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Days Suitable for Fieldwork in Mississippi

MAFES
MISSISSIPPI AGRICULTURAL & FORESTRY EXPERIMENT STATION Verner G. Hurt, Director Mississippi State, MS 39762
Donald W. Zacharias, President Mississippi State University R. Rodney Foil, Vice President

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Stan R. Spurlock
Professor and Economist
Department of Agricultural Economics

Normie W. Buehring
Agronomist
Northeast Mississippi Branch Experiment Station
Verona, Mississippi

DeWitt F. Caillavet
Assistant Economist and Assistant Extension Specialist
Department of Agricultural Economics

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Introduction

Farm managers must develop a farm plan and acquire machinery and labor to perform necessary field operations every year. Determination of an optimal enterprise mix and its associated machinery complement depends on the farmer's ability to complete the required fieldwork in a timely manner. Machinery capacity is a measure of the rate at which a field operation may be performed, usually measured in acres per day or per hour. Too little machinery capacity may lead to delays in completing fieldwork, which often results in yield reductions or complete crop failure. Any yield losses have a negative effect on revenue and thus net farm income. Conversely, too much machinery capacity allows for timely field operations and thus reduces yield losses but increases the cost of production, which causes net farm income to decline.

In an economic sense, there is an optimal level of machinery capacity for every farm plan. To help achieve the optimal capacity level, producers need to realistically assess their capacity for field operations such as tilling, planting, cultivating, and harvesting.

Timeliness is a function of the time that is available to perform fieldwork in relation to the farm's machinery capacity. Time available may be defined as the number of days suitable for fieldwork within a production period multiplied by the working hours in a suitable day. The variable "working hours per suitable day" is usually thought to have a relatively small variance. However, the number of suitable days within a production period is an uncertain quantity that usually has a relatively large variance. Understanding the inherent uncertainty in this component of available time is an important step in the overall farm planning process.

A suitable day for fieldwork is determined by weather-related events (primarily rainfall and temperature) that affect the condition of the soil in a field. Adverse soil conditions make it difficult or impossible to perform some field operations. Suitable days, being related to random weather-related events, are thus also random in nature. Information about the probability distribution of suitable days during critical production periods would help farmers determine their optimal machinery complement and crop mix.

Some empirical research on days suitable for fieldwork in Mississippi has been conducted. Bolton et al. (1968) estimated suitable fieldwork days for the Mississippi River Delta area by using a computerized soil moisture program and 53 years of daily weather data from Tallulah, Louisiana. Suitable days were estimated for tillage and non tillage fieldwork on sandy and clay soils under four different situations labeled conservative, upper limit, average, and 85 percent of years. The "conservative" and "upper limit" estimates were based on different assumptions about the duration of saturation in the top 6 inches of the soil. The "average" days suitable estimates were obtained by calculating the simple average of the conservative and upper limit estimates.

The "85 percent of years" estimates were presented because it was presumed that farmers would not make plans based on days suitable in an average year – in about half the years, actual days suitable would be greater than the average value; the other half of the years would have smaller-than-average suitable days. Bolton et al. stated that farmers would be more likely to consider a days suitable value that had a greater than 50 percent probability of happening. Thus, they presented the "85 percent" value to represent the number of suitable days that farmers could expect to be available in about 6 years out of 7. It should be noted that the selection of a probability equal to 6 out of 7 years by Bolton et al. was a somewhat arbitrary choice, but that this level seemed to reflect the machinery complements observed on farms within the region.

However, if farmers exhibit different levels of risk aversion, a single probability value for all farmers would not be appropriate. It is expected that extremely risk-averse farmers would tend to base decisions on larger probability levels than moderately risk-averse farmers. For example, an extremely risk-averse farmer might require a 95 percent probability of suitable days, while a moderately risk-averse farmer might require only a 60 percent probability. This implies that extremely risk-averse farmers would plan for fewer suitable days than moderately risk-averse farmers.

Cooke et al. (1972) used the Bolton et al. model to estimate suitable days using 37 years of weather data collected at Stoneville, Mississippi. They presented only the "upper limit" estimates mentioned above. The "upper limit" estimates of days suitable provided by

Cooke et al. tended to be slightly greater than those presented by Bolton et al. for the months March through September. However, during October and November, the Cooke et al. estimates were much lower than the Bolton et al. estimates. Days suitable estimates from the two studies were similar for the remaining 3 months. Cooke et al. did not present the "85 percent of years" estimates.

Each of the previously mentioned studies used a computer program to simulate daily soil moisture levels using weather data collected from a specific weather station. Even though the days suitable estimates were similar, there were some differences. These differences can be attributed to the differences in the weather data that were used. It is important to realize that weather events at a specific weather station may not be representative of weather at other locations throughout the state. Days suitable estimates based on observations collected throughout the state may provide useful information to farmers evaluating their production plans.

Data and Methods

The Mississippi Agricultural Statistics Service (MASS) conducts a survey of Mississippi Cooperative Extension Service County Agents on a weekly basis to collect data about crop conditions, weather, and days suitable for fieldwork in each county. MASS calculates the statewide days suitable by averaging the county-level data and publishes the results every week. The weekly statewide average days suitable were collected for 29 years, 1965 to 1993.

