8 D
Tracy	35.7 A	30.6 A	19.6 A	28.7 A	29.3 A	--
Lee 74/Centennial[2]	34.6 C	30.9 A	19.1 A	--	32.0 A	--
Bragg	23.8 D	27.9 B	17.8 A	16.2 AB	28.3 A	29.7 B
Davis	--	--	--	--	--	28.7 B
Pickett	--	--	--	--	--	26.3 C
Cobb	--	--	--	--	--	32.5 A

[1] Data for 1977-79 only.

[2] Lee 74 was representative for this maturity group in 1976 at all locations except Starkville, Centennial was used in 1977-79.

[3] Within each column, values followed by the same letter are not different at a probability level to or less than 0.05 as determined by the Student-Newman-Kuel's Test.

highest yielding of the varieties tested at all planting dates and row spacings (Table 3).

Tracy had the highest yield and the lowest yield reduction when planted in early April. Yields of Forrest, Centennial and Tracy averaged over the three northern locations were 22, 15 and 9% lower, respectively, from mid-April planting than from planting at the optimum time (Table 4). Forrest, an early-maturing variety, generally yielded less in northern Mississippi when planted in April; however, Forrest yields were similar to yields of Tracy and Centennial when planted in May and June. Bragg yielded less than the other varieties when planted early; however, it is susceptible to stem canker, a disease that causes more damage to susceptible varieties when planted early.

The general response of varieties to planting date (photoperiod) is the same, but some varieties are more sensitive than others. The data in Table 5 illustrate this. The most nodes were developed on plants in plots planted in May. Planting earlier or later resulted in fewer nodes. Hill appeared to be more sensitive than Tracy, and Tracy was more sensitive than Bragg.

Table 4. Soybean yield and percent reduction at three planting dates (early, optimum and late), by variety and location,

Planting Date	Variety	Location			
		Northern Mississippi[1]		South Central Mississippi[2]	
		Bu/Acre	% Reduction from May 15-25	Bu/Acre	% Reduction from May 15-25
April 15-20	Hill	22	15	25	29
	Forrest	25	22	29	22
	Tracy	31	9	31	14
	Centennial	29	15	39	9
	Bragg	24	14	38	4
May 15-25	Hill	26	0	35	0
	Forrest	32	0	37	0
	Tracy	34	0	36	0
	Centennial	34	0	43	0
	Bragg	28	0	29	0
June 30-July 2	Hill	15	42	21	40
	Forrest	17	47	25	36
	Tracy	17	50	24	37
	Centennial	20	41	--	--
	Bragg	18	36	26	10

[1] Northern Mississippi data are averages of three row spacings at Verona, Brooksville, and Starkville over four years.

[2] South Central Mississippi data are averages of two row spacings at Raymond and Newton.

Plant Height

Plants at maturity (averages of all varieties tested at Brooksville in 1976) were slightly taller in the 7-inch spacing than in the 30- or 40-inch rows (Table 6). Plant height declined rather dramatically when soybeans were planted after mid-June.

Soil moisture

Soil-water changes at 6-inch intervals, beginning at 21 inches below the soil surface, in plots planted in early May are presented in Figure 3A. All depths dried rapidly soon after June 1 and were recharged to field capacity by a mid-June rain. From that point, there was a long dry period in which the 21-inch depth dried fastest and to the greatest extent. It appeared that the May-planted beans were capable of extracting water from deep in the soil. The soil was dried from the surface; i.e., the 6-inch layer centered at 21 inches below the surface dried before the 6-inch layer immediately below it, and that layer dried faster than the next deepest layer. Apparently, soil water was removed gradually from areas explored by roots as they grew progressively deeper.

Soil water changes did not differ ($P < .05$) among depth intervals on adjacent plots where beans were planted in July (Figure 3B). Apparently these late-planted beans were not capable of rooting sufficiently deep to remove significant amounts of water from any of the depths measured. This condition prevailed even though the surface soil was quite dry and the plants showed severe stress. Soil water content in the deeper strata (21 to 39 inches) was near field capacity during this period.

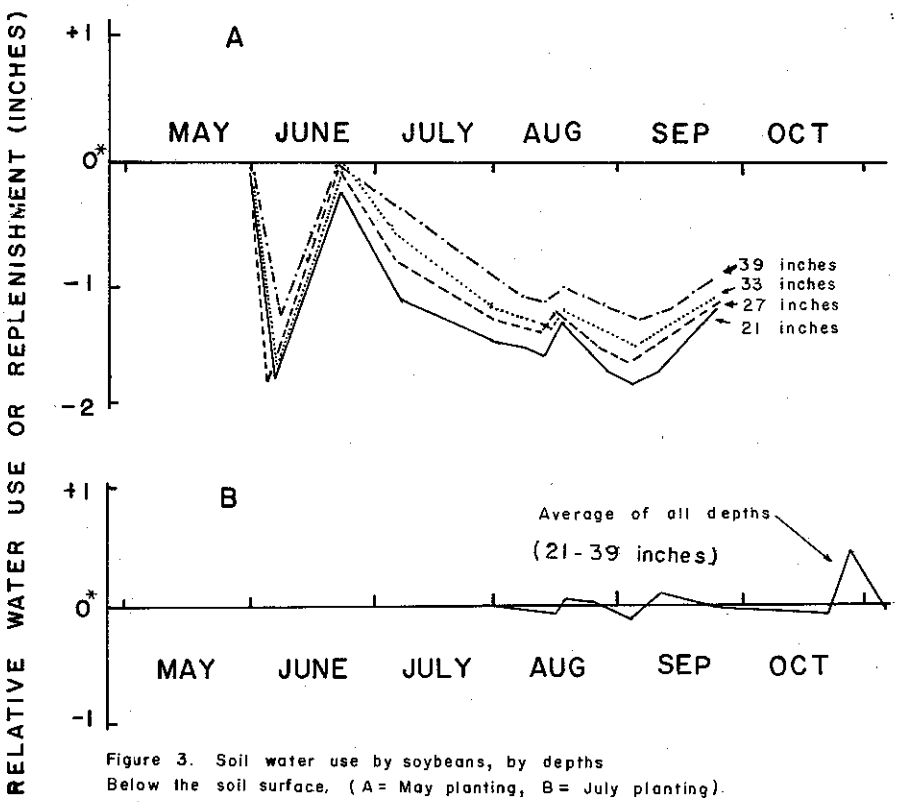

Figure 3. Soil water use by soybeans, by depths below the soil surface. (A = May planting, B = July planting).
* field capacity
Source: Data from the MAFES Black Belt Branch.

Table 5. Effect of planting date and variety on node numbers, by planting date and variety, Verona,

Planting Date	Variety		
	Hill	Tracy	Bragg
	nodes/plant		
4-16-76	12.6	14.5	16.6
2-29-76	12.7	17.2	17.0
5-25-76	12.5	15.9	17.5
4-16-77	13.3	14.8	16.2
4-29-77	13.0	19.1	19.3
5-19-77	14.6	19.3	19.9
6-09-77	11.7	16.8	16.3

Table 6. Plant height at maturity, averages of all varieties tested at Brooksville in 1976, by planting date and row width.

Planting Date	Row Width			Average
	7	30	40	
	inches			
4/20	31	27	28	28.7
4/30	35	28	28	30.3
5/20	32	27	25	28.0
6/14	29	22	25	25.3
7/02	23	18	17	19.3
7/15	12	13	15	13.3
Average	27.0	22.5	23.0	

Morphogenetic development (growth stages)

Stages of development were monitored throughout the growing seasons at Starkville in 1978 and 1979 and in a similar experiment in 1980. (In the 1980 experiment, the same varieties as in previous years plus Bedford were planted April 30, May 12 and June 3. Later plantings were not made due to dry weather.) Dates of flowering were recorded as the time at which flowers appeared

at any of the upper four nodes on the mainstem. Plant maturity was recorded when some of the pods became mature pod colored.

Numbers of days from planting to flowering and numbers of days from flowering to maturity for each of the five varieties at five planting dates in 1979 are presented in Figure 4. This year was selected to represent a year when there was relatively little crop stress. In contrast, 1978 and 1980 were both years in which a hot, dry period occurred during much of the growing season. The data show that days from planting to flowering are influenced strongly by planting date. In the plots planted May 1, all varieties except Bragg flowered at the same time. The general trend for the later plantings was for the later-maturing varieties to require more days between planting and flowering than did the early varieties. Hill, however, usually required a few more days to flower than did Forrest even though it matures earlier. This is a trait for which Hill has been noted previously; however, its fruiting period is shorter.

Numbers of days from flowering to maturity appear to be influenced strongly by planting date. However, in contrast to days to flower, the varietal effect seems to be greater at the early planting dates than at the late planting dates; i.e., at early planting dates there are several days difference among varieties in the length of time from flowering to maturity. Bragg required 80 days compared to about 50 days for Hill when planted on May 1. As the planting date was delayed, the difference in length of reproductive period among varieties was much less. Thus, in late plantings, the primary effect of varieties with later maturity is delayed flowering, not an extension of the pod-filling period.

Data collected in 1980 (a hot and dry growing season) show that length of time from planting to flowering was shorter in the hot season, and the varietal effect on days to flowering was less. Numbers of days from flowering to maturity, however, were longer. The later-maturing varieties (Tracy, Centennial and Bragg) required much longer from flowering to maturity at each planting date than did the earlier-maturing varieties (Hill, Forrest and Bedford). Thus, the hot weather appeared to shorten the time required to flower for all varieties tested but lengthened the period between flowering and maturity. Part of this lengthening probably was due to a delay in fertilization and the successful setting of pods. Due to the hot, dry weather in 1980, the early flowers were aborted, resulting in a long period during which additional flowers were produced. So, the time during which seed actually were being filled may not have been much different.

