1. Yield prospects for various doublecrop options

Doublecropping after wheat can be a high-risk venture. The available growing season is relatively short. Heat and/or dry conditions in July and August may cause problems with germination, emergence, seed set, or grain fill.

However, with adequate or even surplus soil moisture in much of the state going into wheat harvest this year, combined with some of the highest grain prices in history, doublecropping looks like a viable option for many producers.

The most common doublecrop options are soybean, sorghum, and sunflower. Other possibilities include specialized crops such as proso millet or other short-season summer crops. Yield expectations in different areas and at different planting dates, along with production costs, are two of the most important factors in deciding which crop to use for doublecropping.

**Soybean**

Soybeans are probably the most commonly used crop for doublecropping, especially in central and eastern Kansas. With glyphosate-resistant varieties, often, the only production cost for planting double-crop soybeans is the seed, an application of glyphosate, and the fuel and equipment costs associated with planting and harvesting.

The cost for weed control can’t really be counted against the soybeans, however, since that cost would occur whether or not a soybean crop is present. In fact, having beans on
the field may even reduce herbicide costs compared to leaving the field fallow. Later in the summer, a healthy soybean canopy may suppress weeds enough that a late-summer burn-down application may be avoided.

Variety selection for doublecropping is important. Soybeans flower in response to a combination of temperature and day length, so shifting to an earlier-maturing variety when planting late in a doublecrop situation will result in very short plants with pods that are close to the ground. Planting a variety with the same or perhaps even slightly later maturity rating will allow the plant to develop a larger canopy before flowering. Planting a variety that is too much later in maturity, however, increases the risk that the beans may not mature before frost.

What are typical yield expectations for doublecrop soybeans? In southeast Kansas, doublecrop beans can often be planted by mid- or late-June. In doublecrop soybean variety tests at the Southeast Agricultural Research Center at Parsons, yields have typically been between 15 and 30 bushels per acre. Average yields have ranged from 3.5 to 38 bushels per acre over the past 15 years.

At the Harvey County Experiment Field, doublecrop soybeans averaged 20 bushels per acre over a three-year period. In tests near Manhattan, doublecrop beans have ranged from 12 to 35 bushels per acre in recent years.

Sorghum

Sorghum is another doublecrop option. Unlike soybeans, sorghum hybrids for doublecropping should be earlier maturing. Sorghum development is primarily driven by accumulation of heat units and the doublecrop growing season is too short to allow medium-late or late hybrids to mature before frost in most of Kansas.

From 2002 to 2004, doublecrop grain sorghum hybrid performance tests were conducted by the agronomists at the Southeast Agricultural Research Center (Parsons in 2002 and 2004, Columbus in 2003) and in south central Kansas at the Harvey County Experiment Field. Although this small sample of locations and years can’t predict what will happen in every situation, it does provide useful information about double cropping grain sorghum in that part of the state.

The tests in southeast Kansas were planted by mid- to late-June and harvested in September or October. Over the three years, all hybrids averaged about 60 bushels per acre, with a range of 52 to 73 bushels per acre. Hybrids that averaged more than 60 bushels per acre over the three years were Dekalb DKS29-28, Sorghum Partners K35-Y5, and Sorghum Partners KS 310. Hybrids that were in the test only two years and had above-average yields were Asgrow Reward and Sorghum Partners NK5418.

The test at Hesston had similar yields in 2002 and 2004, but produced no grain in 2003 because of very dry conditions after wheat harvest. This test was planted in early to mid-July and fall rains delayed harvest until November or December. Averaged over the two
years that produced reasonable yields, hybrids with yields greater than 60 bushels per acre were Advanced Genetics A115C, Dekalb DKS29-28, Sorghum Partners KS310, and Sorghum Partners KS585. Most of these hybrids were classified as early or medium early. The exceptions were Sorghum Partners KS585 and NK5418, classified as medium maturity, but which had enough time to fill grain before frost in these particular years. In a crop rotation study at Hesston, doublecrop grain sorghum averaged 83 bushels per acre over three years compared to 20 bushels per acre for double crop soybeans over the same time period.

Late-planted sorghum will likely not tiller as much as early plantings and can benefit from narrow row spacing if rainfall is adequate.

In situations with mid-July plantings and where herbicide carry-over issues are not a concern, summer annual sorghum-type forages are also a good option. See last week’s e-Update (No. 145, June 20) for an overview of the major types of summer annual forages for Kansas.

**Corn**

Is doublecrop corn a viable option? Now that glyphosate-resistant hybrids are so common, weed control issues and costs may not be much different than for soybean.

Corn is typically not recommended for June or July plantings because yield is typically substantially less than when planted earlier. Typically, corn planted in mid-July has a difficult time pollinating and seldom has sufficient heat units to fill grain before frost. This was illustrated in a study at the South Central Experiment Field in 2007 where 100 to 112 RM corn planted in late June yielded only 40 bushels per acre compared to over 130 bushels per acre for an April planting. In Manhattan in 2007, the same hybrids planted on June 25 yielded over 130 bushels per acre, which is certainly acceptable but substantially less than the 150 bushels per acre for earlier plantings.

In another study at Manhattan a 112-day corn hybrid planted in mid-July produced nearly 100 bushels per acre. No grain production was expected from that planting, but July rains were above normal at this location, allowing for successful pollination in August and grain fill in September. Note however that the corn could not be harvested until January because it took so long to dry down with the cool fall temperatures. Also note that 2007 was somewhat unusual in the amount and distribution of July and September rains at this location.

Very short-season corn hybrids (80 to 95 RM) have the greatest chance of maturing before frost in double-crop plantings, but generally have less yield potential than hybrids that are more than 100 RM used for full-season plantings. Short-season hybrids often will set the ear fairly close to the ground, increasing the difficulty of harvest.

**Profitability**
The K-State Department of Agricultural Economics has crop budgets for doublecropped soybeans and sunflowers in eastern and central Kansas at: http://www.agmanager.info/farmmg/fmg/nonirrigated/

In addition, