



Double Crop Soybean Production in Kentucky

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The double crop soybean system was pioneered in Kentucky. Traditionally, double crop soybean are planted in June following harvest of a small grain: wheat, barley, and in some cases cereal rye. Since the early 2000s about 25 percent of the total soybean production in Kentucky has been double crop soybean. Many agronomic management strategies are similar between double crop soybean and full season soybean: soybean planted in the spring following corn from the previous year. However, certain management strategies for double crop soybean not only increase yield potential but also offer opportunities to increase profitability.

Planting Dates

Planting date is one management decision that typically does not incur a direct cost. However, it can have a large impact on profitability of double crop soybean production. Yield decreases by about 0.9 percent for each day that double crop soybean planting is delayed. Because planting date for double crop soybean is generally dictated by wheat harvest, wheat management decisions can influence double crop planting dates. Wheat planting date in the fall can greatly impact the wheat harvest date and thus the subsequent double crop planting dates; therefore, it is essential to plant wheat as early as feasibly possible to ensure a timely harvest and soybean planting. Considering the relative maturity of a wheat variety is also important. Selecting wheat varieties that are medium maturing rather than medium-late or late maturing can result in harvest up to four days earlier. Planting double crop soybean four days earlier can result in an additional 1.5 to 2.5 bushels of soybean per acre.

Another wheat management decision that can greatly impact double crop soybean planting date is wheat grain moisture at harvest. Most field-dried wheat is harvested between 13 and 15 percent grain moisture. However, producers with grain drying and storage facilities can safely harvest wheat when grain moisture



is >15 percent. Harvesting at higher wheat grain moisture (>15%) can allow double crop soybean to be planted up to 17 days earlier. For double crop soybean that are expected to yield about 40 bushels per acre, that would be an additional 6 bushel of yield potential (0.36 bushel per day x 17 days = 6 bushel per acre increase). If double crop soybean are expected to yield closer to 65 to 70 bushels per acres, that would be about 10 to 11 bushel of yield potential (0.59 to 0.63 bushels per day).

Soybean planting date can impact the days to canopy closure and number of pods per plant. New research demonstrates that double crop soybean planted three weeks earlier than a second planting date took 49 days to reach full canopy while the planting date three weeks later took 45 days to close the canopy. The number of pods per plant for the first planting date was 41 while only 33 pods per plant were produced for the planting date three weeks later.

Soybean Variety Selection

The decisions for choosing a soybean variety are similar for both full season and double crop soybean. First, identify major pest problems, such as weeds, diseases,

insects and nematodes, that routinely impact soybean production of specific fields. Next, varieties with known resistance to these pests should be chosen. Only after varieties with needed pest resistance are identified should yield potential of the variety be considered.

Another important consideration for variety selection is relative maturity group (rMG). In general terms, varieties with rMG of 4.0 to 5.0 perform well for double crop production in Western and Southern Kentucky. For Northern and Eastern Kentucky, rMG of 3.5 to 4.5 are thought to be good choices for double crop soybean.

In recent research in Western Kentucky, varieties with late-four rMGs performed the best when compared to varieties that were early-four, mid-three, and late-two rMG. The late-four variety yielded 13 percent more than the early-four, 19 percent more than the mid-three, and 28 percent more than the late-two.

Seed Treatments

Seed treatments, with insecticides, fungicides, or nematicides, are not recommended for double crop soybean production. Although final harvested

soybean populations were about 8 percent greater when treated seed was planted versus when untreated seed was planted, in both historic and recent research, final soybean yield was the same for treated and untreated soybean seed. Given that the yield was not impacted it is typically not profitable, and thus not recommended, to use treated seed for double crop soybean production.

Row Spacing

Double crop soybean row spacing should be 15 inches or less to maximize yield potential. The majority of double crop soybean in Kentucky are 15 inches rows.

Seeding Depth

Soybean can be seeded to a depth of 1 to 2 inches. However, given that double crop soybean planting is typically occurring when conditions are or can become quite dry, planting double crop soybean from 1 ½ to 2 inches is recommended to place the seed within the soil where the likelihood of continuous soil moisture is high. Never plant soybean greater than 2 inches deep.

