University of Kentucky
College of Agriculture, Food and Environment
Cooperative Extension Service

Days Suitable for Fieldwork in Kentucky

Jordan Shockley and Tyler Mark, Agricultural Economics

Introduction

Weather risk plays a unique role and influences many decisions made on the farm. Weather determines when you can get into the field and your ability to perform timely operations such as planting, fertilizing, spraying, and harvesting. Delays from weather events of time sensitive operations will result in substantial yield and economic losses. To mitigate such losses, appropriately sized farm machinery is one strategy to manage weather risk. However, there are economic tradeoffs between owning and operating larger machinery to avoid yield loss due to weather related events. The first step in evaluating these tradeoffs is determining the number of days suitable for fieldwork. The sole purpose of this publication is to establish the required data (days suitable for fieldwork) for optimizing the sizing of farm machinery for Kentucky producers.

The time necessary to complete the task depends on whether or not the equipment can operate given field conditions (i.e. suitable for fieldwork). For example, planting row crops in the spring can be hindered by snow, frost, and rainfall events that delay planting, resulting in yield loss. Research shows that approximately 0.50% yield loss occurs in soybeans each day after the optimal planting date of early May in Western Kentucky and mid-May in Central Kentucky for group IV varieties. Similarly, group II soybean varieties experience a 0.42% yield loss per day after the optimal planting date of mid-April in Western Kentucky and late April in Central Kentucky (AGR-130). Therefore, having an expectation of the number of days suitable for fieldwork will allow producers to size farm machinery to mitigate such yield losses appropriately.

Data and Analysis

The USDA National Agricultural Statistics Service (USDA-NASS) Kentucky Field Office reports the number of days per week suitable for fieldwork in Kentucky since 1996 within the Crop Progress and Condition Report. NASS starts surveying the days suitable for fieldwork at the beginning of April and continues until the middle of November. The estimates are for a seven-day workweek. One limitation of this estimate is that it is for the entire state and it does not reflect the regional differences across the state. However, it is a proxy for weather conditions encountered across the state. Table 1 estimates the days suitable for fieldwork in Kentucky based on data from 1996-2016 and the likelihood of those days occurring. The percentiles in Table 1 are consistent with other state studies examining days suitable for fieldwork. For example, the 50th percentile in the table defines a median year. For a median year, the 50th percentile represents the year where half the years had more days suitable for fieldwork, and the other half had less. A bad year is defined as the 15th percentile and a good year defined as the 85th percentile in the table.

In addition to Table 1, it is informative to see how days suitable for fieldwork affects crop progress historically and how that compares to the optimal planting dates recommended by the University of Kentucky. Figures 1a and 1b illustrate the estimated number of days suitable for fieldwork in Kentucky for a bad, median, and a good year from Table 1. To compare against historical crop progress, the right-hand side of both figures is the average planting and harvest progress in Kentucky for soybeans (Figure 1a) and corn (Figure 1b). For comparison, the optimal planting windows for full-season soybeans (AGR-130) and corn (ID-139) are included in their respective graphs.

To illustrate how weather and days suitable for fieldwork impact crop progress, a bad and good year were selected which are 2011 and 2012, respectively. In 2011, Kentucky had an extremely wet spring. As an example, Henderson County, Kentucky, received 13.4 inches of rain in April of 2011, compared to the historical April average of 4.1 inches of rain for the state. This resulted in a minimal number of days suitable for fieldwork, which delayed corn and soybean planting progress in 2011 (figures 2a and 2b). In contrast, Kentucky had an extremely dry spring in 2012. Following the same example, Henderson County, Kentucky received 2.3 inches of rain in April of 2012. This resulted in sufficient number of days suitable for fieldwork, for which the majority corn and soybean across the state were planted within the optimal planting windows in 2012 (figures 3a and 3b). It is clear to see from the figures that the number of days suitable ranges substantially from a good year to a bad year at the critical planting times for both corn and soybeans. To mitigate the risk of not completing key tasks due to weather, producers should consider days suitable for fieldwork to size their equipment appropriately.