The year was divided into different weekly time periods to correspond to periods in which specific crop production operations typically are performed for monocrop soybeans, cotton, corn, and doublecrop wheat/soybeans. The number of suitable days within each period was derived by summing each week's suitable days. The computer package @RISK, an add-in program that works with the spreadsheet program LOTUS 1-2-3, was used to estimate the cumulative probability distribution for suitable days based on the 29 observations under the assumption that each year had an equal likelihood of occurrence. @RISK was then used to simulate 500 random numbers of suitable days for each time period based on the estimated cumulative probability distribution. The probabilistic results from the simulations are presented in tables and are discussed in the following sections.

Information supplied for each production period include: (1) the beginning and ending week numbers, 1 through 52; (2) the assigned beginning and ending dates, assuming that the first week of each year starts on January 1; (3) the total number of days in the period, calculated as the number of weeks in the period multiplied by seven; (4) the number of suitable days at selected probability levels, 0 through 100 percent in 5 percent increments; and (5) summary statistics about the distribution of suitable days such as the mean, minimum and maximum, range, standard deviation, variance, skewness, and kurtosis.

Corn

The results for conventional tillage and no-till corn production are presented in Table 1. Five different time periods were defined for various corn production operations.

Table 1. Days suitable for fieldwork for selected production periods, corn, Mississippi

Item	Production Periods				
Week Period	40-17	1-11	11-17	17-22	38-40
Beginning Date	01-Oct	01-Jan	12-Mar	23-Apr	17-Sep
Ending Date	29-Apr	18-Mar	29-Apr	03-Jun	07-Oct
Total Days in Period	210	77	49	42	21
Percentile Probabilities (Chance ≤ Shown Value)					
0%	65.7	8.8	8.8	8.7	9.2
5%	69.4	10.3	11.0	12.6	10.5
10%	76.0	11.8	14.0	18.3	12.0
15%	77.3	12.1	15.3	18.6	12.1
20%	78.3	13.5	16.5	19.2	12.3
25%	79.2	14.3	17.7	20.7	13.2
30%	80.5	16.9	18.6	21.4	13.7
35%	81.2	18.4	19.2	21.8	14.0
40%	82.1	19.5	19.3	22.1	14.3
45%	85.0	20.8	19.9	22.4	14.6
50%	88.0	21.2	20.5	23.9	15.4
55%	90.0	21.9	21.2	24.4	15.8
60%	92.0	22.5	21.7	25.1	16.0
65%	93.7	22.6	23.3	25.4	16.4
70%	96.9	23.2	25.6	26.0	16.4
75%	100.5	26.0	28.9	27.5	16.5
80%	102.8	30.4	29.7	27.9	16.7
85%	116.0	34.0	30.1	30.0	16.9
90%	122.6	38.6	33.8	32.1	18.4
95%	125.0	44.8	34.4	33.2	18.9
100%	128.3	49.7	35.5	34.4	19.5
Mean Result	91.8	22.6	22.2	23.7	14.9
Maximum Result	128.3	49.7	35.5	34.4	19.5
Minimum Result	65.7	8.8	8.8	8.7	9.2
Range of Possible Results	62.5	40.8	26.7	25.7	10.4
Standard Deviation	16.724	10.050	6.930	5.648	2.424
Variance	279.70	101.00	48.02	31.90	5.87
Skewness	.770	.994	.289	-.304	-.283
Kurtosis	2.576	3.402	2.231	3.290	2.548

Conventional Tillage Corn

Conventional tillage corn producers need to perform tillage work (disk and bed) and apply phosphorus (P) and potassium (K) fertilizers prior to planting in the spring. The time period from January 1 to March 18 was specified as the land preparation period. Of the 77 total days during this period, there is a 20 percent chance (1 out of 5 years) of having less than or equal to 13.5 suitable days. Conversely, there is an 80 percent chance (4 out of 5 years) of having more than 13.5 suitable days.

Producers need to row condition, plant, apply a preemergence herbicide, and apply nitrogen (N) fertilizer after land preparation has been accomplished. The time period from March 12 to April 29 was specified as being relevant for these planting-period operations. During this 7-week period, there is a 20 percent chance of having less than or equal to 16.5 suitable days. If a farm had the machinery capacity to perform these planting-period operations on 30 acres per day, and, if the farmer planned on having 14 suitable days during this period, then planting-period suitable days would impose an upper limit on corn production of 420 acres.

Fields would need to be cultivated after planting and the time period from April 23 to June 3 was defined to determine the days suitable for cultivation. During this 6-week period, there is a 20 percent chance of having less than or equal to 19.2 suitable days.

The time period from September 17 to October 7 was defined as the corn harvesting period. There is a 20 percent chance of having less than or equal to 12.3 suitable days during this 3-week period. If a farm had the machinery capacity to harvest 25 acres per day, and if the farmer planned on having 12 suitable days during this period, then harvest-period suitable days would impose an upper limit on corn production of 300 acres.

No-till Corn

No-till corn producers need to apply P and K fertilizers in the fall after harvest, or in the spring before planting. The time period from October 1 to April 29 was defined to determine the days suitable for applying P and K. Of the 210 total days during this period, there is a 20 percent probability of having less than or equal to 78.3 suitable days.

