

REVISING SOFT RED WINTER WHEAT YIELD POTENTIAL PREDICTIONS BASED UPON WHEAT STANDS PRIOR TO "GREEN-UP"

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Figure 1. Wheat Stands Prior to 'Green-up' (Feekes 3).

Kentucky wheat producers can sometimes be forced to plant wheat later than they would like due to wet weather, harvest responsibilities of other crops, and/or labor shortages. This can result in fewer tillers developing prior to winter dormancy than if wheat was planted earlier. Another reason that tiller development can be reduced is when temperatures are colder than normal in the fall and/or early winter and winter dormancy begins earlier than normal. It has been more than 30 years since yield predictions based upon the number of plants per square foot prior to 'green-up' (Feekes 3 growth stage) have been evaluated and revised. Establishing estimates for minimum early season stands, which are based upon final grain yield potential, can help producers make better, more profitable

management decisions.

The objectives of this preliminary study were to determine the yield potential of soft red winter wheat based upon stand counts prior to 'green-up' (Feekes 3) and compare results to existing yield predictions, which are more than 30 years old.

In the fall of 2017 and 2018 Pembroke 2016 and Pioneer 26R53 were drilled into seven 7-inch row plots at two seeding rates (35 pure live seed ft⁻² and 56 pure live seed ft⁻²) and two planting dates (early October and late November). Throughout the growing season, the wheat crop was managed according to University of Kentucky recommendations.

Wheat stands (plants per ft²) were determined by counting all stems that had at least three leaves prior to 'green-up' (Feekes 3) in late winter of 2018 and 2019. The yield potential of fifteen plots (replications) for 14 categories (wheat stand ranges) was determined as:

$$\frac{\text{Yield of a Specific Plot}}{\text{Average Maximum Yield}} \times 100$$

The average maximum yield was 92.2 bushels per Acre.

The fourteen categories were:

1 to 9 plants ft ⁻²	70 to 79 plants ft ⁻²
10 to 19 plants ft ⁻²	80 to 89 plants ft ⁻²
20 to 29 plants ft ⁻²	90 to 99 plants ft ⁻²
30 to 39 plants ft ⁻²	100 to 109 plants ft ⁻²
40 to 49 plants ft ⁻²	110 to 119 plants ft ⁻²
50 to 59 plants ft ⁻²	120 to 129 plants ft ⁻²
60 to 69 plants ft ⁻²	130 to 165 plants ft ⁻²

In 2018 and 2019, a wide range in plants ft⁻² prior to 'green-up' (60 to 109 plants ft⁻² and 120 to 129 plants ft⁻²) produced a final grain yield with 94-100% yield potential (Figure 2). However, as stands exceeded 129 plants ft⁻², there was a yield reduction of about 15% compared to the yield potential when stands ranged from about 60 to 109 plants ft⁻² at 'green-up'. The yield potential remained greater than 60 to as great as 88% when stands prior to 'green-up' ranged from 10 to 59 plants ft⁻². It was not until stands were 1 to 9 plants ft⁻² that yield potential was reduced to less than 50%.