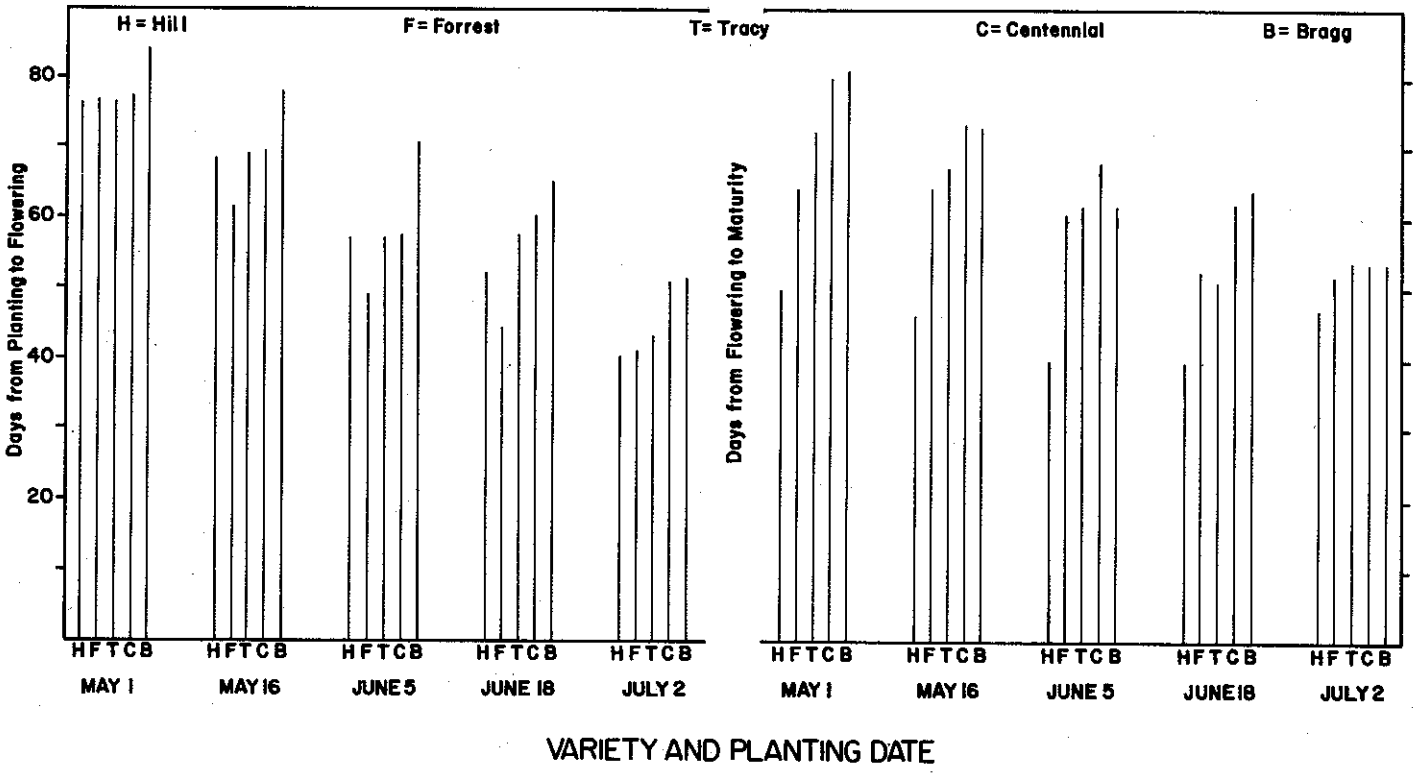

Figure 4. Time from planting to flowering and from flowering to maturity of soybeans grown on the MAFAS Plant Science Farm in 1979, by variety and planting date.

Table 7. Dates of soybean growth stage attainment, by variety and planting dates, Starkville, 1979[1/].

	R-2	R-3	R-4	R-5	R-6	R-7	R-8
	date						
Hill							
PD 1[2/]	7/16-7/26	7/26-7/29	7/29-8/4	8/04-8/8	8/08-8/26	8/26-9/05	9/05-9/08
2	7/17-7/28	7/28-8/4	8/04-8/9	8/9-8/21	8/21-8/28	8/28-9/06	9/06-9/09
3	8/02-8/7	8/07-8/13	8/13-8/19	8/19-8/29	8/29-9/6	9/06-9/09	9/09-9/15
4	8/11-8/17	8/17-8/23	8/23-8/27	8/27-9/3	9/03-9/12	9/12-9/16	9/16-9/21
5	8/12-8/14	8/14-8/31	8/31-9/3	9/03-9/9	9/09-9/21	9/21-9/26	9/26-10/02
Forrest							
PD 1	7/06-7/28	7/28-8/03	8/03-8/08	8/08-8/24	8/24-9/08	9/08-9/13	9/13-9/21
2	7/17-8/01	8/01-8/08	8/08-8/16	8/16-8/30	8/30-9/13	9/13-9/17	9/17-9/21
3	8/02-8/06	8/06-8/12	8/12-8/25	8/25-9/03	9/03-9/15	9/15-9/21	9/21-9/27
4	8/07-8/16	8/16-8/23	8/23-8/29	8/29-9/07	9/07-9/15	9/15-9/21	9/21-9/27
5	8/13-8/24	8/24-8/28	8/28-9/06	9/06-9/11	9/11-9/29	9/29-10/03	10/03-10/10
Tracy							
PD 1	7/06-8/04	8/04-8/12	8/12-8/23	8/23-8/30	8/30-9/21	9/21-9/24	9/24-10/01
2	7/17-8/09	8/09-8/13	8/13-8/25	8/25-9/03	9/03-9/21	9/21-9/24	9/24-10/03
3	8/08-8/12	8/12-8/19	8/19-8/27	8/27-9/04	9/04-9/24	9/24-9/28	9/28-10/03
4	8/08-8/20	8/20-8/27	8/27-9/02	9/02-9/09	9/09-9/26	9/26-10/01	10/01-10/06
5	8/14-8/22	8/22-8/28	8/28-9/07	9/07-9/19	9/19-9/30	9/30-10/03	10/03-10/08
Centennial							
PD 1	7/17-8/10	8/10-8/19	8/19-8/29	8/29-9/07	9/07-9/25	9/25-10/01	10/01-10/08
2	7/14-8/14	8/14-8/23	8/23-9/02	9/02-9/09	9/09-9/29	9/29-10/01	10/01-10/10
3	8/01-8/19	8/19-8/27	8/27-9/02	9/02-9/09	9/09-9/29	9/29-10/04	10/04-10/10
4	8/08-8/24	8/24-8/29	8/29-9/06	9/06-9/18	9/18-10/01	10/01-10/05	10/05-10/12
5	9/14-8/26	8/26-9/02	9/02-9/07	9/07-9/22	9/22-10/03	10/03-10/11	10/11-10/17
Bragg							
PD 1	7/21-8/15	8/15-8/18	8/18-8/26	8/26-9/08	9/08-10/01	10/01-10/09	10/09-10/17
2	7/24-8/15	8/15-8/18	8/18-8/30	8/30-9/11	9/11-10/01	10/01-10/10	10/10-10/18
3	8/08-8/17	8/17-8/24	8/24-9/01	9/01-9/11	9/11-10/01	10/01-10/10	10/10-10/20
4	8/14-8/24	8/24-8/29	8/29-9/06	9/06-9/19	9/19-10/07	10/07-10/10	10/10-10/20
5	8/22-8/27	8/27-9/02	9/02-9/06	9/06-9/19	9/19-10/07	10/07-10/13	10/13-10/22

[1/] Growth stages from Fehr & Caviness, 1977.

[2/] Planting Dates: PD 1 = May 1, PD 2 = May 16, PD 3 = June 5, PD 4 = June 18, PD 5 = July 2.

Table 7 contains data on the calendar time required for each variety at each planting date in the 1979 experiment to progress through the different reproductive growth stages (Table 8). This table can be used to estimate the length of time to maturity. It also may be used to compare the effect of planting date and variety on the rate of progression through the various reproductive growth stages. The growing season in 1979 was relatively cool and wet, especially during the reproductive period. By comparing the developmental rate of these soybean varieties with the same varieties in different years, some idea of the effect of weather on developmental rate can be gained.

Table 8. Reproductive stages of development of soybean

R1 .... time of first flower

R2 .... time when flowers are extended to any of the upper four nodes on the main stem

R3 .... beginning pod (3/16-inch long at any of the four uppermost nodes)

R4 .... full pod (3/4-inch long or longer at any of the four uppermost nodes)

R5 .... beginning seed (slight seed enlargement can be felt)

R6 .... full seed (pod containing green seed that fill the cavity of pods at any of the top four nodes)

R7 .... beginning maturity (leaves turning yellow and one pod on mainstem has reached mature pod color)

R8 .... full maturity (95% of pods have reached mature pod color)

Five to 10 days of drying weather are required before R8 beans have less than 15% moisture.

Source: Fehr and Caviness, 1977.

Discussion

Date of Planting

Results of this trial are similar to those from trials in other states. The response to planting dates by adapted varieties was compared to Illinois, Kentucky, South Carolina and Florida. Varieties best adapted to each location were tested at several planting dates. The yield response to planting dates was similar at each location.

Examination of our results on the effect of date of planting on soybean yields (Figure 2, Table 1 and Appendix Tables 1-6) reveals marked declines in yields of soybeans planted after June 10. Comparison of these data with the historic planting practices of Mississippi producers (Figure 1) shows that 33% of the Mississippi soybean acreage is planted too late for optimum production. Producers need to find ways to plant more acreage during the optimum planting period (May 1 to June 10). The data (Table 1) show that soybeans planted in northern Mississippi as early as April 15-20 yield more than those planted after June 10.

Row Spacing

Soybeans grown in 7-inch rows cover the soil surface more quickly and should reduce erosion, but there are some reasons for using this production practice with caution. Generally it is more difficult to get uniform seed placement (in-the-row and depth) with a grain drill than with a row planter. We had some poor stands from planting with a grain drill where planting conditions were marginal but did get acceptable stands with row-planting equipment. Grain-drills, however, are being improved for better depth control and placement in the row. Because of the greater risk in stand establishment with old types of grain drills, more seed/acre may need to be planted with a grain drill than when planting in rows.

The reasons for differences in results of row-spacing research in midwestern states and results from our study and from studies at several other locations---e.g., south Georgia and South Carolina (Parker and Marchant, 1981 and Palmer, 1980)---are not completely understood. Midwestern research reports 5-15% increases in yields of soybeans planted in narrow rows (20 inches or less) over yields with 30-inch and wider row spacings.

This difference in response may be caused by combinations of soils and weather that prevail in the southern states. The high temperatures in the southern states cause high rates of water use, and this, in association with frequent short-period droughts, exposes crops to short periods of drought stress. The soils on which soybeans are produced in Mississippi are often fine textured and have low hydraulic conductivity that results in slower water movement than in the midwestern coarser textured soils or fine textured soils with more organic matter and a more developed soil structure. Thus, a uniform distribution of soybean plants over the soils used in this study may result in a more rapid use of available water early in the season and reduce the availability of stored water later in the season. Unless an excellent distribution of rain occurs during the growing season (especially July, August and September), the narrow-rows (drilled crop) are exposed to more serious drought stress than are crops planted on 30-inch row spacings. Also, stands in some of our late-planted plots were poor, especially the drill-seeded plots, which may be the reason for failure to obtain a higher yield in late, drill-seeded beans than in beans planted on the 30- and 40-inch rows.

Flowering

The variety determines how short days have to be before flowering is induced. Young seedlings growing under conditions that do not induce flowering normally have five to eight immature leaf buds and vegetative nodes in the growing tip of the stem. An additional immature leaf is formed as the oldest buds grow and become visible. The next immature node becomes floral rather than vegetative when the photoperiod becomes short enough for leaves to induce flowering, and the plant will begin to flower when that developing bud matures. The plant then ceases to grow additional main-stem nodes.

Some stem elongation and branch growth may occur after the apex becomes floral. First flowering usually is apparent near the middle of the main stem, and flowers seemingly develop at random at nodes on the main stem. Flowering on the branches occurs in much the same pattern but a few days later than on the main stem.