Plant Population

Double crop soybean plant populations should be seeded to achieve a harvest population of 140,000 to 150,000 plants per acre. At planting, this will require adjusting the seeding rate based upon the germination rate of the seed lot and the expected stand loss. For example, to achieve 140,000 plants per acre for a seed lot with 85 percent seed germination and an expected stand loss of 10 percent, the seeding rate should be about 183,000 seeds per acre.

$$140,000 \div 0.85 = 164,705 \div (1-0.10) = 183,006 \text{ seeds per acre}$$

Whereas a seed lot with 98 percent germination requires about 158,730 seeds per acre.

$$140,000 \div 0.98 = 142,857 \div (1-0.10) = 159,000 \text{ seeds per acre}$$

As seeding rates increase, stand losses also increase. In double crop research conducted from 2016 to 2019 at the University of Kentucky's Research and Education Center in Princeton, Kentucky, stand loss increased from 2 percent when the seeding rate was 50,000 seeds per acre to 53 percent when the seeding rate was 250,000 seeds per acre (Table 1). These losses were estimated prior to harvest (R8 growth stage) and likely capture loss during early vegetative growth stages as well as loss due to plant-to-plant competition that can occur throughout the growing season. Therefore, it is important not to utilize extremely high seeding rates to achieve the desired plant population because it can negatively impact overall profitability.

Seed Inoculant

Most double crop soybean fields in Kentucky do not need a *Bradyrhizobium japonicum* seed inoculant. However, in the following cases *B. japonicum* seed inoculants should be used at planting:

- A field that has not produced soybean within the last three to five years.
- Fields with a history of poor root nodulation.
- Fields that remain saturated for extended periods of time.

Soybean inoculant is a living organism, and this inoculant must be stored in a temperature-controlled facility with low humidity. An air-conditioned room that maintains temperatures between 60 and 75°F is adequate for short-term storage of unopened inoculant containers. Many of the inoculant labels require the use of the entire container within 24 hours of opening. Some inoculants have been stored successfully in refrigerators for longer periods of time and remained viable, but that practice may or may not be compliant with the label.

Nutrient Management

Soil tests should be conducted to determine nutrient requirements for double crop soybean. Nutrient management for double crop soybean is similar to full season soybean except for phosphate.

Table 1. Percent double crop soybean stand loss at harvest maturity (R8 growth stage) for different seeding rates from double crop soybean research conducted at University of Kentucky's Research and Education Center, Princeton, Kentucky, 2016 to 2019.

Soybean Seeding Rate (seeds per acre)	Percent Stand Loss at Harvest (R8)
50,000	2
100,000	33
150,000	44
200,000	49
250,000	53

The phosphate recommendation for small grains should be utilized, and all nutrients should be applied in the fall prior to small grains planting.

Weed, Disease, and Insect Management

Weed, disease, and insect management are similar to full season soybean. Therefore, management of double crop soybean for weed control and management of diseases and insects should be the same as full season soybean.

Resources

Bradley, C.A. 2020. Foliar Fungicide Considerations for Soybean. <https://kentuckypestnews.wordpress.com/2020/07/07/foliar-fungicide-considerations-for-soybean-2/>.

Knott, C., and C. Lee. 2017. A Comprehensive Guide to Soybean Management in Kentucky (ID-249). <http://www2.ca.uky.edu/agcomm/pubs/ID/ID249/ID249.pdf>.

Legleiter, T., and J.D. Green. 2020. Weed Control Recommendations for Kentucky Grain Crops (AGR-6). <http://www2.ca.uky.edu/agcomm/pubs/AGR/AGR6/AGR6.pdf>.

Ritchey, E., and J. McGrath. 2020. 2020-2021 Lime and Nutrient Recommendations (AGR-1). <http://www2.ca.uky.edu/agcomm/pubs/agr/agr1/agr1.pdf>.

Villanueva, R.T. 2019. Insecticide recommendations for soybeans 2019 (ENT-13). <http://entomology.ca.uky.edu/files/ent13-soybeans.pdf>.