Using Days Suitable for Fieldwork for Machinery Management

Example: Let's consider a 5,000-acre grain farm that is in a 50-50 corn and full-season soybean rotation. Therefore, 2,500 acres of full-season soybeans are planted each year and ideally within the optimal planting window of mid-April to early May for Western Kentucky (April 18-May 9). Utilizing Table 1, the total number of days suitable from April 18 to May 9 for three weather scenarios is presented in Table 2.

Operating hours per day will vary by producer based on labor and technology availability. Therefore, three different operating hours per day are assumed for this example (10, 12, and 15 hours per day). If the producer operates 10 hours

per day, for a bad year, there would be only 86 total hours within the optimal window (8.6 days x 10 hr./day). If you have to plant 2,500 acres during a bad year, that would require a planter that could complete 29 acres per hour (2,500 acres divided by 86 total hours). Table 3 depicts the required acres planted per hour for various weather scenarios and operating hours per day.

Summary

Weather in Kentucky will vary year to year and potentially at the extremes like in 2011 and 2012. Understanding the number of days suitable for fieldwork is the first step to appropriately sizing farm machinery to mitigate weather risk. Utilizing Table 1 and the example presented, producers can calculate machinery capacity requirements based on days suitable for fieldwork, operating hours per day, and farm size.

Table 1. Estimated number of days suitable for fieldwork in Kentucky.

Week ending	Percentile probability of days suitable				
	15th	35th	50th	65th	85th
4 – Apr	2.7	3.6	4.3	4.4	4.8
11 – Apr	2.1	3.3	3.9	4.2	5.5
18 – Apr	2.2	3.5	4.0	4.4	5.7
25 – Apr	2.7	3.7	3.9	4.4	5.4
2 – May	2.3	3.0	3.3	3.8	5.0
9 – May	1.4	2.7	3.8	4.4	5.0
16 – May	2.3	3.1	4.1	5.2	5.6
23 – May	2.6	3.8	4.7	5.4	6.1
30 – May	2.7	3.7	4.4	5.2	5.8
6 – Jun	3.9	4.2	4.5	5.0	6.3
13 – Jun	1.9	4.3	4.6	5.4	5.8
20 – Jun	2.9	4.7	5.3	5.7	5.9
27 – Jun	4.6	5.0	5.5	5.8	6.1
4 – Jul	2.8	5.1	5.5	5.8	6.3
11 – Jul	4.5	5.0	5.3	5.7	6.2
18 – Jul	3.9	5.1	5.3	5.5	5.8
25 – Jul	4.7	5.0	5.2	5.6	6.1
1 – Aug	4.4	5.3	5.5	5.8	6.3
8 – Aug	4.1	5.1	5.9	6.2	6.3
15 – Aug	4.9	5.3	5.7	5.8	6.4
22 – Aug	5.2	5.6	5.9	6.4	6.5
29 – Aug	5.6	5.9	6.2	6.4	6.6
5 – Sep	5.2	5.8	6.0	6.4	6.6
12 – Sep	5.7	5.9	6.0	6.2	6.4
19 – Sep	4.7	5.4	6.0	6.3	6.7
26 – Sep	4.5	5.3	5.8	6.3	6.5
3 – Oct	4.3	5.5	6.0	6.3	6.6
10 – Oct	4.6	5.5	5.7	5.8	6.5
17 – Oct	3.6	4.8	5.3	5.6	6.3
24 – Oct	3.5	5.0	5.5	5.9	6.3
31 – Oct	3.5	4.5	5.1	5.5	6.5
7 – Nov	3.9	4.4	5.1	5.6	6.2
14 – Nov	3.4	4.1	5.0	5.5	6.1