Late-planted beans often are induced to flower when the first true leaf is exposed, and this causes the newly formed buds in the tip of

the stem to be floral. As soon as the five to eight preformed leaf buds have developed, this floral bud will be the next to mature and the plant begins to flower. This usually is long before the "vegetative factory" is large enough to supply adequate photosynthetic materials for optimum seed production. Such small plants can be expected to yield less per plant; therefore, higher yields from late-planted beans can be expected if narrower plant spacings are used. However, this is not always evident due to other growth limiting factors.

In general, the late-maturing varieties are less sensitive to photoperiod than are early- or mid-season varieties. Results from south Georgia showed the most nodes/plant from early May planting and the fewest from early July planting. Bragg and Hutton had 12 and 13 nodes, respectively, when planted in early July compared with the earlier maturing Essex which had only 10 nodes. Beans planted in early April had two to three fewer nodes than those planted in early May but one to three more nodes than those planted in early July. Centennial planted in mid-June at Starkville, Mississippi, produced 20 nodes on plants 39 inches tall but, when planted in late July, averaged only 9.5 nodes/plant and 8.6 inches tall.

Flower racemes originate from buds at the nodes. The more nodes, the more chances for racemes when the days become short enough to stimulate flower formation.

Root Development

The above-ground and below-ground plant parts grow normally during vegetative development. Roots may grow 5 to 8 ft deep under good soil conditions, but there generally are not enough very deep roots to supply all the water needed to the developing leaves.

Many small secondary and tertiary roots live for only a short time, and they die faster if conditions become less favorable. Their replenishment depends on a ready supply of organic nutrients in the form of sugars supplied by the leaves. Thus, if above-ground conditions become unfavorable for growth or other plant parts become too competitive for available sugars, roots die faster than replacement roots are developed.

Developing seed become a repository for large quantities of the sugars produced by leaves. About two weeks normally are required from flowering until the developing seed begin to add significant dry weight, after which the seed grow rapidly and, apparently because of their proximity to the leaves, receive the major part of the sugars available from the leaves. Therefore, during the period of maximum seed growth (from about two weeks after flowering until maturity), root numbers decrease and total root length decreases. This causes the plant to become more dependent on fewer roots for its water and nutrient supply.

This occurs in Mississippi during August and September for early varieties and during late August, September and October for late varieties. The plants are most susceptible to drought during this time. This also is a period of very high evaporative demand. The combination of intra-plant competition for nutrients, which results in a decreasing root mass, and the high evaporative demand of the atmosphere forces the crop into a highly dependent situation relative to available water supply. The crop needs a soil with excellent water-holding capabililties and a reasonable seasonal distribution of rain if it is to reach its yield potential.

In late-planted beans, which flower while the plant is still small, the intra-plant competition for available nutrients limits root development. In such cases, the smaller root mass forces the plant into a less competitive position relative to removal of available soil water than exists for plants that have had adequate time for vegetative growth and root development before flowering. Such late-planted beans are more dependent on a uniform distribution of rainfall during the growing season.

The failure of July-planted beans to root deeply in Mississippi probably is caused by the internal competition of one plant part with another for available carbohydrates. The late-planted beans are induced to flower before they have a chance to develop a large root system, and a major part of the available carbohydrates is used in seed production rather than for leaf, stem and root growth.

Premature flowering results in a self-destructive situation for the plant in a dry environment because the plant is unable to feed the root to support the growth it needs. Thus, the late-planted crop is much more dependent on timely rainfall than is the crop planted at the optimum time.

Data on growth-stages were not collected on the experiments in south Mississippi during the relatively cool and wet growing season in 1979. Similar data were collected for the varieties Essex, Davis, Bragg and Hutton at Tifton, Georgia. A three-year average of the planting date, flowering and maturity-date data shows that the length of time to flowering is considerably shorter at that latitude than at Starkville. Bragg required 82 and 52 days from planting to flowering at Starkville when planted in early May and early July, respectively. In south Georgia, Bragg required only 60 and 40 days to develop flowers after

planting in early May and early July, respectively. In south Georgia, the day length will be shorter in summer than in north Mississippi. Therefore, it appears that the critical short-day length necessary to induce flowering in Bragg occurs 12 to 20 calendar days earlier at Tifton, Georgia than at Starkville, Mississippi.

The length of time from flowering to maturity for soybeans at the more southernly latitude was longer than that at Starkville. Bragg required 108 days from flowering to maturity in south Georgia when planted in early May but only 81 days at Starkville. When planted in early July, the length of Bragg's reproductive period was reduced to 68 days at the more southernly latitude and 55 days at Starkville. The effect of relatively small changes in day length (as influenced by north-south location and planting dates) obviously can have a large effect on the development of soybeans.

Cultural Considerations

Two very serious constraints on late planting are difficulty in obtaining stands and water-related problems.

Row-planted beans can be cultivated and herbicides can be post-directed for weed control; whereas, weed control in drill-planted beans must be accomplished entirely with over-the-top herbicides and canopy cover. Cultivation and post-directed herbicide applications for weed control are generally less costly than broadcast over-the-top herbicide applications. Beans on rows may be treated with herbicides over-the-top, in a band over the row or post-directed; however, only over-the-top applications can be used with solid-seeded beans.

Late-season insect populations frequently are such a serious threat to soybeans in south Mississippi that producers need to be alert to damaging infestations each season and be prepared to apply insecticides as needed.

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Appendix Table 1. Yield of soybeans, by planting date, variety and row spacing, MAFES North Mississippi Branch, 1976-79.

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		1976			
		bushels/acre[1/]			
4/16	Kent	20.4 c	27.4 d	26.2 c	24.2
	Hill	46.2 ab	38.0 b	44.0 a	42.7
	Forrest	38.5 b	40.2 b	37.2 b	38.6
	Tracy	49.3 a	50.3 a	48.7 a	49.1
	Lee 74	40.4 ab	36.5 b	38.3 b	38.4
	Bragg	29.3 c	28.8 d	27.7 c	28.6
	Average	37.3	36.9	37.0	37.1
4/29	Kent	25.7 d	34.1 bc	36.5 ab	32.1
	Hill	36.4 b	34.7 bc	34.2 ab	35.1
	Forrest	42.4 a	35.2 bc	40.9 a	39.5
	Tracy	43.4 a	43.4 a	40.5 a	42.4
	Lee 74	33.1 c	41.2 ab	34.2 ab	36.2
	Bragg	17.0 e	31.0 c	29.0 b	25.7
	Average	33.0	36.6	35.9	35.2
5/25	Kent	34.5 ab	31.1 b	36.4 b	34.0
	Hill	38.0 ab	42.0 a	45.3 a	41.8
	Forrest	35.6 ab	43.7 a	42.2 ab	40.5
	Tracy	40.4 a	44.2 a	46.2 a	43.6
	Lee 74	32.2 b	44.4 a	40.4 ab	39.0
	Bragg	31.6 b	33.9 b	34.7 b	33.4
	Average	35.4	39.9	40.9	38.7
6/30	Kent	21.4 b	25.2 a	21.8 a	22.8
	Hill	28.1 a	28.9 a	25.0 a	27.3
	Forrest	28.4 a	28.9 a	22.7 a	26.7
	Tracy	27.9 a	29.3 a	24.2 a	27.1
	Lee 74	27.0 a	27.5 a	26.8 a	27.1
	Bragg	27.3 a	29.5 a	27.6 a	28.1
	Average	26.7	28.2	24.7	26.5

continued

Appendix Table 1. (Continued)

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		1977			
		----------bushels/acre----------			
4/16	Hill	21.6 by	25.9 cx	26.4 b x	24.6
	Forrest	36.8 a xy	40.6 a x	32.6 a y	36.7
	Tracy	33.3 a x	37.7 ab x	35.7 a x	35.6
	Centennial	31.9 a x	36.0 b x	34.2 a x	34.0
	Bragg	12.6 c z	18.2 d y	20.4 c x	17.1
	Average	27.2	31.7	30.0	29.6
4/30	Hill	26.1 b y	34.1 b x	30.5 b x	30.2
	Forrest	41.9 a x	46.4 a x	41.8 a x	43.4
	Tracy	42.7 a x	43.9 a x	39.3 a x	42.0
	Centennial	38.9 a y	44.5 a x	40.4 a y	41.3
	Bragg	11.0 c y	20.4 c x	18.4 c x	16.6
	Average	32.1	37.9	34.1	34.7
5/19	Hill	36.7 b x	33.4 b x	31.7 c x	33.9
	Forrest	52.4 a x	37.9 a y	37.5 a y	42.6
	Tracy	38.1 b x	37.9 a x	33.1 bc x	36.4
	Centennial	35.5 b x	37.9 a x	36.4 ab x	36.6
	Bragg	9.4 c y	15.1 c x	14.9 d x	13.1
	Average	34.4	32.4	30.7	32.5
6/09	Hill	31.7 b xy	36.5 a x	31.0 a y	33.1
	Forrest	37.8 a x	33.8 ab x	34.1 a x	35.2
	Tracy	32.7 ab x	37.4 a x	31.6 a x	33.9
	Centennial	33.1 ab x	33.9 ab x	31.7 a x	32.9
	Bragg	14.8 c y	27.8 b x	19.9 b y	20.8
	Average	30.0	33.9	29.7	31.2
7/06	Hill	22.2 ab x	18.9 c x	16.5 c x	19.2
	Forrest	28.2 a x	27.7 a x	22.0 abc x	26.0
	Tracy	25.2 ab x	20.1 bc x	23.1 ab x	22.8
	Centennial	24.7 ab x	26.2 ab x	26.9 a x	25.9
	Bragg	20.0 b x	16.8 c x	17.2 bc x	18.0
	Average	24.1	21.9	21.1	22.4

continued

Appendix Table 1. (Continued)

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		1978			
		----------bushels/acre----------			
4/17 [2]	Hill	27.8	29.0	23.7	26.8
	Forrest	26.8 bc x	31.4 a x	29.8 bc x	29.3
	Tracy	34.8 a x	37.6 a x	37.3 a x	36.6
	Centennial	33.0 ab x	30.2 a x	33.5 ab x	32.2
	Bragg	22.7 c x	24.8 a x	27.2 c x	24.9
	Average	29.4	31.0	31.9	30.8
5/19	Hill [3]	--	27.8	24.4	26.1
	Forrest	35.8 a x	30.7 a x	30.6 b x	32.4
	Tracy	39.2 a x	33.8 a x	38.1 a x	37.0
	Centennial	40.9 a x	36.4 a x	38.7 a x	38.7
	Bragg	28.1 b x	29.3 a x	30.6 b x	29.3
	Average	36.0	32.5	34.5	34.3
6/6	Hill	30.0 [3]	-- [3]	-- [3]	--
	Forrest	39.4 b y	45.3 a x	42.5 ab xy	42.4
	Tracy	40.0 b y	47.7 a x	41.2 ab y	43.0
	Centennial	45.6 a x	48.9 a x	45.9 a x	46.8
	Bragg	36.0 b y	47.8 a x	37.4 b y	40.4
	Average	40.2	47.4	41.8	43.2
6/28	Hill	29.2	25.6	22.5	25.8
	Forrest	39.6 a x	37.1 a x	34.6 a x	37.1
	Tracy	38.4 a x	33.0 a y	33.0 a y	34.8
	Centennial	40.2 a x	37.4 a x	33.1 a y	36.9
	Bragg	35.8 a x	37.8 a x	32.8 a x	35.5
	Average	38.5	36.3	33.4	36.1
		1979			
4/20	Hill	22.9 bx	26.3 bx	26.2 bx	25.2
	Forrest	5.8 cy	14.6 cx	13.5 cx	11.3
	Tracy	41.4 ax	38.4 ax	41.5 ax	40.4
	Centennial	18.5 by	30.1 abx	25.6 bxy	24.7
	Bragg	0.8 cx	1.2 cx	1.4 cx	1.1
	Average	17.4	22.1	21.1	

continued

Appendix Table 1. (Continued)