The time period for planting, applying burndown and preemergence herbicides, and applying N fertilizer was specified to be March 12 to April 29. There is a 20 percent chance of having less than or equal to 16.5 suitable days. If a farm had the machinery capacity to perform these operations on 30 acres per day, and if the farmer planned on having 14 suitable days during this period, then planting-period suitable days would impose an upper limit on no-till corn production of 420 acres.

A postemergence directed spray may be required after planting. The time period from April 23 to June 3 was defined for this operation. The harvest period for no-till corn production was assumed to be the same as that of conventional tillage corn production, September 17 to October 7.

Soybeans

The results for conventional tillage, conventional drilled, and no-till drilled soybean production are presented in Table 2. Nine different time periods were defined for various soybean production operations.

Conventional Tillage Soybeans

Conventional tillage soybean producers need to apply P and K fertilizers and chisel in the fall or spring. The time period from October 29 to April 15 was defined to determine the days suitable for these preplant operations. Of the 168 total days during this period, there is a 20 percent chance of having less than or equal to 53.8 suitable days.

Preplant tillage operations, such as field cultivation, need to be performed during the March 5 to April 29 period. During this 8-week period, there is a 20 percent chance of having less than or equal to 17.5 suitable days.

Producers would then prepare the field for planting with another field cultivation and the application of a preplant-incorporated (PPI) herbicide. The time period from April 16 to June 10 was defined as the period suitable for these operations. There is a 20 percent chance of having less than or equal to 26.1 suitable days.

The time period from April 30 to June 10 was defined as the planting period for conventional tillage soybeans. During this 6-week period, there is a 20 percent chance of having less than or equal to 21.1 suitable days. If a farm had the machinery capacity to perform these operations on 30 acres per day, and if the farmer planned on having 22 suitable days during this period, then plantingperiod suitable days would impose an upper limit on soybean production of 660 acres.

After planting, producers may need to cultivate and apply a postemergence over-the-top (POT) herbicide. The time period from May 21 to July 1 was defined as suitable for these operations. There is a 20 percent chance of having less than or equal to 23.1 suitable days during this 6-week period.

A late cultivation plus an application of a postemergence directed spray may be required. The time period from June 18 to July 29 was defined as the period suitable for these operations. Of the 42 total days during this period, there is a 20 percent chance of having less than or equal to 27.4 suitable days.

The time period from October 1 to November 4 was defined as the soybean harvest period. During this 5-week period, there is a 20 percent chance of having less than or equal to 21.4 suitable days. If a farm had the machinery capacity to harvest 40 acres per day, and if the farmer planned on having 21 suitable days during this period, then harvest-period suitable days would impose an upper limit on soybean production of 840 acres.

Conventional Tillage Drilled Soybeans

Conventional tillage drilled soybean producers need to apply P and K fertilizers and chisel in the fall or spring. The time period from October 29 to April 15 was selected for these preplant operations and there is a 20 percent chance of having less than or equal to 53.8 suitable days.

Preplant tillage operations, such as field cultivation, need to be performed during the March 5 to April 29 time period. There is a 20 percent chance of having less than or equal to 17.5 suitable days. Producers need to prepare the field for planting with another field cultivation and the application of a preplant-incorporated (PPI) herbicide. The time period from

Table 2. Days suitable for fieldwork for selected production periods, soybeans, Mississippi

Item	Production Periods								
Week Period	44-15	44-19	10-17	16-23	17-20	18-23	21-26	25-30	40-44
Beginning Date	29-Oct	29-Oct	05-Mar	16-Apr	23-Apr	30-Apr	21-May	18-Jun	01-Oct
Ending Date	15-Apr	13-May	29-Apr	10-Jun	20-May	10-Jun	01-Jul	29-Jul	04-Nov
Total Days in Period	168	196	56	56	28	42	42	42	35
Percentile Probabilities (Chance ≤ Shown Value)									
0%	47.6	54.9	10.1	13.7	4.4	12.0	16.4	12.0	13.1
5%	49.5	57.5	12.8	18.7	6.6	14.2	17.6	17.6	14.1
10%	50.4	61.0	15.2	23.7	9.1	16.8	20.5	24.1	15.3
15%	52.0	63.3	17.1	24.7	11.1	20.4	22.2	25.6	21.1
20%	53.8	66.3	17.5	26.1	12.3	21.1	23.1	27.4	21.4
25%	54.2	67.4	19.0	29.0	12.9	21.8	23.1	27.6	21.5
30%	55.0	69.9	19.9	29.3	13.5	22.5	24.2	27.9	21.7
35%	56.3	71.2	20.7	29.9	13.7	23.0	25.9	28.1	22.3
40%	58.0	72.8	21.9	30.8	14.0	23.1	26.2	28.4	23.2
45%	59.2	74.1	22.8	31.5	15.1	23.3	26.8	29.7	23.4
50%	60.6	75.0	23.7	32.9	15.9	23.6	27.3	30.2	23.9
55%	61.2	77.1	24.3	33.1	16.0	23.9	27.8	30.2	25.0
60%	62.6	80.8	25.8	33.9	16.9	24.7	28.0	31.4	25.4
65%	64.8	82.1	26.4	34.5	17.1	25.3	29.5	31.4	25.7
70%	68.1	84.9	28.5	34.8	18.1	26.6	30.3	31.7	25.8
75%	69.0	87.3	30.5	35.0	18.6	27.3	30.5	32.4	26.4
80%	75.3	89.2	31.8	35.6	20.1	28.7	30.8	33.5	27.1
85%	88.4	107.6	33.2	38.1	20.5	32.1	32.2	34.0	28.1
90%	94.0	108.0	38.1	42.2	22.3	33.3	34.0	34.2	28.6
95%	94.7	117.1	40.0	43.2	22.8	34.5	35.5	34.8	30.9
100%	96.3	120.0	42.1	45.0	23.7	36.4	37.6	35.7	32.4
Mean Result	65.0	80.2	24.8	31.8	15.5	24.6	27.2	29.2	23.7
Maximum Result	96.3	120.0	42.1	45.0	23.7	36.4	37.6	35.7	32.4
Minimum Result	47.6	54.9	10.1	13.7	4.4	12.0	16.4	12.0	13.1
Range of Possible Results	48.7	65.1	32.0	31.2	19.3	24.4	21.1	23.7	19.3
Standard Deviation	14.535	17.490	7.896	6.740	4.586	5.575	4.993	4.902	4.439
Variance	211.26	305.90	62.35	45.43	21.03	31.08	24.93	24.03	19.70
Skewness	1.055	.835	.427	-.409	-.320	.115	-.122	-1.651	-.589
Kurtosis	2.851	2.732	2.484	3.407	2.752	2.909	2.574	6.360	3.253

April 16 to June 10 was defined to determine the days suitable for these operations, and results showed that there is a 20 percent chance of having less than or equal to 26.1 suitable days.

Conventional tillage drilled soybean producers need to drill soybeans during the period from April 30 to June 10 with current technology. If a farm had the machinery capacity to drill 40 acres per day, and if the farmer planned on having 22 suitable days during this period, then planting-period suitable days would impose an upper limit on drilled soybean production of 880 acres.

An early POT herbicide would be applied during the May 21 to July 1 period. A late POT herbicide would be applied during the June 18 to July 29 period. Harvest would occur from October 1 to November 4, which has a 20 percent chance of having less than or equal to 21.4 suitable days. If a farm had the machinery capacity to harvest 40 acres per day, and if the farmer planned on having 21 suitable days during this period, then harvest-period suitable days would impose an upper limit on drilled soybean production of 840 acres.

No-till Drilled Soybeans

No-till drilled soybean producers in the "Hill" areas of the state need to apply P and K fertilizers in the fall after harvest, or in the spring before planting. The time period from October 29 to May 13 was defined as this fertilization period. Of the 196 total days during this period, there is a 20 percent chance of having less than or equal to 66.3 suitable days.

No-till producers need to apply a burndown herbicide prior to planting, and the time period from April 23 to May 20 was defined for this operation. During this 4-week period, there is a 20 percent chance of having less than or equal to 12.3 suitable days.

Producers need to drill soybeans, apply a burndown herbicide, and apply a preemergence herbicide during the time period from April 30 to June 10. During this 6-week period, there is a 20 percent chance of having less than or equal to 21.1 suitable days. If a farm had the machinery capacity to perform these operations on 25 acres per day, and if the farmer planned on having 22 suitable days during this period, then planting-period suitable days would impose an upper limit on no-till soybean production of 550 acres.

An early POT herbicide may be applied from May 21 to July 1 and a late POT herbicide may be applied from June 18 to July 29. Producers would harvest during the time period from October 1 to November 4. During this 5-week period, there is a 20 percent chance of having less than or equal to 21.4 suitable days. If a farm had the machinery capacity to harvest 40 acres per day, and if the farmer planned on having 21 suitable days during this period, then harvest-period suitable days would impose an upper limit on no-till soybean production of 840 acres.

Wheat Followed by No-till Soybeans

Doublecrop systems allow two crops to be grown on the same field during the year. The system described in this section assumes that a crop such as soybeans or corn has been harvested in the fall, and that a wheat crop will then be planted, followed by a no-till soybean crop. Harvesting wheat and planting soybeans in a timely manner increases the importance of planning for suitable days. The results for this wheat-soybean system are presented in Table 3. Five

Table 3. Days suitable for fieldwork for selected production periods, wheat followed by soybeans, Mississippi

Item	Production Periods				
Week Period	40-44	43-46	6-9	23-25	25-28
Beginning Date	01-Oct	22-Oct	05-Feb	04-Jun	18-Jun
Ending Date	04-Nov	18-Nov	04-Mar	24-Jun	15-Jul
Total Days in Period	35	28	28	21	28
Percentile Probabilities (Chance ≤ Shown Value)					
0%	13.1	10.2	4.1	7.3	7.6
5%	14.1	10.6	4.7	7.7	10.0
10%	15.3	11.9	5.0	9.6	14.8
15%	21.1	13.4	6.7	10.0	16.3
20%	21.4	14.0	7.8	11.8	17.0
25%	21.5	15.0	8.0	12.3	17.7
30%	21.7	15.3	8.5	12.7	18.2
35%	22.3	15.7	8.7	13.5	18.9
40%	23.2	17.5	9.2	14.1	19.2
45%	23.4	17.5	9.8	14.4	19.7
50%	23.9	17.9	10.7	14.6	20.5
55%	25.0	18.2	11.3	15.0	20.6
60%	25.4	18.6	11.6	15.2	21.0
65%	25.7	19.0	12.2	15.8	21.0
70%	25.8	19.3	12.7	16.3	21.5
75%	26.4	19.5	13.3	16.4	22.4
80%	27.1	20.8	14.5	16.6	22.8
85%	28.1	21.5	15.5	17.2	23.3
90%	28.6	22.3	17.8	18.0	23.6
95%	30.9	23.4	18.8	18.8	23.9
100%	32.4	23.9	19.7	19.6	24.6
Mean Result	23.7	17.4	10.9	14.2	19.4
Maximum Result	32.4	23.9	19.7	19.6	24.6
Minimum Result	13.1	10.2	4.1	7.3	7.6
Range of Possible Results	19.3	13.8	15.6	12.3	17.1
Standard Deviation	4.441	3.630	4.110	3.138	3.860
Variance	19.72	13.17	16.90	9.85	14.90
Skewness	-.588	-.197	.390	-.519	-1.277
Kurtosis	3.252	2.303	2.401	2.523	4.575

different time periods were defined for this doublecrop system.

Wheat before Soybeans

Wheat producers in the Hill areas need to apply P and K fertilizers and disk twice in the fall. The time period from October 1 to November 4 was defined for these preplant operations. During this 5-week period, there is a 20 percent probability of having less than or equal to 21.4 suitable days.

Producers need to row condition and plant wheat during the period from October 22 to November 18. There is a 20 percent chance of having less than or equal to 14.0 suitable days during this period. If a farm had the machinery capacity to perform these operations on 30 acres per day, and if the farmer planned on having 10 suitable days during this period, then planting-period suitable days would impose an upper limit on wheat production of 300 acres.

Producers need to apply N fertilizer and a herbicide in the winter. The time period from February 5 to March 4 was defined for these operations. During this 4-week period, there is a 20 percent chance of having less than or equal to 7.8 suitable days.

The time period from June 4 to June 24 was used to determine the days suitable for wheat harvest. Of the 21 total days during this period, there is a 20 percent chance of having less than or equal to 11.8 suitable days. If a farm had the machinery capacity to harvest wheat at the rate of 40 acres per day, and if the farmer planned on having 7 suitable days during this period, then harvest-period suitable days would impose an upper limit on wheat production of 280 acres.

No-till Soybeans after Wheat

Producers need to plant no-till soybeans and apply a burndown herbicide after the wheat harvest. The time period from June 4 to June 24 was used to determine the days suitable for these operations. Since this period is the same as the wheat harvest period, any wheat fields must be harvested before soybeans are planted unless a relay intercropping system is used. If a farm had the machinery capacity to plant and spray soybeans at the rate of 35 acres per day, and if the farmer planned on having 6 suitable days during this period, then planting-period suitable days would impose an upper limit on doublecrop soybean production of 210 acres.

Doublecrop soybean producers may need to apply an early POT herbicide and the time period from June 18 to July 15 was defined for this operation. Of the 28 total days during this period, there is a 20 percent chance of having less than or equal to 17.0 suitable days.

Doublecrop soybean producers usually harvest later than monocrop soybean producers. The time period from October 22 to November 18 was defined as the harvest period for doublecrop soybeans. During this 4-week period, there is a 20 percent chance of having less than or equal to 14.0 suitable days. If a farm had the machinery capacity to harvest 40 acres per day, and if the farmer planned on having 14 suitable days during this period, then harvest-period suitable days would impose an upper limit on doublecrop soybean production of 560 acres.

Cotton

The results for conventional tillage and no-till cotton production are presented in Table 4. Twelve different time periods were defined for cotton production.

Conventional Tillage Cotton

Cotton producers need to mow the cotton stalks after harvest in the fall. The time period from October 1 to November 18 was defined for this operation. Of the 49 total days during this period, there is a 20 percent probability of having less than or equal to 28.0 suitable days.

Conventional tillage production may require P and K fertilization, plus a chisel operation. The time period from October 1 to April 1 was used to determine the days suitable for these operations. Of the 182 total days during this period, there is a 20 percent probability of having less than or equal to 67.5 suitable days.

Producers would need to disk from February 19 to April 1. During this 6-week period, there is a 20 percent chance of having less than or equal to 10.7 suitable days.

Seedbed preparation needs to be completed from February 26 to April 8. There is a 20 percent chance of having less than or equal to 10.2 suitable days.

Nitrogen fertilizer would need to be applied from February 26 to May 27. Of the 91 total days during this period, there is a 20 percent chance of having less than or equal to 33.0 suitable days.