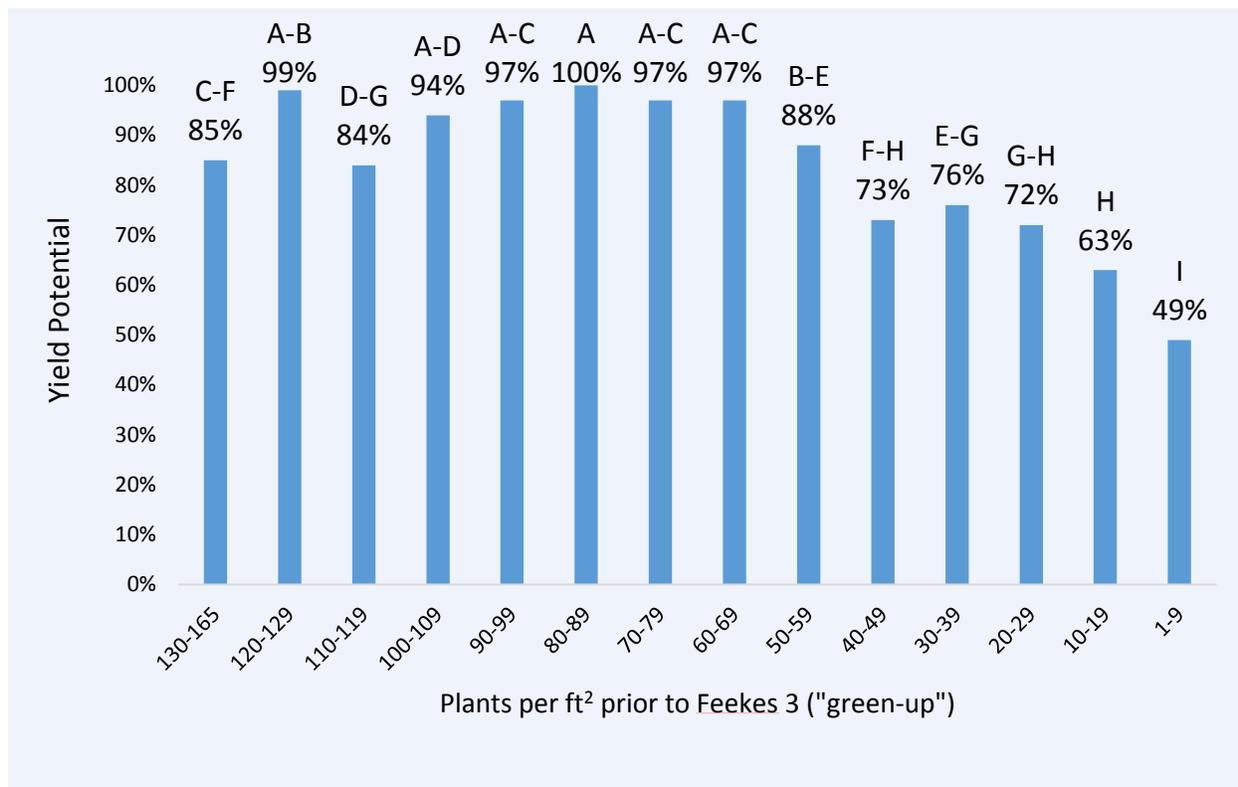
It was unexpected, and unclear, why the 110 to 119 plants ft⁻² category had a 16% yield reduction. Additional years examining yield potential, when predicted by stands prior to 'green-up' will help us understand if this is a true difference or just an anomaly for these two years.

The previous prediction for yield potential, which is about 30 years old, was based upon plant stands, which counted all the tillers and main stem from a single seed as one plant. In reality, stands prior to 'green-up' are much easier to determine based upon all stems that include at least 3 leaves, regardless of whether they are main stems or tillers. Therefore, assuming that three tillers and a main stem are produced from a single seed, the previous prediction for yield potential indicated a:

- 90 to 100% yield potential when 72 to 140 plants had at least 3 leaves ft⁻² prior to 'green-up'
- 75 to 80% yield potential when 60 to 72 plants had at least 3 leaves ft⁻² prior to 'green-up'
- 60 to 70% yield potential when 48 to 56 plants had at least 3 leaves ft⁻² prior to 'green-up'
- 40 to 50% yield potential when 24 to 28 plants had at least 3 leaves ft⁻² prior to 'green-up'

This older work predicts that the yield potential is greatly reduced at much greater stands than our current preliminary work indicates. However, our preliminary results align more closely with producer and agronomist observations that acceptable yields can be attained with much lower stands prior to 'green-up'.

Figure 2. Estimated Yield Potential for Soft Red Winter Wheat in Kentucky Based Upon Stands (number of plants with at least 3 leaves per ft²) Prior to 'Green-up' (Feekes 3) in 2018 and 2019 at Princeton, KY. Each category labelled with a different letter is statistically different (*P* < 0.05).



FUTURE WORK

This work will be expanded to include multiple seeding rates and planting dates to help us more fully understand the yield potential when predicted prior to 'green-up'. It will also be expanded to include a prediction of yield potential based upon heads ft⁻² at early dough stage (Feekes 11.1 to 11.2).

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