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		----------bushels/acre----------			
5/21	Hill	25.4 bcy	26.9 bcy	23.4 by	25.2
	Forrest	22.4 cy	23.8 cy	22.6 by	22.9
	Tracy	34.0 ay	37.5 ax	32.6 ay	34.7
	Centennial	28.8 aby	31.5 by	30.5 ay	30.3
	Bragg	12.9 dy	17.8 dxy	21.4 bx	17.4
	Average	24.7	27.5	26.1	
6/13	Hill	33.2 ax	34.1 bx	26.0 ax	31.1
	Forrest	37.8 ax	35.8 bxy	27.4 ay	33.7
	Tracy	39.8 ax	35.4 bx	29.2 ay	34.8
	Centennial	40.2 ax	39.3 ax	32.6 ax	37.4
	Bragg	35.4 ax	28.6 cx	27.2 ax	30.4
	Average	37.3	34.6	28.5	
6/29	Hill	31.3 ax	23.8 bxy	18.9 abcy	24.6
	Forrest	25.6 ax	22.1 bxy	14.3 cy	20.7
	Tracy	27.2 ax	25.9 abx	16.9 cy	23.3
	Centennial	36.0 ax	33.5 ax	26.8 ax	32.1
	Bragg	33.5 ax	25.1 aby	24.0 aby	27.5
	Average	30.7	26.1	20.2	

*Adjusted to 13% moisture.

1/ Within each row width and planting date, values followed by the same letter (a, b, c or d) are not different at a probability of equal to or less than 0.05 as determined by Duncan's New Multiple Range Test. Values across row width, within a date and within a variety are not different if followed by the same letter (x or y).

2/ Hill seed was of poor quality and, although planting rate was increased, the resulting yield may be artificially low. Hill was therefore excluded from data analysis.

3/ Was not harvested because of poor stand.

end of table.

Appendix Table 2. Yield of soybeans, by planting date, variety and row spacing, MAFES Plant Science Farm, 1976-79.

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		1976			
		---------- bushels/acre ----------			
4/16	Kent	14.6 c[1/]	8.9 c	9.2 c	10.9
	Hill	33.0 b	24.1 b	19.6 b	25.6
	Forrest	36.5 ab	21.4 b	17.0 bc	25.0
	Tracy	53.7 a	42.2 a	39.8 a	45.2
	Lee 74	45.7 ab	31.4 ab	36.1 a	37.7
	Bragg	46.6 ab	33.0 ab	35.4 a	38.3
	Average	38.3	26.8	26.1	
4/28	Kent	11.4 c	14.6 b	15.8 c	13.9
	Hill	28.0 b	33.8 a	25.2 bc	29.0
	Forrest	28.2 b	38.3 a	25.9 b	30.8
	Tracy	38.9 a	46.8 a	34.6 ab	40.1
	Lee 74	45.1 a	43.2 a	39.7 a	42.7
	Bragg	40.6 a	43.8 a	40.6 a	41.7
	Average	32.0	36.7	30.3	
5/24	Kent	34.9 c	28.1 b	22.7 c	28.6
	Hill	46.4 b	35.0 b	33.3 b	38.2
	Forrest	53.6 a	52.3 a	44.6 a	50.2
	Tracy	45.3 b	46.0 a	42.0 a	44.4
	Centennial	40.2 bc	48.5 a	42.8 a	43.8
	Bragg	44.3 b	44.6 a	44.1 a	44.3
	Average	44.1	42.4	38.2	
6/8	Kent	10.7 c	13.1 d	18.0 c	13.9
	Hill	31.4 b	27.4 c	25.2 bc	28.0
	Forrest	37.3 ab	27.9 c	27.4 ab	30.9
	Tracy	36.3 ab	32.9 b	30.2 ab	33.1
	Centennial	40.9 a	38.8 a	35.6 a	38.4
	Bragg	42.8 a	35.4 ab	32.4 ab	36.9
	Average	33.2	29.2	28.1	

continued

Appendix Table 2. (Continued)

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		----------bushels/acre----------			
7/12	Kent Hill Forrest Tracy Centennial Bragg	late maturity and fall rains prevented harvest			
		1977			
		---------- bushels/acre ----------			
4/14	Hill	14.5 b y	22.8 c x	22.3 bc x	19.9
	Forrest	14.5 b y	26.1 bc x	20.6 c xy	20.4
	Tracy	22.6 ab y	35.9 a x	31.8 a xy	30.1
	Centennial	27.2 a x	34.5 a x	28.6 ab x	30.1
	Bragg	24.4 ab y	28.3 b xy	29.0 ab x	27.2
	Average	20.6	29.5	26.5	25.5
5/2	Hill	26.9 a x	27.8 b x	21.2 a x	25.3
	Forrest	30.0 a x	26.6 b x	22.8 a x	26.5
	Tracy	36.1 a x	38.8 a x	30.4 a x	35.1
	Centennial	36.5 a x	33.9 ab x	31.7 a x	34.0
	Bragg	30.9 a x	27.7 b y	25.2 a z	27.9
	Average	32.1	31.0	26.3	30.0
5/16	Hill[2/]	12.6 a y	27.1 a x	16.5 b y	18.7
	Forrest[2/]	11.4 a y	29.0 a x	20.1 ab xy	20.2
	Tracy[2/]	13.2 a y	34.0 a x	29.1 a x	25.4
	Centennial[2/]	16.4 a y	31.5 a x	22.4 ab xy	23.4
	Bragg[2/]	11.5 a y	26.8 a x	19.5 ab x	19.3
	Average	13.0	29.7	21.5	21.4
5/30	Hill	23.2 b x	22.4 bc x	13.9 c y	19.8
	Forrest	30.0 a x	28.0 ab x	22.8 ab x	26.9
	Tracy	34.0 a x	30.1 a x	28.5 a x	30.9
	Centennial	28.8 ab x	27.1 ab x	21.8 b y	25.9
	Bragg	22.6 b x	21.0 c x	19.8 bc x	21.1
	Average	27.7	25.7	21.4	24.9

continued

Appendix Table 2. (Continued)

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		----------bushels/acre----------			
6/15	Hill	11.5 a x	14.6 a x	15.0 a x	13.7
	Forrest	14.3 a x	16.7 a x	14.1 ab x	15.0
	Tracy	10.9 a x	11.1 a x	11.1 ab x	11.0
	Centennial	10.3 a x	14.0 a x	10.6 ab x	11.6
	Bragg	9.0 a x	11.1 a x	7.5 b x	9.2
	Average	11.2	11.3	11.6	12.1
7/6	Plots not harvested due to very poor stands caused by intense rainfall July 9.				
		1978			
4/15	Hill[3/]	16.0	20.4	18.9	18.4
	Forrest	19.2 c x	24.4 b x	24.2 b x	22.6
	Tracy	22.8 bc x	26.2 b x	27.2 ab x	25.4
	Centennial	32.7 a x	38.0 a x	33.7 a x	34.8
	Bragg	28.7 ab x	29.0 b x	28.4 ab x	28.7
	Average	25.8	29.4	28.4	27.9
4/28	Hill	21.3	15.8	12.5	16.5
	Forrest	27.6 b x	24.1 b x	19.0 b x	23.6
	Tracy	40.7 a x	35.3 a x	34.7 a x	36.9
	Centennial	37.2 a x	41.0 a x	32.4 a x	36.9
	Bragg	36.7 a x	35.1 a xy	30.4 a y	34.1
	Average	35.5	33.8	29.1	32.8
5/17	Hill	22.0	22.3	20.2	21.5
	Forrest	31.9 c x	26.7 b x	18.7 b y	25.8
	Tracy	42.5 ab x	42.4 a x	39.1 a x	41.3
	Centennial	47.8 a x	40.9 a y	37.9 a y	42.2
	Bragg	38.2 b x	36.6 a x	35.6 a x	36.6
	Average	40.1	36.6	32.7	36.5
6/5	Hill	13.3	15.8	17.4	15.5
	Forrest	17.4 c y	28.3 a x	18.6 a y	21.4
	Tracy	27.6 b x	33.6 a x	26.6 a x	29.3
	Centennial	31.2 ab xy	36.6 a x	25.6 a y	31.1
	Bragg	38.4 a x	28.8 a y	25.3 a y	30.8
	Average	28.6	31.8	24.0	28.2

continued

Appendix Table 2. (Continued)

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		----------bushels/acre----------			
6/30	Hill	4/ --	4/ --	4/ --	4/ --
	Forrest	2.8 a x	5.5 a x	4.4 a x	4.2
	Tracy	3.9 a x	7.8 a x	4.7 a x	5.5
	Centennial	4.8 a x	6.9 a x	5.6 a x	5.8
	Bragg	4.0 a x	6.7 a x	6.6 a x	5.8
	Average	3.9	6.7	5.3	5.3
		1979			
5/1	Hill	28.5 cx	28.0 ax	23.6 cx	26.7
	Forrest	35.1 bcx	41.6 ax	28.9 bcx	35.2
	Tracy	45.8 ax	41.1 axy	37.5 ay	41.5
	Centennial	43.8 ax	40.8 ax	34.0 aby	39.5
	Bragg	39.1 abx	34.9 ax	33.1 abx	35.7
	Average	38.5	37.3	31.4	
5/16	Hill	27.4 cx	31.8 cx	26.3 cx	28.5
	Forrest	34.3 bcxy	39.6 ax	30.5 bcy	34.8
	Tracy	42.3 abx	41.8 ax	37.6 ax	40.6
	Centennial	46.9 ax	38.8 aby	35.0 aby	40.2
	Bragg	32.6 bcx	35.6 bcx	34.2 abx	34.1
	Average	36.7	37.5	32.7	
6/5	Hill	34.8 bx	34.8 bcx	29.1 cy	32.9
	Forrest	37.8 abx	37.1 bxy	33.8 by	36.2
	Tracy	43.4 ax	42.0 axy	38.5 ay	41.3
	Centennial	43.6 ax	42.8 ax	33.2 by	39.9
	Bragg	29.1 abz	31.9 cy	36.2 abx	32.4
	Average	37.7	37.7	34.2	
6/18	Hill	23.0 bx	18.0 bx	14.5 bx	18.5
	Forrest	34.4 ax	23.3 by	16.0 bz	24.2
	Tracy	41.6 ax	30.7 ay	17.9 bz	30.1
	Centennial	38.7 ax	32.4 axy	27.0 ay	32.7
	Bragg	32.7 ax	22.2 by	17.7 by	24.2
	Average	33.9	25.3	18.6	

continued

Appendix Table 2. (Continued)

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		----------bushels/acre----------			
7/2	Hill	20.7 bx	19.7 cx	17.0 ax	19.1
	Forrest	21.7 bx	22.6 bcx	22.7 ax	22.3
	Tracy	27.0 abx	27.9 ax	21.1 ax	25.3
	Centennial	31.4 ax	29.7 ax	24.3 ay	28.5
	Bragg	28.7 abx	26.1 abx	24.0 ax	26.3
	Average	25.9	25.2	21.8	

end of table

*Adjusted to 13% moisture.