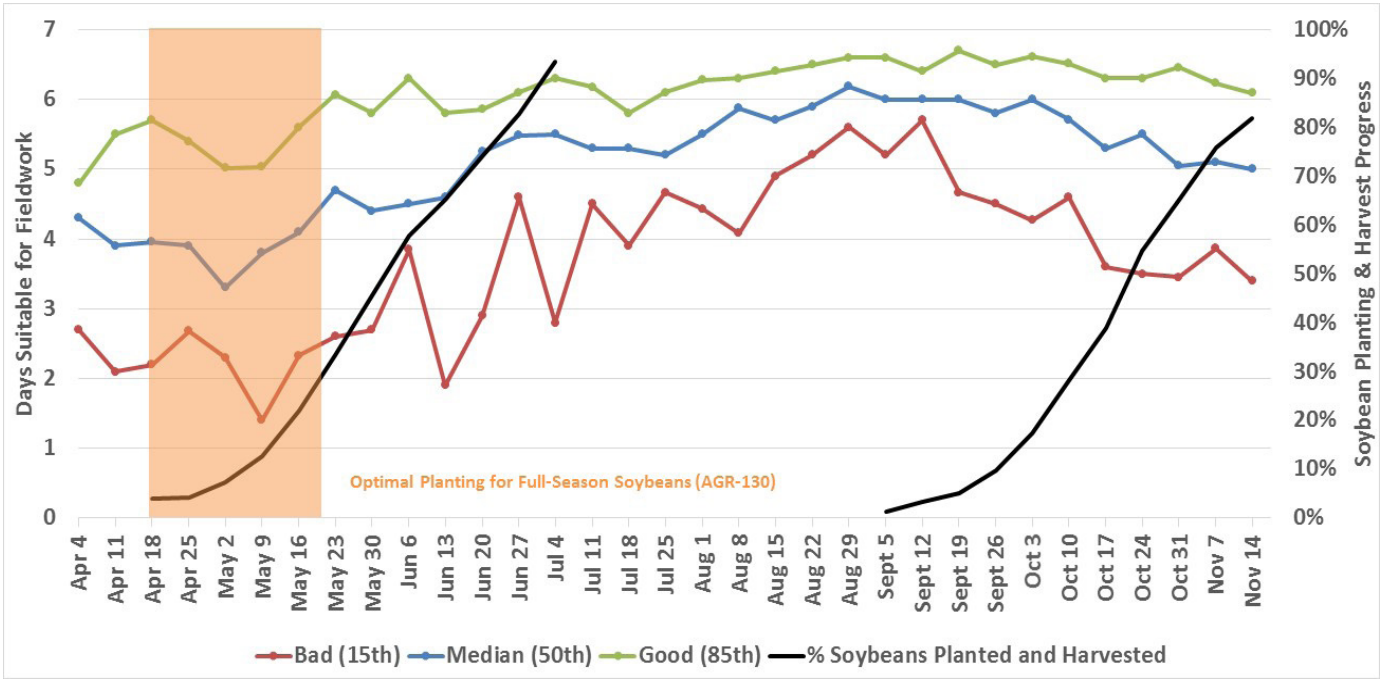
Table 2. Total number of days suitable for fieldwork under three weather scenarios from April 18 to May 9.

Total Days Suitable for Fieldwork (April 18-May 9)	
Bad (15th)	8.6
Median (50th)	15.0
Good (85th)	21.1

Table 3. Total acres per hour required to complete planting 2,500 acres of soybeans for various hours per day worked and weather scenarios.

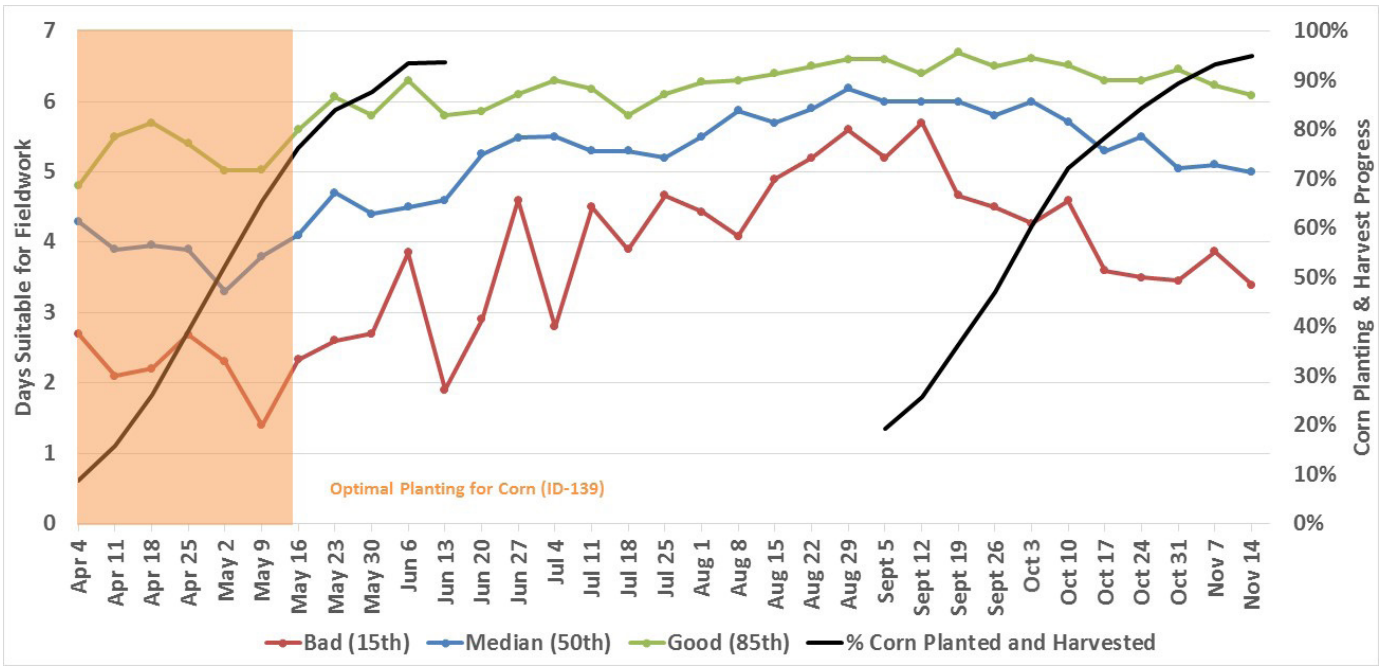
Planter Performance Requirements for Optimal Full-Season Soybean Window Based on Operating Hours Per Day (acres/hr.)			
	10 hr./day	12 hr./day	15 hr./day
Bad (15th)	29.0	24.2	19.4
Median (50th)	16.7	13.9	11.1
Good (85th)	11.8	9.9	7.9

Figure 1a. Comparison of Days Suitable for Fieldwork, Crop Progress, and Optimal Planting for Full-Season Soybeans in Kentucky



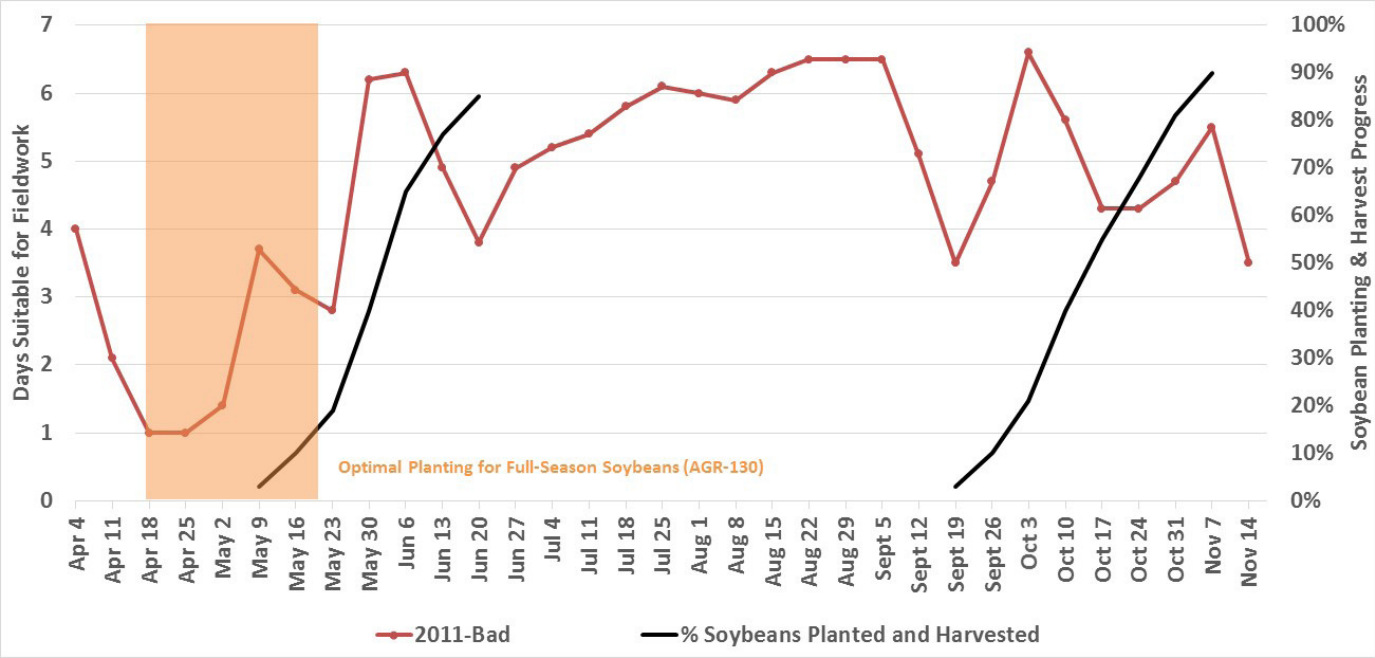
Sources: USDA-NASS; University of Kentucky AGR-130 Bulletin