Producers would need to row condition, plant, and apply a preemergence herbicide during the April 23 to May 27 time period. Of the 35 total days during this period, there is a 20 percent chance of having less than or equal to 16.6 suitable days. If a farm had the machinery capacity to perform these operations on 50 acres per day, and if the farmer planned on having 15 suitable days during this period, then planting-period suitable days would impose an upper limit on cotton production of 750 acres.

Early cultivation plus applying a postemergence directed spray would occur during the May 7 to June 24 time period. During this 7-week period, there is a 20 percent chance of having less than or equal to 25.3 suitable days.

Producers would apply additional N and perform late cultivation plus apply another postemergence directed spray during the June 4 to July 8 time period. Of the 35 total days during this period, there is a 20 percent chance of having less than or equal to 20.0 suitable days.

Applying a layby herbicide would occur during the June 25 to July 29 time period. Of the 35 total days during this period, there is a 20 percent chance of having less than or equal to 21.9 suitable days.

The time period from September 3 to October 14 was defined as the defoliation period. Of the 42 total days during this period, there is a 20 percent chance of having less than or equal to 21.8 suitable days.

Cotton harvest usually begins about 2 weeks after defoliation. The time period from September 17 to October 28 was used to determine the days suitable for harvesting cotton. During this 6-week period, there is a 20 percent chance of having less than or equal to 21.3 suitable days. If a farm had the machinery capacity to harvest 30 acres per day, and if the farmer planned on having 20 suitable days during this period, then harvest-period suitable days would impose an upper limit on conventional tillage cotton production of 600 acres.

Table 4. Days suitable for fieldwork for selected production periods, cotton, Mississippi

Item	Production Periods											
Week Period	40-46	40-13	8-13	9-14	9-21	15-19	17-21	19-25	23-27	26-30	36-41	38-43
Beginning Date	01-Oct	01-Oct	19-Feb	26-Feb	26-Feb	09-Apr	23-Apr	07-May	04-Jun	25-Jun	03-Sep	17-Sep
Ending Date	18-Nov	01-Apr	01-Apr	08-Apr	27-May	13-May	27-May	24-Jun	08-Jul	29-Jul	14-Oct	28-Oct
Total Days in Period	49	182	42	42	91	35	35	49	35	35	42	42
Percentile Probabilities (Chance ≤Shown Value)												
0%	22.0	54.4	7.8	8.3	25.6	4.1	7.0	17.6	13.7	11.2	18.2	17.0
5%	22.8	58.6	8.9	9.4	27.5	6.8	10.2	19.4	16.0	14.4	19.3	17.7
10%	24.3	65.3	9.8	10.0	29.8	9.6	14.4	21.6	18.2	19.9	20.9	18.0
15%	26.9	66.4	10.2	10.0	31.7	12.8	14.8	23.2	18.9	21.5	21.6	20.9
20%	28.0	67.5	10.7	10.2	33.0	13.7	16.6	25.3	20.0	21.9	21.8	21.3
25%	28.7	67.9	11.1	10.8	34.5	15.0	16.9	26.6	20.7	22.7	22.8	23.2
30%	29.8	68.0	11.7	11.7	37.4	17.0	17.1	27.6	22.3	23.9	23.4	23.4
35%	30.3	70.4	12.5	12.7	38.1	17.7	17.7	28.3	22.6	24.1	23.8	23.6
40%	31.8	73.4	13.7	13.2	39.1	18.0	17.9	29.5	23.3	24.6	24.4	24.1
45%	32.3	73.9	13.8	14.2	40.2	18.2	18.7	29.8	23.4	24.9	24.6	24.3
50%	32.7	74.8	14.3	16.1	42.0	18.9	19.2	30.1	23.8	25.2	25.0	24.5
55%	33.0	75.8	16.0	16.6	43.3	19.1	19.2	31.1	24.7	25.5	25.4	25.1
60%	33.5	76.5	16.6	16.8	46.3	19.5	19.6	31.9	25.1	25.9	25.5	25.5
65%	34.8	77.5	16.9	17.1	47.0	20.1	22.1	32.6	25.5	26.0	25.6	25.9
70%	35.4	82.5	16.9	18.3	47.7	21.5	22.5	33.7	26.0	26.1	26.4	26.3
75%	35.5	86.1	17.2	19.1	49.3	21.9	22.8	34.2	26.8	26.7	26.5	26.6
80%	35.7	89.0	18.5	20.1	50.2	23.4	23.1	35.0	27.9	27.6	27.0	26.9
85%	37.9	94.8	22.0	21.9	55.3	26.3	26.4	36.2	28.3	28.3	27.5	27.3
90%	39.5	103.3	24.2	26.2	57.2	28.4	27.3	37.6	28.4	29.0	28.6	28.2
95%	41.4	105.1	25.2	29.2	62.8	29.1	28.2	41.5	30.7	29.1	30.5	30.1
100%	43.8	107.0	26.9	30.3	68.8	30.4	29.2	44.0	32.5	29.7	31.9	32.8
Mean Result	32.4	77.9	15.4	16.2	43.0	18.7	19.7	30.3	23.8	24.4	24.8	24.4
Maximum Result	43.8	107.0	26.9	30.3	68.8	30.4	29.2	44.0	32.5	29.7	31.9	32.8
Minimum Result	22.0	54.4	7.8	8.3	25.6	4.1	7.0	17.6	13.7	11.2	18.2	17.0
Range of Possible Results	21.8	52.6	19.1	22.0	43.2	26.4	22.2	26.5	18.8	18.4	13.8	15.8
Standard Deviation	5.212	13.539	5.021	5.890	10.423	6.194	5.055	6.101	4.234	4.013	3.037	3.483
Variance	27.16	183.30	25.21	34.69	108.63	38.36	25.56	37.23	17.93	16.11	9.22	12.13
Skewness	-.028	.715	.685	.836	.459	-.211	-.136	-.007	-.252	-1.491	.054	-.194
Kurtosis	2.573	2.678	2.606	2.898	2.634	2.846	2.909	2.721	2.693	5.462	2.937	3.158

