Management Strategies for Double-crop Soybean

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Planting Dates

Double-crop soybean can be one of the most productive systems for Oklahoma producers. It allows growers to take advantage of all the benefits of a wheat production system, including winter grazing and a sustainable winter crop, as well as an additional highly profitable summer crop system. Since soybean in double-crop systems are planted following the harvest of wheat, they are planted 30 to 45 days later than the typical planting period. This delayed planting often results in lower yields of double-crop systems compared to full-season production; however, under certain environmental conditions or regions of the state, this yield decline may be very minimal. Even though the crop is planted so much later, some of the benefits comes from the crop reaching pod de
development and seed fill (R3 to R6 growth stage) during late August through early October, which are associated with more frequent rainfall and cooler temperatures compared to that of July or early August that are typical with full-season production.

While double-crop systems do have potential in the state, the later planting can result in a fair amount of stress to the crop. Soybeans are considered to be photoperiod sensitive, meaning maturity is controlled by day-length. Furthermore, soybean are short-day plants; in other words the maturity occurs more rapidly as daylight hour’s decrease. With the longest day of the year occurring on June 21st, most double-crop soybean will have emerged shortly before or following this date. This typically results in a shorter vegetative growth period as well as decreased flowering and pod filling periods compared to full-season counterparts. Production inputs must be optimized to minimize the yield loss attributed to the shortened growing season, ensuring adequate production and potential profitability.

Planting Populations

Determining the optimum plant population for individual production systems is fairly difficult as it can change quite drastically depending on variety characteristics, row spacing, tillage and fertility. In response to the condensed season and lower vegetative growth achieved compared to full-season production, growers may have to increase plant populations to achieve yield potential. Planting more seed would allow additional plants to provide similar coverage typically maintained in full-season production systems. A recent study at Oklahoma State University documented the difference in yields at various plant populations between full-season and double-crop production systems (Figure 1). This study found that full-season soybean production only needed 96,000 seeds per acre to statistically optimize yields. Similar to previous findings, double-crop soybean systems did require more seeds to achieve similar results. In fact, double-crop seeding rates are similar to those previously found at around 120,000 seed per acre. However, because most universities have recommended decreasing full-season populations, the

Figure 1. Impact of seeding rate on soybean grain yield for full-season and double-crop production systems.
percent increase in population is much higher between full-
season and double-crop than previously reported. Therefore,
as growers look to decrease seeding rates with earlier planting
dates, make there are adequate populations for double-crop
production, with this value being 15 to 30% increase more
than full-season production.

Row Spacing
Similar to planting populations, row spacing can greatly
affect other production practices. In fact, row spacing will have
a significant impact on what plant populations growers should
utilize. Wider row spacing will typically warrant a decrease in
plant populations, due to intra-row competition. This is the
case for full-season as well as double-crop production.

For double-crop production systems, any row-spacing
can be adequate. However, as the system does produce
lower vegetative biomass, a narrower spacing can help cover
rows and minimize bare soils. A decrease in bare soil can result
in better moisture conservation and potentially fewer
weeds later in the season. Lower weed pressure can be very
beneficial as several herbicides are considered off-label once
soybeans reach flowering. For double-crop systems, can be
fairly early in the season. The main difference in row spac-
ing comes with the equipment used to plant. For wider row
spacing, planters are commonly used, while air seeders or
drills are typically used for more narrow spacing. Since most
double-crop systems are planted as no-till and into potentially
high levels of residue, the main concern is the adequacy of
both the drills and the planters for planting into those condi-
tions. Overall, both can achieve satisfactory results in heavy
residue conditions; however, planters are typically a better
option because they can utilize specialized equipment, such
as row cleaners, to help deal with higher residue levels.

Residue Management
Residue management at planting is one of the most
overlooked, but challenging, aspects of double-crop soybean
production partially because of the amount of variables that
can influence planting and planting management practices.
Several factors of the system can dictate how growers
should manage the system, including biomass, harvest type
and conditions at planting. Wheat systems that produce a
higher amount of biomass can be particularly challenging.
As mentioned previously, most modern planters should be
able to successfully plant into no-till systems. However, when
excessive residue exists, most research classifies this as
wheat yields more than 50 bushels per acre, specialized
no-till equipment or additional residue management may be
required to achieve acceptable soybean stands.

Most double-crop soybean systems are no-till planted
immediately or shortly following harvest of the previous
small grain. Not having to manage the residue prior to plant-
ing allows growers to plant earlier, which can be a major
benefit to the system. However, researches from around
the soybean production region have shown that soybean in
a no-till system, even those in double-crop systems, have
slower germination, emergence and early season growth.
Furthermore, high amounts of residue can interfere with
pre-plant and early season herbicide applications. Growers
can manage the residue by tilling or burning the crop resi-
due following harvest but prior to planting. However, these
practices create several different challenges, that often are
more difficult to overcome, including soil drying, crusting
and the loss of valuable residue. An alternative would be to
mow or shred the residue prior to planting. This would better
spread the residue across the soil surface and minimize the
interference at planting. The shorter residue could lead to
greater soil drying, but not as much as the tilled or burned
systems. Work being done at OSU has shown no significant
differences in soybean yield associated with either no-till or
where the residue was mowed prior to planting (Figure 2).

Figure 2. Impact of residue management treatments on
soybean grain yield in a double-crop production system
in Oklahoma. Research was conducted at the Cimarron
Valley Research Station in Perkins.

Another aspect of residue management that most do not
consider is height of the soybean crop and height of the first
node. Due to higher rates of vegetative growth in full-season
production system, height to first harvestable node is not a
measurement most would consider. Not only is there a set
height (typically 4 inches above the soil surface), but most
combines should not harvest as close to the soil surface as
possible to limit the risk of foreign material being lodged into
the system. Height of the residue can greatly influence the
height in which soybeans set pods in double-crop systems.
Growers want high enough residue to minimize losses but
not too high to where the soybean crop can become spindly
with weaker stalk strength. Research has indicated that either
the mowed or no-till production system will produce the first
pod high enough where it can be easily harvested. However,
no-till systems produce better results, with findings showing
more than 7 inches of clearance of the first pod to the soil
surface compared to 4.5 inches for the mowed system. Both
burned and tilled plots resulted in initial pod being under the
critical height for harvest (Figure 3) and at least one node of
pods should be expected to be lost.

Overall, double-crop soybean production can be an
extremely profitable and productive system. Planting and
management practices associated with planting can be some
of the most important actions made throughout the season.
As double-crop soybean systems are typically planted one
to two months later than full-season production systems, the
growing season, particularly vegetative growth period, has
been substantially shortened. Therefore, practices should
be selected to allow and promote earlier and more timely
planting as well as early season growth.
Figure 3. Impact of residue management treatments on soybean grain height to first harvestable node in a double-crop production system in Oklahoma. Research was conducted at the Cimarron Valley Research Station in Perkins.

For double-crop soybean, growers should consider:

- Increase planting populations by 15 to 30%. The difference will depend on full-season planting rates.
- Implement agronomic procedures that increase rate of canopy closure and vegetative growth. These could be planting rate, row spacing or planting orientation.
- If equipment is available, maintain residue on the soil surface as this may be the only aspect that saves soybean in hot and dry years.
  - If heavy residue exists and no-till planter options are not available, growers could look into methods that maintain residue and minimize influence, such as mowing.
The Oklahoma Cooperative Extension Service

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Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

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