1/ Within each row width and planting date, values followed by the same letter (a, b, or c) are not different ($1^{o} < .05$) of equal to or less than 0.05 as determined by Duncan's New Multiple Range Test. Values across row widths within a date and within a variety are not different if followed by the same letter (x, y, or z).

2/ Poor stands were obtained in soybeans planted 5/16 due to dry weather. This was especially a problem with those plots planted on 7-inch rows.

3/ Hill seed was of poor quality and, although planting rate was increased, the resulting yield may be artificially low. Hill was therefore excluded in data analysis.

4/ Was not harvested because of poor stand.

Appendix Table 3. Yield of soybeans, by planting date, variety and row spacing, MAFES Black Belt Branch, 1976-79.

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		1976			
		----------bushels/acre----------			
4/20	Kent	19.8 c[1/]	16.4 e	13.3 c	16.5
	Hill	26.6 b	25.6 cd	24.5 b	25.6
	Forrest	34.2 a	22.9 d	22.8 b	26.6
	Tracy	38.6 a	36.2 a	31.6 a	35.5
	Lee 74	36.8 a	32.6 ab	24.0 b	31.1
	Bragg	31.9 ab	29.0 bc	20.7 b	27.2
	Average	31.3	27.1	22.8	
4/30	Kent	24.8 b	15.2 c	13.1 c	17.7
	Hill	25.2 b	22.2 b	21.0 b	22.8
	Forrest	34.3 a	24.2 b	24.3 ab	27.6
	Tracy	33.4 a	33.2 a	28.0 a	31.5
	Lee 74	34.4 a	28.0 a	23.6 ab	28.7
	Bragg	31.2 a	23.6 b	21.0 b	25.3
	Average	30.6	24.4	21.8	
5/20	Kent	28.2 c	20.5 b	13.9 b	20.9
	Hill	32.5 bc	26.4 ab	23.0 a	27.3
	Forrest	35.5 ab	37.1 a	20.8 ab	31.1
	Tracy	35.2 ab	36.4 a	28.6 a	33.4
	Lee 74	39.4 a	37.5 a	26.6 a	34.5
	Bragg	35.4 ab	33.8 a	26.5 a	31.9
	Average	34.4	32.0	23.2	
6/14	Kent	27.2 b	26.9 a	16.2 b	23.4
	Hill	36.6 a	30.2 a	30.2 a	32.3
	Forrest	39.0 a	27.7 a	29.3 a	32.0
	Tracy	37.5 a	32.5 a	30.4 a	33.5
	Lee 74	38.2 a	35.6 a	32.9 a	35.6
	Bragg	37.2 a	33.8 a	34.2 a	35.1
	Average	35.9	31.1	28.9	

continued

Appendix Table 3. (Continued)

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		bushels/acre			
7/02	Kent	17.6 b	12.7 cd	12.0 ab	14.1
	Hill	22.4 ab	19.4 ab	12.9 ab	18.2
	Forrest	22.1 ab	12.2 d	11.6 b	15.3
	Tracy	20.6 b	16.4 bcd	12.6 ab	16.5
	Lee 74	27.4 a	18.7 abc	14.3 ab	20.1
	Bragg	27.5 a	23.7 a	16.2 a	22.5
	Average	22.9	17.2	13.3	
7/15	Kent				
	Hill				
	Forrest	Late maturity and fall rains prevented harvest			
	Tracy				
	Lee 74				
	Bragg				
		1977			
4/14	Hill	7.1 b xy	10.9 b x	5.4 b y	7.8
	Forrest	10.6 b x	12.4 b x	9.5 b x	10.8
	Tracy	16.8 a xy	19.3 a x	16.0 a y	17.4
	Centennial	18.0 a x	18.7 a x	17.8 a x	18.2
	Bragg	15.1 a x	18.0 a x	15.9 a x	16.3
	Average	13.5	15.9	12.9	14.1
4/28	Hill	9.2 b x	9.3 b x	7.4 b x	8.6
	Forrest	12.4 b x	12.6 b x	8.3 b y	11.1
	Tracy	18.6 a x	19.9 a x	15.1 a y	17.9
	Centennial	18.5 a x	19.1 a x	16.7 a x	18.1
	Bragg	16.2 a x	18.3 a x	15.2 a x	16.6
	Average	15.0	15.8	12.5	14.5
5/13	Hill	8.7 c x	6.9 b xy	5.7 b y	7.1
	Forrest	10.8 bc x	8.9 b xy	8.2 b y	9.3
	Tracy	14.1 b x	17.8 a x	14.0 a x	15.3
	Centennial	17.7 a x	16.3 a x	16.9 a x	17.0
	Bragg	12.9 b y	17.4 a x	15.5 a xy	15.3
	Average	12.8	13.5	12.1	12.8

continued

Appendix Table 3. (Continued)

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		----------bushels/acre----------			
6/15	Hill	4.3 a x	2.6 a x	3.0 a x	3.3
	Forrest	4.2 a x	6.2 a x	4.5 a x	5.0
	Tracy	4.1 a x	4.8 a x	3.6 a x	4.2
	Centennial	7.2 a x	5.2 a x	4.7 a x	5.7
	Bragg	5.9 a x	4.3 a x	4.9 a x	5.0
	Average	5.2	4.6	4.1	4.6
6/30	Hill	1.6 b x	1.8 a x	0.8 c x	1.4
	Forrest	1.5 b x	2.8 a x	2.5 ab x	2.3
	Tracy	4.5 a x	1.6 a y	1.4 bc y	2.5
	Centennial	1.9 b x	2.4 a x	3.8 a x	2.7
	Bragg	2.4 b x	2.7 a x	2.3 bc x	2.5
	Average	2.8	2.7	2.0	2.5
		1978			
4/17	Hill[2/]	16.0	11.0	10.2	12.4
	Forrest	15.6 a x	14.4 a x	14.1 a x	14.7
	Tracy	8.9 b x	12.6 ab x	9.8 b x	10.4
	Centennial	6.2 b x	4.8 c x	8.4 b x	6.5
	Bragg	6.0 b y	8.3 bc x	9.3 b x	7.9
	Average	9.2	10.0	10.4	9.9
5/15	Hill	16.6	17.5	15.8	16.6
	Forrest	17.8 a x	18.6 a x	18.1 a x	18.2
	Tracy	13.7 ab x	18.6 a x	18.3 a x	16.9
	Centennial	7.8 c x	7.6 b x	13.0 a x	9.5
	Bragg	10.2 bc x	14.9 a x	15.9 a x	13.7
	Average	12.4	14.9	16.3	14.5
6/1	Hill	15.3	18.6	14.7	16.2
	Forrest	17.1 a y	25.8 a x	17.2 b y	20.0
	Tracy	23.4 a x	25.5 a x	22.5 a x	23.8
	Centennial	19.4 a x	21.6 a x	17.2 b x	19.4
	Bragg	20.5 a x	20.7 a x	17.8 ab x	19.7
	Average	20.1	23.4	18.7	20.7

continued

Appendix Table 3. (Continued)

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		----------bushels/acre----------			
6/15	Hill	3.6	5.4	6.0	5.0
	Forrest	18.4 a x	18.2 a x	16.5 a x	17.7
	Tracy	19.9 a x	21.0 a x	20.0 a x	20.3
	Centennial	16.4 a y	19.4 a x	18.2 ab xy	18.0
	Bragg	15.7 a x	22.0 a x	20.2 a x	19.3
	Average	17.6	20.1	18.7	18.8
6/30	Hill	--3/	--	--	--
	Forrest	1.1 b y	3.2 a y	6.1 a x	3.5
	Tracy	4.3 a x	4.8 a x	5.6 a x	4.9
	Centennial	0.7 by	3.6 a xy	5.7 a x	3.3
	Bragg	2.1 ab y	3.5 a x	6.5 a x	4.0
	Average	2.0	3.8	6.0	3.9
7/14	Hill	--	--	--	--
	Forrest	9.6 a x	3.4 a y	0.7 c y	4.6
	Tracy	5.3 a x	4.3 a x	1.7 ab y	3.7
	Centennial	7.2 a x	6.3 a x	2.3 a x	5.4
	Bragg	5.1 a x	4.6 a x	1.4 b x	3.7
	Average	6.8	4.6	1.6	4.3
		1979			
4/18	Hill	13.9 bx	12.2 bx	12.6 bx	12.9
	Forrest	14.5 bx	13.0 bx	9.0 bx	12.1
	Tracy	17.8 abx	17.2 bx	14.1 bx	16.3
	Centennial	24.9 ax	23.7 ax	22.1 ax	23.6
	Bragg	16.9 bx	15.6 bx	15.3 bx	15.9
	Average	17.6	16.4	14.6	
4/30	Hill	19.0 ax	15.7 ax	13.3 bx	16.0
	Forrest	23.9 ax	17.1 ax	12.0 bx	17.7
	Tracy	34.1 ax	25.2 ax	20.5 abx	26.6
	Centennial	33.7 ax	22.8 ax	25.6 ax	27.4
	Bragg	28.7 ax	20.9 ax	16.5 abx	22.0
	Average	27.9	20.3	17.6	

continued

Appendix Table 3. (Continued)

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		----------bushels/acre----------			
5/17	Hill	9.7 by	21.3 cdx	14.4 bxy	15.1
	Forrest	19.2 ax	13.7 dx	15.5 bx	16.8
	Tracy	23.9 ax	29.3 abx	26.5 ax	26.6
	Centennial	25.6 az	34.5 ax	30.0 ay	30.0
	Bragg	23.8 ax	24.2 bcx	25.4 ax	24.5
	Average	20.5	25.0	22.4	
6/5	Hill	15.3 bx	19.0 abx	18.7 ax	17.7
	Forrest	11.7 bx	17.0 bx	15.5 ax	14.8
	Tracy	20.3 abx	25.9 ax	18.9 ax	21.7
	Centennial	26.1 ax	29.2 ax	27.3 ax	27.5
	Bragg	20.4 abx	26.1 abx	21.8 ax	22.8
	Average	18.8	23.4	20.5	
6/15	Hill	5.2 bx	2.8 abx	4.0 bcx	4.0
	Forrest	1.1 cx	1.1 bx	1.0 dx	1.1
	Tracy	13.8 ax	13.4 ax	2.2 cdx	9.8
	Centennial	13.1 ax	7.8 abx	7.3 ax	9.4
	Bragg	2.6 cy	3.3 abxy	4.4 bx	3.5
	Average	7.2	5.7	3.8	
6/29	Hill	6.6 bx	10.8 ax	8.4 ax	8.6
	Forrest	10.0 abx	10.7 ax	9.3 ax	10.0
	Tracy	11.0 abx	10.3 ax	9.2 ax	10.2
	Centennial	14.5 ax	10.9 ax	10.6 ax	12.0
	Bragg	11.9 ax	16.2 ax	10.5 ax	12.9
	Average	10.8	11.8	9.6	

end of table

*Adjusted to 13% moisture.