No-till Cotton

Cotton stalks need to be mowed after harvest in the fall during the time period from October 1 to November 18. No-till cotton producers need to apply P and K fertilizers in the fall after harvest, or in the spring before planting. The time period from October 1 to April 1 was defined to determine the days suitable for these operations. There is a 20 percent probability of having less than or equal to 67.5 suitable days.

Nitrogen fertilizer needs to be applied prior to planting from February 26 to May 27. There is a 20 percent chance of having less than or equal to 33.0 suitable days during this 13-week period.

No-till cotton producers would apply a burndown herbicide prior to planting, and the time period from April 9 to May 13 was used to determine the days suitable for this operation. There is a 20 percent chance of having less than or equal to 13.7 suitable days.

Planting and applying a preemergence herbicide would occur from April 23 to May 27. There is a 20 percent chance of having less than or equal to 16.6 suitable days. If a farm had the machinery capacity to perform these operations on 50 acres per day, and if the farmer planned on having 15 suitable days during this period, then planting-period suitable days would impose an upper limit on no-till cotton production of 750 acres.

No-till producers would apply an early postemergence directed spray during the period from May 7 to June 24. They would apply additional N fertilizer and a late postemergence directed spray during the period from June 4 to July 8. A layby herbicide would be applied during the period from June 25 to July 29. Defoliation would occur from September 3 to October 14.

Cotton producers would harvest in the fall about 2 weeks after defoliation during the period from September 17 to October 28. During this 42-day period, there is a 20 percent chance of having less than or equal to 21.3 suitable days. If a farm had the machinery capacity to harvest 30 acres per day, and if the farmer planned on having 20 suitable days during this period, then harvest-period suitable days would impose an upper limit on no-till cotton production of 600 acres.

Four-Week Periods

The year was divided into 13 four-week periods to provide information about how the probability distributions of suitable days vary across seasons. The results for these periods are presented in Table 5. As expected, the winter periods have the fewest suitable days while the summer periods have the most suitable days.

These results were compared with those of Bolton et al. and Cooke et al. It was found that the days suitable estimates from the other studies were much lower than the days suitable estimates from the current study during the winter months. However, the results from the current study showed slightly fewer suitable days during the spring, summer, and fall periods. It is possible that the probability distributions derived in the current study are different from those derived in the previous studies since the current study used actual observations made by county agents while the previous studies used a computer program to estimate suitable days. Users of the results presented here should attempt to evaluate the accuracy of the probability distributions presented in this study.

Also, as indicated by the skewness coefficient (a skewness coefficient of 0 indicates a symmetrical probability distribution), the distributions for winter and early spring periods are positively skewed (skewed to the right) indicating that a larger portion of the probability distribution contains lower suitable days. This means that relatively few years had a large number of suitable days during the winter periods. However, distributions for late spring, summer, and fall are negatively skewed (skewed to the left) meaning that a larger portion of the probability distribution contains more suitable days. This means that relatively few years had a small number of suitable days during summer and fall periods.

Limitations

The results discussed in this bulletin were based on statewide average days suitable per week that were derived from the responses of county agents located throughout the state. MASS collects weekly data from only one county in each Crop Reporting District during the winter months. Thus, the statewide average for the weeks in the winter are based on relatively few observations. The fewer the observations, the less reliable the estimate. It is expected that the estimates for the spring, summer, and fall months are more reliable since they are based on more observations.

The correspondence of probability distributions estimated from these statewide average values with probability distributions estimated from actual suitable days on a specific field or farm is unknown. It may be necessary to adjust our results upwards or downwards to arrive at a more reasonable distribution for a specific location. For instance, one might expect more suitable days in the southern part of the state than in the northern part of the state during the spring and fall months.

Also, soil type would influence days suitable. The

clay content in a field would impact the field's internal drainage. Thus, fields with predominantly sandy soils would tend to have more suitable days than fields having mostly claytype soils.

Another factor for farmers to consider is the availability of Sundays and holidays as working days. The days suitable presented in this paper have not been adjusted for Sundays and holidays. An appropriate adjustment factor may be used to reduce the days suitable due to nonworking days. For instance, suppose a 4-week period has four Sundays and one holiday for a total of 5 nonworking days and 23 working days. The adjustment factor would be 0.82, which is found by dividing 23 by 28. The days suitable presented for the 4-week period would need to be multiplied by 0.82 to obtain an estimate of the suitable days during the "revised" 23-day working period.

