



The Management of Double-Crop Corn System

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EXTENSION

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Key points:

- The best time to plant double-crop corn is in July, so critical growth stages occur after typically sub-optimal conditions in late July through early September.
- Unlike other double-crop systems, higher seeding rates do not increase yields compared to full-season production systems. Similar seeding rates could be utilized in both systems.
- Growers shouldn't utilize shorter-season corn maturity, this could increase the potential of the corn crop maturing during sub-optimal conditions.

What are double-crop systems?

Double-cropping is a unique production system where two crops are grown in the same field during the same year. The most common of these systems will not only have two crops grown in a single year but also harvested. In these systems, summer crops are often planted directly following the harvest of the winter crop. This is typically done in the region with wheat-soybean or wheat-grain sorghum systems. However, Oklahoma has the climatic advantage of having some alternative double-cropping systems. One of these that has gained a lot of interest in recent years has been the double-crop corn system.

How do we manage the double-crop corn system?

Planting timing

Similar to other double-cropping systems, double-crop corn is planted following the harvest of winter wheat. For other double-crop systems, one of the primary means for success is to get the summer crop planted as early in June as harvest allows. However, for double-crop corn systems, growers are

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encouraged to wait and plant as soon as optimum conditions are present in July. So, one must ask, "Why would you delay corn planting but not for other crops". One of the primary reasons is that corn is most sensitive to excessive heat and low moisture, especially from tasseling through grain fill. Some reports have indicated that double-crop corn can reach tasseling within 30-50 days following emergence. Earlier planting would result in corn beginning to go through these sensitive stages during late July or early August. However, if planting was delayed by two to four weeks, this would occur in later August or earlier September when conditions are often more favorable. This does lead to an increased risk of early fall/winter freezes.

Plant Population

Double-crop systems often require higher seeding rates compared to full-season production. This is often to make up for decreased vegetative growth due to the shorter season. Recent evaluations of full-season and double-crop found that corn did not follow those trends. This is even the case as full-season seeding densities have decreased in recent years. Once the upper population threshold is surpassed, the risk of yield loss could be present due to competition for resources and space, especially in double-crop systems (Figure 1; Table 1). With the additional considerations for shorter production seasons, it is vital to maintain an optimization over maximization philosophy.

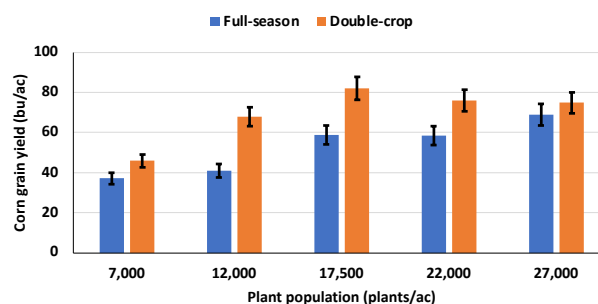


Figure 1. Impact of plant population on corn yield in both full-season and double-crop production systems. Data were collected from the Efav research station located near Stillwater, Oklahoma during the 2020 production season. Yields from full-season systems were lower than normal due to excessive moisture stress during kernel filling stages.

Table 1. Agronomic management practices for corn trials evaluating plant population and N rate for full-season and double-crop corn at the Efav research station in 2020.

System	Hybrid used	Maturity	Planting date	Harvest date
Full season	DKC 65-95	115	April 7, 2020	August 29, 2020
Double-crop	CP5789	117	July 6, 2020	November 19, 2020

Hybrid maturity

With later planting resulting in an increased risk of late-season freezes, many would consider planting shorter-season hybrids. However, this will often encounter the risk of reaching reproductive stages too quickly, potentially resulting in decreased yield potential due to the conditions around tasseling and grain fill. Work in both Oklahoma and Virginia have suggested planting too short of a season corn hybrid could decrease yields. Planting a corn hybrid of fewer than 90 days reduced yields by nearly 50% compared to those of 100-115 day hybrids (Behl et al., 1998). Ultimately, the environmental conditions, specifically heat and moisture, at tasseling through early grain fill will dictate the success of this crop, and later planting with a longer-season hybrid will often reduce the risk of failure.

Residue (Manage or plant no-till)

Residue is often considered a vital component of double-crop systems, especially in Oklahoma. Not only does planting no-till often decrease the time between wheat harvest and double-crop planting but the residue can often aid in retaining moisture during the periods of the summer with high evaporation. This is no different for corn. In a test conducted at Oklahoma State University (Table 2), double-crop corn often yielded 500 lbs/ac higher in no-till wheat than following canola (PSS-3001 for more details). While this is not a direct comparison, corn germination and early growth was not different between the two crops but yield loss occurred later in the season when moisture became limited. Therefore, while the delayed planting can allow for management of the residue (either burning or tilling), corn will often benefit from high quality standing residue.

Pest management

Increased pest pressure is almost always a concern with double-crop or later planted crops. In Oklahoma, many of our insect and disease species come from more southern locations, where they typically overwinter. Full-season or early-planted corn will grow and mature before many of these are able to establish yield-limiting populations. However, when corn is planted later in the season, growers may have to manage more of these corn diseases that are not typically seen. One of these problems is rust. Both common and southern rust need prolonged leaf wetness and cooler temperatures during infection than we experience in the middle of the summer (60-75°F for common rust and 75-85°F for southern rust). However, when the planting date is delayed for corn, this can be a more economical issue. Rust around grain filling is often resulting in decreased yields. Therefore, it should be expected that growers may need to plan for the management of rust for double-crop corn production. Additionally, insect pests can also be an issue. During the last several years when evaluating double-crop corn in Oklahoma, it has been noted increased pressure from corn earworm and various borer species.

Aflatoxin can be a major issue for downstate dryland corn production systems. This is because hot and dry conditions during grain fill will increase the risk of not only infection from *Aspergillus* but also aflatoxin contamination in the field. With double-crop corn, however, the later planting can result in cooler conditions during grain fill decreasing the risk of this making aflatoxin a potentially lower risk in double-crop systems compared to full-season production.

Table 2. Impacts of double-crop rotation on crop yield, emergence percentage, and early season vigor from multi-year, multi-site study.

Summer Cash Crop	Previous crop	Yield (lbs/ac)	Emergence (%)	Seedling vigor
Grain Sorghum	Wheat	4206A	65	5
	Canola	4127A	70	8
Soybean	Wheat	2046A	65	7
	Canola	1572B	65	7
Corn	Wheat	3747A	70	7
	Canola	3267B	75	9
Sesame	Wheat	626B	60	3
	Canola	856A	85	8

Different letters indicate significantly yield differences within the summer crop

Nitrogen Management

Double-crop systems are noted for the need to optimize production inputs due to increased stress associated with the shorter season. For corn, nitrogen (N) management plays a direct role in production and profitability. Nitrogen fertilizer applications are made based on both yield goal and the amount of residual N present in the soil. A pre-plant soil test and a realistic yield goal will provide appropriate N as well as phosphorus and potassium recommendations. Physiologically, corn requires and uses most N between V8 through VT growth stages. Deficiencies during this time can have a negative effect on end of season yield. As with other management considerations, double-crop systems provide unique challenges due to the time constraints of the shorter season. Therefore, applications will have to be made at planting or shortly after.

Literature Cited:

- Behl, H., E. Bender, D. Brann, D. Moore, and L. Barrack. 1998. Evaluation of double crop corn in eastern Virginia. Virginia Cooperative Extension, Virginia Tech.

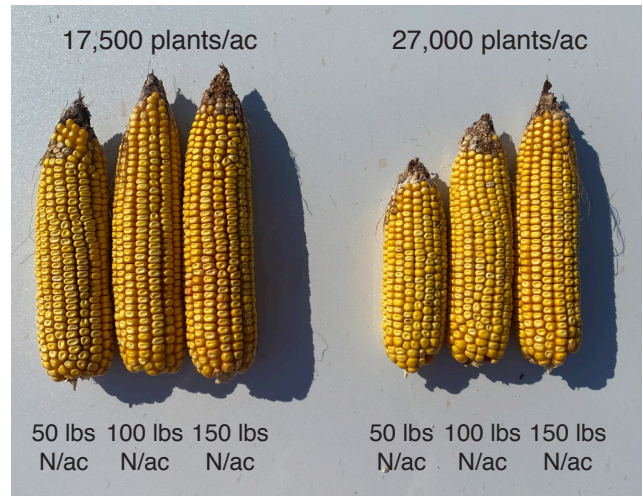


Figure 2. Corn ears at 17,500 and 27,000 plants per acre across different N rates.

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