1/ Within each row width and planting date, values followed by the same letter (a, b, or c) are not different at a probability of equal to or less than 0.05 as determined by Duncan's new Multiple Range Test. Values across row widths within a date and within a variety are not different if followed by the same letter (x, y, or z).

2/ Hill seed was of poor quality and, although planting rate was increased, the resulting yield may be artificially low. Hill was therefore excluded in data analysis.

3/ Plots not harvested due to poor stands.

Appendix Table 4. Yield of soybeans, by planting date, variety and row spacing, MAFES Coastal Plain Branch, 1977-79.

Planting Date	Variety	Yield* Row Width (inches) 7	40	Average
		1977		
		--------- bushels/acre[1] ---------		
4/15	Hill	21.5 a x[1]	25.4 b x	23.4
	Forrest	28.7 a x	30.0 ab x	29.4
	Tracy	26.4 a x	35.8 a x	31.1
	Bragg	21.2 a x	28.0 b x	24.6
	Average	24.4	29.8	27.1
5/2	Hill	31.3 b x	29.1 a x	30.2
	Forrest	39.4 ab x	29.5 a x	34.4
	Tracy	43.5 a x	36.5 a y	40.0
	Bragg	33.0 b x	33.3 a x	33.2
	Average	36.8	32.1	34.5
5/16	Hill	37.7 a x	32,8 b x	35.2
	Forrest	37.1 a x	38.5 b x	37.8
	Tracy	47.7 a x	44.7 a x	46.2
	Bragg	37.6 a x	36.8 b x	37.2
	Average	40.0	38.2	39.1
		1978		
4/21	Hill	[2] --	[2] --	[2] --
	Forrest	11.3 a y	28.4 a x	19.8
	Tracy	7.6 a y	19.4 b x	13.5
	Bragg	11.2 a x	10.6 c x	10.9
	Average	10.0	19.5	14.7
5/2	Hill	[2] --	[2] --	[2] --
	Forrest	[2] --	29.1 a	[2] --
	Tracy	[2] --	17.1 b	[2] --
	Bragg	7.6 x	9.5 c x	8.6
	Average			
5/22	[3] Hill	29.0 a x	29.2 a x	29.1
	Forrest	27.6 a x	22.2 ab y	24.9

continued

Appendix Table 4. (Continued)

Planting Date		Yield* Row Width (inches) 7	40	Average
		bushels/acre		
	Tracy	14.9 b x	19.0 b x	17.0
	Bragg	14.3 b x	12.9 c x	13.6
	Average	21.4	20.8	21.2
6/6	3/ Hill	12.7 b y	23.6 a x	18.2
	Forrest	19.6 a x	21.8 a x	20.7
	Tracy	12.9 b y	20.0 a x	16.4
	Bragg	15.0 b x	15.9 b x	15.4
	Average	15.0	20.3	17.7
		1979		
5/3	Hill	20.4 ax	29.0 ax	24.7
	Forrest	21.9 ax	29.2 ax	25.5
	Tracy	23.9 ay	36.2 ax	30.0
	Bragg	25.1 ax	33.3 ax	29.2
	Average	24.0	31.9	27.4
5/28	Hill	41.7 abx	33.0 ax	37.3
	Forrest	45.8 ax	34.3 ax	40.0
	Tracy	38.1 bx	28.9 ax	33.5
	Bragg	39.5 abx	35.1 ax	36.3
	Average	41.3	32.8	36.8
6/14	Hill	32.8 ax	33.7 bx	33.2
	Forrest	32.3 ax	37.2 abx	34.7
	Tracy	37.3 ax	36.4 abx	36.9
	Bragg	43.3 ax	40.1 ax	41.7
	Average	36.4	36.9	36.6
6/27	Hill	36.7 ax	27.4 by	32.0
	Forrest	39.9 ax	27.8 by	33.9
	Tracy	39.3 ax	30.9 bx	35.1
	Bragg	44.0 ax	35.6 ay	39.8
	Average	40.0	30.4	35.2

end of table

*Adjusted to 13% moisture.

1/ Within each row width and planting date, values followed by the same letter (a or b) are not different at a probability of equal to or less than 0.05 as determined by Duncan's New Multiple Range Test. Values across row widths, within a date and within a variety are not different if followed by the same letter (x or y).

2/ Not harvested because of poor stand.

3/ New source of Hill seed.

Appendix Table 5. Yield of soybeans, by planting date, variety and row spacing, MAFES Brown Loam Branch, 1976-79.

Planting Date	Variety	Yield* Row Width (inches) 7	40	Average
		1976		
		-------- bushels/acre[1/]		----------
4/19	Kent	33.5 a[1/]	28.3 a	30.9
	Hill	35.0 a	36.6 a	35.8
	Forrest	39.8 a	39.8 a	39.8
	Tracy	44.2 a	41.3 a	42.8
	Lee 74	41.1 a	37.0 a	39.0
	Bragg	33.6 a	34.5 a	34.0
	Average	37.9	36.2	37.1
5/05	Kent	43.7 a	29.2 c	36.4
	Hill	32.3 a	39.2 abc	35.8
	Forrest	38.3 a	31.5 bc	34.9
	Tracy	48.1 a	41.2 ab	44.6
	Lee 74	42.1 a	46.6 a	44.4
	Bragg	43.0 a	36.8 abc	39.9
	Average	41.2	37.4	39.3
5/19	Kent	45.3 a	35.3 b	40.3
	Hill	39.9 a	40.2 ab	40.0
	Forrest	46.3 a	47.0 a	46.6
	Tracy	36.0 a	39.5 b	37.8
	Lee 74	44.9 a	38.9 b	41.9
	Bragg	39.2 a	35.2 b	37.2
	Average	41.9	39.4	40.6
6/04	Kent	12.5 a	10.4 c	11.4
	Hill	23.6 a	17.0 b	20.3
	Forrest	24.3 a	16.2 b	20.2
	Tracy	17.4 a	20.3 ab	18.8
	Lee 74	22.1 a	22.2 a	22.2
	Bragg	23.0 a	22.1 a	22.6
	Average	20.5	18.0	19.3

continued

Appendix Table 5. (Continued)

Planting Date	Variety	Yield* Row Width (inched) 7	40	Average
		----------bushels/acre----------		
7/01	Kent	10.8 b	12.7 b	11.8
	Hill	23.9 a	15.3 ab	19.6
	Forrest	20.6 a	17.2 ab	18.9
	Tracy	20.0 a	15.3 ab	17.6
	Lee 74	22.7 a	18.5 a	20.6
	Bragg	24.2 a	17.6 ab	20.9
	Average	20.4	16.1	18.2
7/16	Kent	7.3 ab	--3/	--
	Hill	13.7 a	10.9 a	12.3
	Forrest	12.7 ab	6.9 a	9.8
	Tracy	6.4 b	7.0 a	6.7
	Lee 74	11.8 ab	8.9 a	10.4
	Bragg	7.8 ab	11.7 a	9.8
	Average	9.9	8.9	9.8
		1977		
4/29	Hill	18.8 d x	18.7 b x	18.8
	Forrest	24.1 cd x	25.1 b x	24.6
	Tracy	39.0 a x	38.1 a x	38.5
	Centennial	36.5 ab x	39.7 a x	38.1
	Bragg	28.3 bc x	34.0 a x	31.2
	Average	39.3	31.1	30.2
6/22	Hill	20.6 b x	18.8 b x	19.7
	Forrest	24.0 ab y	29.3 a x	26.7
	Tracy	28.4 a x	29.0 a x	28.7
	Centennial	18.4 b y	27.8 a x	23.1
	Bragg	21.8 b x	27.7 a x	24.8
	Average	22.6	26.5	24.6
7/6	Hill	13.9 b x	14.1 c x	14.0
	Forrest	13.4 b y	18.1 bc x	15.8
	Tracy	18.6 a y	17.4 c x	18.0
	Centennial	14.7 b y	22.2 ab x	18.5
	Bragg	20.2 a x	23.3 a x	21.8
	Average	16.2	19.0	17.6

continued

Appendix Table 5. (Continued)

Planting Date	Variety	Yield* Row Width (inches) 7	40	Average
		----------bushels/acre----------		
7/27	Hill			2.7
	Forrest	Not harvested due to		3.4
	Tracy	insect damage		2.9
	Centennial			3.0
	Bragg			2.5
		1978		
4/27 [3/]	Hill	18.3	22.1	20.2
	Forrest	25.0 b x	28.4 a x	26.7
	Tracy	26.1 b x	34.3 a x	30.2
	Centennial	37.2 a x	33.8 a x	35.5
	Bragg	37.2 a x	34.8 a x	36.0
	Average	31.4	32.8	32.1
5/24	Hill	28.1	31.9	30.0
	Forrest	32.7 a x	30.8 b x	31.8
	Tracy	34.4 a x	34.9 ab x	34.6
	Centennial	34.9 a x	4.05 a x	37.7
	Bragg	37.7 a x	31.4 b x	34.6
	Average	35.0	34.4	34.7
6/21	Hill	26.1	22.2	24.2
	Forrest	30.4 a x	27.8 a x	29.1
	Tracy	30.2 a x	30.9 a x	30.6
	Centennial	35.8 a x	38.2 a x	37.0
	Bragg	35.9 a x	30.8 a x	33.4
	Average	33.1	31.9	32.5
7/12	Hill [4/]	-- [4/]	-- [4/]	--
	Forrest	14.0 a x	11.5 a x	12.8
	Tracy	11.4 a x	10.4 a x	10.9
	Centennial	14.2 a x	16.3 a x	15.2
	Bragg	19.1 a x	14.3 a x	16.7
	Average	14.7	13.1	13.9

continued

Appendix Table 5. (Continued)

Planting Date	Variety	Yield* Row Width (inches) 7	40	Average
		1979		
		----------bushels/acre----------		
4/19	Hill	25.8 bx	33.5 bx	29.7
	Forrest	33.0 abx	42.6 abx	37.8
	Tracy	31.7 abx	39.1 abx	35.4
	Centennial	35.7 ay	49.6 ax	42.6
	Bragg	32.5 aby	43.9 abx	38.2
	Average	31.7	41.7	36.7
5/28	Hill	39.0 bx	32.6 bx	35.8
	Forrest	43.0 bx	34.8 bx	38.9
	Tracy	45.0 abx	39.8 abx	42.4
	Centennial	53.5 ax	43.4 ax	48.5
	Bragg	43.2 bx	40.4 abx	41.8
	Average	44.8	38.2	41.5
6/29	Hill	33.2 cx	30.6 cx	31.9
	Forrest	42.9 ax	35.6 bcy	39.2
	Tracy	36.9 bx	35.2 bcx	36.0
	Centennial	42.4 ax	43.5 ax	43.0
	Bragg	41.7 ax	37.4 by	39.6
	Average	39.4	36.4	37.9
7/20	Hill	24.6 bx	20.0 bx	22.3
	Forrest	31.5 ax	22.9 aby	27.2
	Tracy	26.9 abx	17.7 by	22.3
	Centennial	28.4 abx	26.1 ax	27.3
	Bragg	31.3 ax	22.1 aby	26.7
	Average	28.6	21.7	25.2

end of table

*Adjusted to 13% moisture.