Figure 1b. Comparison of Days Suitable for Fieldwork, Crop Progress, and Optimal Planting for Corn in Kentucky



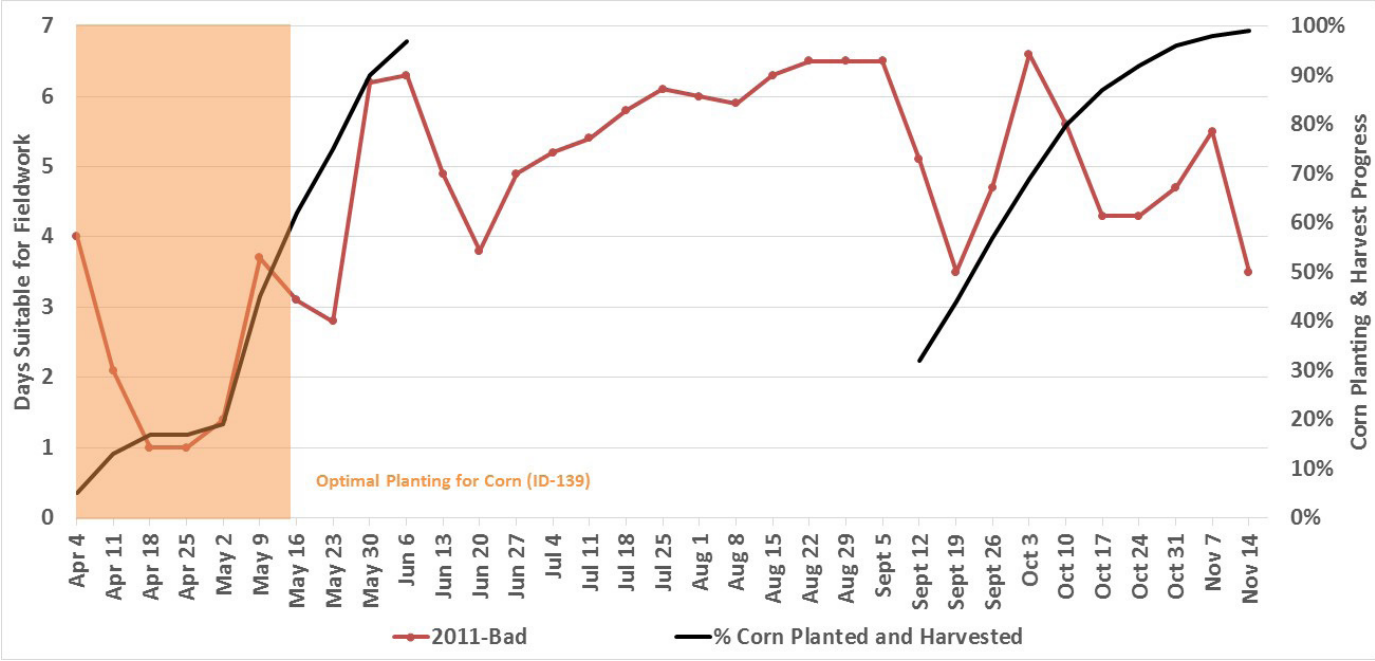
Sources: USDA-NASS; University of Kentucky ID-139 Bulletin