Plans for Future Work

For the past few years, MASS has computed average days suitable for each Crop Reporting District in the state. When enough years of data are available, studies such as this one could be conducted for each Crop Reporting District. This would help refine the estimates for suitable fieldwork days across different regions of the state.

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Table 5. Days suitable for fieldwork for selected 4-week periods, Mississippi

Item	Periods												
Week Period	1-4	5-8	9-12	13-16	17-20	21-24	25-28	29-32	33-36	37-40	41-44	45-48	49-52
Beginning Date	01-Jan	29-Jan	26-Feb	26-Mar	23-Apr	21-May	18-Jun	16-Jul	13-Aug	10-Sep	08-Oct	05-Nov	03-Dec
Ending Date	28-Jan	25-Feb	25-Mar	22-Apr	20-May	17-Jun	15-Jul	12-Aug	09-Sep	07-Oct	04-Nov	02-Dec	30-Dec
Total Days in Period	28	28	28	28	28	28	28	28	28	28	28	28	28
Percentile Probabilities (Chance ≤ Shown Value)													
0%	.1	2.5	4.5	5.2	4.4	8.5	7.6	11.7	13.7	14.0	7.9	6.8	2.2
5%	1.4	3.1	5.2	6.0	6.5	9.5	9.9	12.2	15.0	14.6	8.7	7.4	3.2
10%	2.2	3.8	6.5	6.5	9.2	12.0	15.0	13.8	16.5	15.7	10.6	8.5	4.9
15%	2.3	4.4	6.8	7.3	11.2	13.6	16.3	14.1	17.1	16.2	16.4	9.3	6.1
20%	2.8	4.7	7.2	8.0	12.3	13.9	17.0	16.6	17.7	16.5	16.7	10.3	7.3
25%	3.0	5.3	7.7	9.3	12.9	15.0	17.7	17.9	18.3	18.6	17.4	12.2	7.9
30%	3.3	5.9	8.0	9.6	13.5	16.1	18.2	18.0	18.8	19.1	17.6	12.8	9.2
35%	4.3	6.1	8.5	10.1	13.7	16.5	18.9	18.5	19.1	19.2	17.9	13.8	9.6
40%	5.2	6.6	8.8	11.0	14.0	16.9	19.2	19.2	19.7	19.5	18.1	14.0	10.2
45%	5.5	7.2	9.4	11.1	15.1	17.4	19.7	20.2	20.0	19.7	18.3	14.2	10.5
50%	6.0	7.5	9.9	12.0	15.9	18.0	20.5	20.2	20.6	20.0	19.4	14.5	10.6
55%	6.2	7.8	10.3	12.2	16.0	18.4	20.6	20.6	21.1	20.2	19.8	15.2	11.4
60%	6.4	8.2	11.0	13.1	16.9	19.4	21.0	21.0	21.8	20.4	20.0	15.7	12.5
65%	7.3	9.1	11.2	13.7	17.1	19.4	21.0	21.3	22.0	20.6	20.2	16.9	13.1
70%	8.0	10.3	11.5	15.7	18.1	19.5	21.5	21.5	22.3	20.9	20.3	17.7	13.4
75%	9.5	11.0	12.0	17.3	18.6	19.6	22.4	22.3	22.8	21.5	21.4	18.7	14.1
80%	10.0	11.3	13.3	17.9	20.1	21.3	22.8	22.6	23.5	22.1	22.3	19.1	15.4
85%	12.8	11.7	15.3	18.7	20.5	21.6	23.3	22.9	24.1	22.6	22.7	20.1	15.7
90%	15.3	12.3	16.5	19.2	22.3	22.5	23.6	23.7	24.5	24.1	23.0	20.5	16.9
95%	18.4	13.1	17.9	21.6	22.8	23.2	23.9	24.4	25.1	25.0	24.9	21.1	18.8
100%	21.2	14.1	19.1	24.0	23.7	24.5	24.6	24.9	25.9	25.5	26.1	22.0	20.6
Mean Result	7.1	7.9	10.5	12.8	15.5	17.5	19.4	19.5	20.5	19.8	18.7	14.9	11.1
Maximum Result	21.2	14.1	19.1	24.0	23.7	24.5	24.6	24.9	25.9	25.5	26.1	22.0	20.6
Minimum Result	.1	2.5	4.5	5.2	4.4	8.5	7.6	11.7	13.7	14.0	7.9	6.8	2.2
Range of Possible Results	21.0	11.5	14.5	18.8	19.3	16.0	17.1	13.2	12.2	11.4	18.1	15.1	18.3
Standard Deviation	5.101	3.166	3.693	4.880	4.585	3.865	3.861	3.600	3.046	2.877	4.216	4.253	4.442
Variance	26.02	10.02	13.63	23.81	21.02	14.94	14.91	12.96	9.28	8.28	17.78	18.09	19.73
Skewness	1.134	.198	.666	.452	-.320	-.460	-1.278	-.649	-.218	-.098	-.922	-.183	.001
Kurtosis	3.583	1.901	2.654	2.256	2.754	2.678	4.575	2.460	2.252	2.558	3.745	2.026	2.436

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