1/ Within each row width and planting date, values followed by the same letter (a, b, or c) are not different at a probability of equal to or less than 0.05 as determined by Duncan's New Multiple Range Test. Values across row widths, within a date and within a variety are not different if followed by the same letter (x or y).

2/ Plots not harvested due to shattering.

3/ Hill seed was of poor quality and, although planting rate was increased, the resulting yield may be artificially low. Hill was therefore excluded in the data analysis.

4/ Was not harvested because of poor stand.

Appendix Table 6. Yield of soybeans, by planting date, variety and planting date, MAFES South Mississippi Branch, 1976-79.

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		1976			
		---------- bushels/acre ----------			
4/28	Hill	47.4 a[1/]	25.9 ab	29.4 ab	34.2 a
	Forrest	27.5 ab	20.3 b	25.5 b	24.4 b
	Pickett 71	23.5 b	26.2 ab	28.8 ab	26.1 ab
	Davis	25.7 ab	18.1 b	27.0 b	23.6 b
	Bragg	33.7 ab	34.1 a	33.0 ab	33.6 a
	Cobb	33.8 ab	26.2 ab	36.1 a	32.0 ab
	Average	31.9	25.1	29.9	29.0
5/13	Hill	33.6 ab	25.2 b	22.2 bc	27.0 bc
	Forrest	28.7 b	17.5 c	23.2 bc	23.2 cd
	Pickett 71	38.7 ab	31.1 ab	27.7 ab	32.5 ab
	Davis	22.9 b	14.8 c	16.5 c	18.0 d
	Bragg	53.3 a	34.4 a	32.2 a	40.0 a
	Cobb	44.4 ab	26.6 b	29.5 ab	33.5 ab
	Average	36.9	24.9	25.2	29.0
6/18	Hill	24.6 ab	19.7 a	16.5 b	20.2 ab
	Forrest	33.8 a	22.8 a	23.8 a	26.8 a
	Pickett 71	22.3 ab	17.5 a	19.3 ab	19.7 b
	Davis	21.0 ab	19.8 a	22.8 a	21.2 ab
	Bragg	35.3 a	24.3 a	20.4 ab	26.7 a
	Cobb	17.5 b	21.5 a	19.0 ab	19.3 b
	Average	25.7	20.9	20.3	22.3
		1977			
4/28	Hill	11.6 c x	9.7 d xy	3.8 c y	8.4 c
	Forrest	19.0 bc x	14.3 cd x	6.8 c x	13.4 c
	Pickett 71	28.1 ab x	21.8 bc x	13.6 bc x	21.1 b
	Davis	29.1 ab x	29.6 ab x	28.8 a x	29.1 a
	Bragg	30.2 ab x	38.0 ab x	19.2 ab x	25.8 ab
	Cobb	36.4 a x	35.8 a x	26.6 a x	32.9 a

continued

Appendix Table 6. (Continued)

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		----------bushels/acre----------			
	Average	25.7	24.9	16.5	
5/12	Hill	18.9 a x	19.6 a x	17.6 a x	18.7 b
	Forrest	32.4 a x	26.2 a x	18.9 a x	25.8 ab
	Pickett 71	32.8 a x	23.6 a x	23.4 a x	26.6 ab
	Davis	34.2 ax	22.5 ax	23.5 ax	26.7 ab
	Bragg	29.7 ax	21.2 ax	20.0 ax	23.6 ab
	Cobb	34.8 ax	24.0 ax	26.5 ax	28.4 a
	Average	30.5	22.8	21.7	
2/ 6/2	Hill		11.1	14.8	
	Forrest		12.4	15.6	
	Pickett 71		26.4	17.8	
	Davis		28.8	16.5	
	Bragg		24.6	14.6	
	Cobb		30.0	24.5	
	Average		22.2	17.3	
		1978			
4/21	3/ Hill	29.1	22.6	18.6	23.4
	Forrest	37.8 a x	25.10 a xy	22.8 by	28.6
	Pickett 71	38.1 a x	25.6 a x	35.0 a x	32.9
	Davis	34.4 a x	33.1 a x	35.6 a x	34.4
	Bragg	30.7 a x	30.0 a x	30.5 ab x	30.4
	Cobb	31.6 a x	26.2 a x	30.9 ab x	29.6
	Average	34.5	28.0	31.0	31.2
5/11	Hill	27.6	29.6	19.7	25.6
	Forrest	36.2 ab x	30.7 ab xy	25.6 a y	30.8
	Pickett 71	39.2 ab x	33.6 ab x	26.9 a x	33.2
	Davis	41.1 a x	38.0 a x	33.6 a x	37.6
	Bragg	28.2 b x	23.5 b x	31.9 a x	27.9
	Cobb	41.4 a x	29.8 ab y	31.3 a y	34.2
	Average	37.2	31.1	29.9	32.7

continued

Appendix Table 6. (Continued)

Planting Date	Variety	Yield* Row Width (inches) 7	30	40	Average
		----------bushels/acre----------			
6/12	Hill	28.3	25.4	15.3	23.0
	Forrest	30.7 a x	30.5 a x	21.5 b x	27.6
	Pickett 71	39.4 a x	22.5 a y	21.4 b y	27.8
	Davis	34.3 a x	26.6 a x	23.6 ab x	28.2
	Bragg	30.1 a x	25.1 a x	20.4 b x	25.2
	Cobb	42.6 a x	30.8 a x	30.0 a x	34.5
	Average	35.4	27.1	23.4	28.7
		1979			
4/17	Hill	0 by	16.5 cx	13.1 cx	9.8
	Forrest	0 by	17.5 cx	16.9 bcx	11.5
	Pickett 71	0 by	19.9 cx	17.6 bcx	12.5
	Davis	20.1 ay	33.5 ax	24.5 bxy	26.1
	Bragg	23.5 axy	26.9 bx	18.3 bcy	22.8
	Cobb	0 by	35.9 ax	38.7 ax	24.8
	Average	7.3	25.0	21.5	
5/3	Hill	21.5 bx	20.9 cx	19.7 cx	20.7
	Forrest	20.5 bx	27.1 cx	21.0 cx	22.9
	Pickett 71	22.9 bx	32.9 bx	29.8 bx	28.5
	Davis	41.0 ax	37.5 abx	30.2 bx	36.3
	Bragg	40.3 ax	37.0 abx	32.7 abx	36.7
	Cobb	52.6 ax	41.1 ay	37.9 ay	43.9
	Average	33.2	32.8	28.6	
5/18	Hill	28.0 bx	26.8 cdx	17.4 cy	24.1
	Forrest	32.3 bx	20.8 dy	25.6 bxy	26.2
	Pickett 71	28.2 bx	30.4 bcx	30.9 abx	29.8
	Davis	34.3 bx	35.1 abx	32.0 abx	33.8
	Bragg	36.7 bx	37.7 abx	26.1 by	33.5
	Cobb	58.7 ax	40.0 ay	35.9 ay	44.8
	Average	36.4	31.8	28.0	

end of table

*Adjusted to 13% moisture.

1/ Within each row width and planting date, values followed by the same letter (a, b, c or d), are not different at a probability of equal to or less than 0.05 as determined by Duncan's New Multiple Range Test. Values across row widths, within a date and within a variety, are not different if followed by the same letter (x or y).

2/ Data in the June 2 planting were not included in analysis because drilled plots were not harvested due to poor stands caused by severe drought at planting. The data reported in this planting are averages of 3 replications.

3/ Hill seed was of poor quality and, although planting rate was increased, the resulting yield may be artificially low. Hill was therefore excluded in the data analysis.

Appendix Table 7. Rainfall (inches) by weeks, months, years and locations of test sites.

Month	Week	Rainfall					
		Verona	Starkville	Brooksville	Newton	Raymond	Poplarville
		inches					
		1976					
April	1-7	0.0	0.0	0.0		0.0	0.0
	8-14	0.4	0.0	0.0		0.0	0.0
	15-21	0.5	0.0	0.0		0.3	0.2
	22-28	0.7	1.1	1.9		1.0	1.2
	29-30	0.2	0.0	0.1		0.1	0.5
	Monthly Total	1.8	1.1	2.0		1.4	1.9
May	1-7	0.0	2.0	1.5		0.4	1.2
	8-14	2.0	2.7	2.9		3.8	1.0
	15-21	0.8	1.3	0.8		0.5	0.0
	22-28	0.7	0.4	0.9		1.4	1.9
	29-31	0.3	0.0	0.0		0.0	0.0
	Monthly Total	3.8	6.4	6.1		6.1	4.1
June	1-7	1.9	1.6	2.1		0.5	0.7
	8-14	0.0	0.0	0.0		0.0	0.0
	15-21	2.5	1.2	1.9		1.4	1.1
	22-28	0.6	1.2	1.3		1.5	0.3
	29-30	0.0	0.2	0.0		1.1	1.6
	Monthly Total	5.0	4.2	5.3		4.5	3.7

continued

Appendix Table 7. (Continued)

Month	Week	Rainfall				
		Verona	Starkville	Brooksville	Newton	Raymond	Poplarville
		inches				
July	1-7	0.4	1.7	2.0	2.4	4.9
	8-14	0.3	0.0	0.0	0.0	0.2
	15-21	0.1	0.1	0.0	0.5	0.2
	22-28	0.4	3.1	0.2	0.0	0.9
	29-31	0.5	0.2	0.4	0.0	1.2
	Monthly Total	1.7	5.1	2.6	2.9	7.4
August	1-7	0.0	0.3	0.9	0.3	1.9
	8-14	0.0	0.0	0.0	0.0	0.0
	15-21	0.4	0.4	5.1	0.0	0.2
	22-28	3.4	0.0	0.0	1.2	0.4
	29-31	1.2	0.1	0.0	0.0	2.0
	Monthly Total	5.0	0.8	6.0	1.5	4.5
September	1-7	3.2	1.5	2.6	0.3	3.1
	8-14	0.7	1.8	2.8	0.0	0.0
	15-21	0.4	0.9	0.0	0.1	0.0
	22-28	0.4	0.6	0.0	0.0	0.2
	29-30	0.1	0.3	0.0	0.3	0.0
	Monthly Total	4.8	5.1	5.4	0.7	3.3
October	1-7	1.2	1.2	1.2	0.0	-1/
	8-14	0.1	0.0	0.0	0.0	0.0
	15-21	1.0	0.3	0.5	0.0	1.5
	22-28	1.2	0.8	1.1	0.1	1.3
	29-31	1.2	1.0	0.8	1.2	2.9

continued

Appendix Table 7. (Continued)

Month	Week	Rainfall					
		Verona	Starkville	Brooksville	Newton	Raymond	Poplarville
		inches					
	Monthly Total	4.7	3.3	3.6		1.3	-
		1977					
April	1-7	5.2	6.5	2.9	3.6	6.0	0.5
	8-14	0.0	0.0	0.0	0.0	0.0	0.0
	15-21	0.2	2.6	0.2	0.9	0.6	3.0
	22-28	1.4	0.0	3.7	3.6	3.0	0.8
	29-30	0.0	0.0	0.0	0.0	0.0	0.0
	Monthly Total	6.8	9.1	6.8	8.1	9.6	4.3
May	1-7	0.7	0.4	0.3	1.4	0.6	2.6
	8-14	0.0	0.0	0.1	0.0	0.0	0.1
	15-21	0.0	0.0	0.0	0.0	0.0	0.0
	22-28	0.1	0.1	0.0	0.4	0.1	0.3
	29-31	0.3	0.0	1.4	0.6	0.0	0.2
	Monthly Total	1.1	0.5	1.8	2.4	0.7	3.2
June	1-7	0.3	0.1	0.0	0.5	0.1	0.9
	8-14	0.0	0.0	0.0	0.4	0.0	0.0
	15-21	0.8	0.6	0.2	0.6	1.0	0.2
	22-28	0.1	0.1	0.6	1.1	0.6	0.2
	29-30	0.0	0.1	0.1	0.0	0.0	0.0
	Monthly Total	1.2	0.9	0.9	2.6	1.7	1.3

continued

Appendix Table 7. (Continued)

Month	Week	Rainfall					
		Verona	Starkville	Brooksville	Newton	Raymond	Poplarville
		inches					
July	1-7	0.0	0.3	0.0	0.0	1.4	1.6
	8-14	2.7	3.2	4.5	1.5	1.2	1.8
	15-21	1.9	0.5	0.6	1.5	1.6	1.7
	22-28	0.5	3.7	3.0	1.5	1.0	1.6
	29-31	0.5	1.0	1.3	3.2	0.0	1.4
	Monthly Total	5.6	8.7	9.4	7.7	5.2	8.1
August	1-7	0.0	0.0	0.0	1.1	0.1	0.4
	8-14	0.0	0.0	0.0	0.0	0.0	1.5
	15-21	1.0	0.9	0.0	0.6	1.3	4.2
	22-28	0.0	0.0	0.2	0.0	0.0	0.8
	29-31	0.0	0.0	0.0	0.2	0.6	1.3
	Monthly Total	1.0	0.9	0.2	1.9	2.0	8.2
September	1-7	0.9	2.9	5.2	4.2	0.9	2.7
	8-14	0.8	1.8	0.9	0.9	0.0	2.5
	15-21	2.3	1.6	1.9	0.4	0.7	0.3
	22-28	1.8	0.5	0.4	0.0	0.0	0.3
	29-30	0.9	0.9	1.3	2.1	1.0	0.9
	Monthly Total	6.7	7.7	9.7	7.6	2.6	6.7
October	1-7	0.9	0.0	0.0	0.7	1.8	0.4
	8-14	1.7	2.9	2.1	1.1	2.6	1.1
	15-21	0.0	0.0	0.0	0.0	0.0	0.0
	22-28	2.2	2.1	2.2	5.1	0.3	1.4
	29-31	0.0	0.0	0.0	0.0	0.0	0.0

continued

Appendix Table 7. (Continued)

Month	Week	Rainfall					
		Verona	Starkville	Brocksville	Newton	Raymond	Poplarville
		inches					
	Monthly Total	4.8	5.0	4.3	6.9	4.7	2.9
		1978					
April	1-7	0.0	0.0	0.0	0.0	0.0	0.0
	8-14	1.1	0.8	0.8	2.9	1.3	2.9
	15-21	1.2	0.0	0.3	0.4	1.3	1.2
	22-28	0.3	0.0	0.2	0.4	0.7	0.1
	29-30	0.0	0.0	0.0	0.0	0.0	0.0
	Monthly Total	2.6	0.8	1.3	3.7	3.3	4.2
May	1-7	7.0	1.5	3.0	2.1	4.4	4.1
	8-14	2.0	5.8	4.6	3.0	3.1	1.5
	15-21	0.1	1.0	0.2	0.3	0.4	0.8
	22-28	1.2	0.5	2.3	0.4	0.3	0.1
	29-31	1.9	1.7	0.6	0.0	1.3	0.0
	Monthly Total	12.2	10.5	10.7	5.8	9.5	6.5
June	1-7	0.7	1.2	0.4	0.5	0.5	2.0
	8-14	0.9	0.0	0.5	1.7	0.7	6.3
	15-21	1.2	2.0	1.2	0.1	1.1	0.0
	22-28	0.0	0.0	0.0	0.2	0.0	0.1
	29-30	0.0	0.0	0.0	0.0	0.0	0.0
	Monthly Total	2.8	3.2	2.1	2.5	2.3	8.4

continued

Appendix Table 7. (Continued)

Month	Week	Rainfall					
		Verona	Starkville	Brooksville	Newton	Raymond	Poplarville
		inches					
July	1-7	0.0	0.1	0.3	1.7	0.0	0.2
	8-14	1.3	1.3	0.0	0.4	1.4	0.5
	15-21	0.0	0.4	1.5	0.3	1.7	0.0
	22-28	0.4	0.0	0.0	0.8	0.3	3.3
	29-31	0.0	0.0	0.0	0.1	0.0	1.8
	Monthly Total	1.7	1.8	1.8	3.3	3.4	5.8
August	1-7	1.0	0.2	0.0	0.4	0.0	1.9
	8-14	0.3	1.7	1.3	1.8	0.3	3.3
	15-21	0.0	0.0	0.0	0.6	0.3	0.4
	22-28	0.0	0.0	0.0	0.0	0.0	0.9
	29-31	0.1	0.1	0.2	0.1	2.6	0.2
	Monthly Total	1.4	2.0	1.5	2.9	3.2	6.7
September	1-7	0.0	0.7	0.0	0.0	0.2	0.0
	8-14	0.3	1.3	0.3	0.4	0.1	1.3
	15-21	1.9	0.0	1.5	0.0	0.5	0.0
	22-28	0.1	0.0	0.1	0.0	0.7	2.4
	29-30	0.0	0.0	0.0	0.0	0.0	0.3
	Monthly Total	2.3	2.0	1.9	0.4	1.5	4.0
October	1-7	0.0	0.0	0.0	0.0	0.0	0.0
	8-14	0.2	0.3	0.0	0.2	0.9	0.0
	15-21	0.0	0.0	0.0	0.0	0.0	0.0

continued

Appendix Table 7. (Continued)

Month	Week	Rainfall					
		Verona	Starkville	Brooksville	Newton	Raymond	Poplarville
		inches					
	22-28	0.0	0.0	0.0	0.0	0.0	0.0
	29-31	0.0	0.0	0.0	0.0	0.0	0.0
	Monthly Total	0.2	0.3	0.0	0.2	0.9	0.0
		1979					
April	1-7	2.8	2.4	2.1	3.5	3.1	7.0
	8-14	4.8	13.2	16.2	7.4	6.1	0.4
	15-21	0.9	0.0	0.0	0.0	0.0	0.0
	22-28	0.0	0.8	0.8	1.4	1.3	6.3
	29-30	0.0	0.0	0.0	0.0	0.0	0.0
	Monthly Total	6.6	16.4	19.1	12.3	10.5	13.7
May	1-7	3.5	0.0	1.1	1.6	0.8	3.3
	8-14	1.2	0.0	2.8	0.1	2.4	1.3
	15-21	0.0	0.0	0.0	0.0	0.0	0.0
	22-28	1.3	1.4	0.7	1.7	1.0	0.4
	29-31	3.6	0.5	1.9	1.3	1.3	1.6
	Monthly Total	9.6	1.9	6.5	4.7	5.5	6.6
June	1-7	0.8	0.2	0.4	1.6	1.4	0.4
	8-14	0.6	1.3	0.0	0.1	0.0	0.2
	15-21	0.0	0.1	0.0	0.0	0.0	0.0
	22-28	1.9	0.6	1.1	0.3	0.8	0.0
	29-30	0.0	0.1	0.0	0.0	0.0	0.4

continued

Appendix Table 7. (Continued).

Month	Week	Rainfall					
		Verona	Starkville	Brooksville	Newton	Raymond	Poplarville
		inches					
	Monthly Total	3.3	2.3	1.5	2.0	2.2	1.0
July	1-7	4.9	1.4	1.7	0.5	0.3	0.0
	8-14	2.3	7.8	4.0	5.5	3.1	4.5
	15-21	0.1	1.1	1.0	0.7	0.6	1.2
	22-28	1.7	1.8	1.4	1.9	0.8	6.2
	29-31	0.0	0.3	0.2	0.0	0.0	0.0
	Monthly Total	9.0	12.3	8.3	8.6	4.8	11.9
August	1-7	1.0	0.0	0.2	1.7	0.2	0.4
	8-14	0.3	0.1	2.2	1.5	0.5	0.1
	15-21	0.2	0.0	0.0	0.0	0.3	0.5
	22-28	4.0	0.0	1.3	2.5	3.8	1.7
	29-31	0.2	0.4	0.0	0.0	0.0	0.0
	Monthly Total	5.7	0.5	3.7	5.7	4.8	2.7
September	1-7	1.0	0.7	1.1	0.2	0.2	1.1
	8-14	3.5	4.0	4.3	3.9	0.2	2.5
	15-21	2.6	5.3	3.9	2.9	3.3	1.8
	22-28	0.0	0.0	0.0	0.0	0.0	0.0
	29-30	0.0	0.0	0.0	0.0	0.0	0.0
	Monthly Total	7.1	10.0	5.3	7.0	3.7	5.4

continued

Appendix Table 7. (Continued)

Month	Week	Rainfall					
		Verona	Starkville	Brooksville	Newton	Raymond	Poplarville
		inches					
October	1-7	1.0	1.2	0.9	0.0	0.0	0.0
	8-14	0.3	0.1	0.1	0.2	0.1	0.0
	15-21	0.0	0.3	0.0	0.0	0.0	0.0
	22-28	0.5	0.0	0.0	0.0	0.5	0.6
	29-31	0.1	0.6	0.1	0.8	1.6	1.0
	Monthly Total	1.9	2.2	1.1	1.0	2.2	1.6

end of table

1/ Rainfall not recorded.

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