Figure 2a. Comparison in 2011, a Bad Year, of Days Suitable for Fieldwork, Crop Progress, and Optimal Planting for Full-Season Soybeans in Kentucky



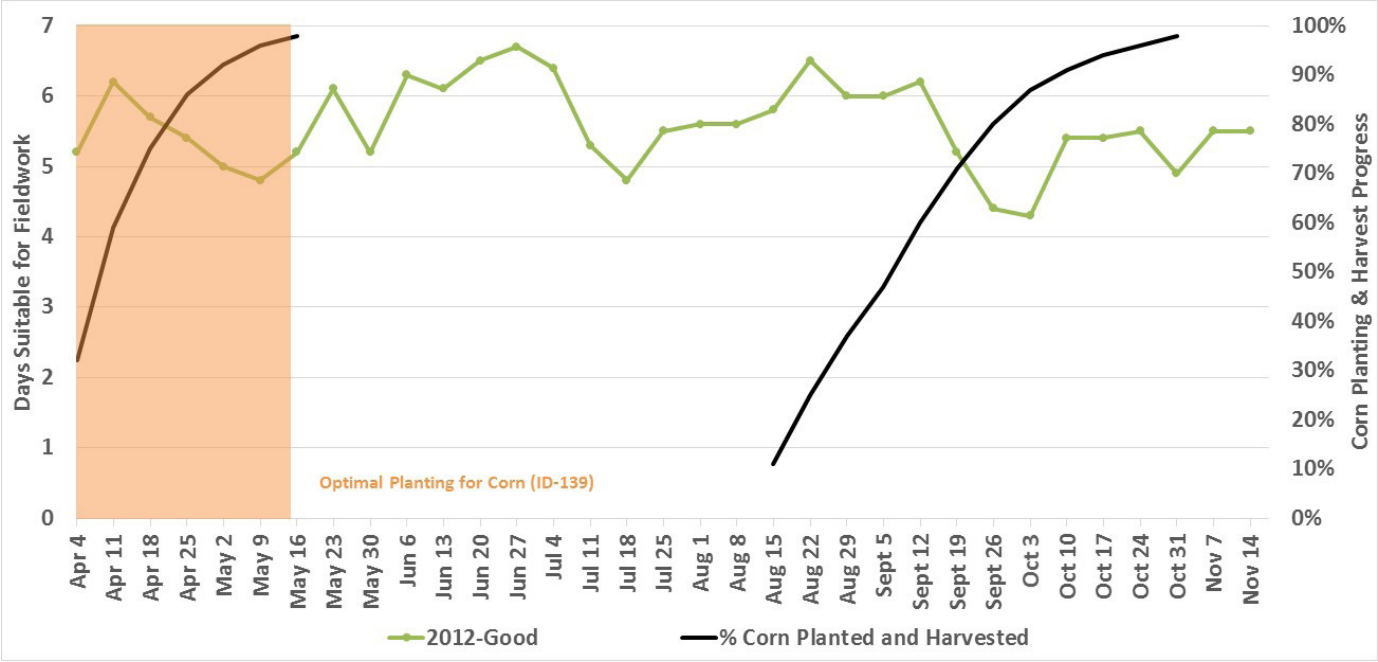
Sources: USDA-NASS; University of Kentucky AGR-130 Bulletin

Figure 2b. Comparison in 2011, a Bad Year, of Days Suitable for Fieldwork, Crop Progress, and Optimal Planting for Corn in Kentucky



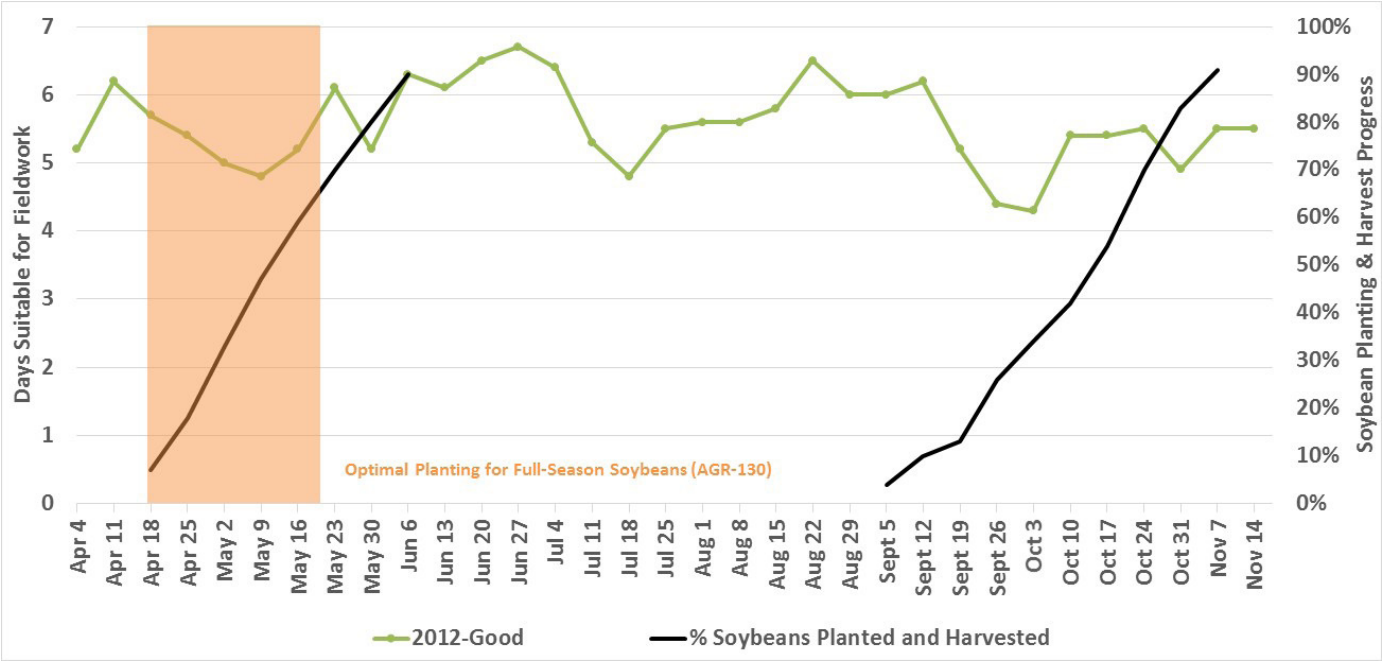
Sources: USDA-NASS; University of Kentucky ID-139 Bulletin

Figure 3b. Comparison in 2012, a Good Year, of Days Suitable for Fieldwork, Crop Progress, and Optimal Planting for Corn in Kentucky



Sources: USDA-NASS; University of Kentucky ID-139 Bulletin

Figure 3a. Comparison in 2012, a Good Year, of Days Suitable for Fieldwork, Crop Progress, and Optimal Planting for Full-Season Soybeans in Kentucky



Sources: USDA-NASS; University of Kentucky AGR-130 Bulletin

References

Kentucky Climate Center. Western Kentucky University – Kentucky Mesonet. Accessed June 2017 at: http://www.kymesonet.org.

University of Kentucky Cooperative Extension Service. AGR-130, Soybean Production in Kentucky. Accessed April 2017 at: http://www2.ca.uky.edu/agcomm/pubs/agr/agr130/agr130.pdf.

University of Kentucky Cooperative Extension Service. ID-139, A Comprehensive Guide to Corn Management in Kentucky. Accessed April 2017 at: http://www2.ca.uky.edu/agcomm/pubs/id/id139/id139.pdf.

USDA-NASS., Kentucky Field Office. Crop Progress and Condition Report. 1996-2016. Available at: https://www.nass.usda.gov/Statistics_by_State/Kentucky/Publications/Crop_Progress_&_Condition/

Issued 9-2017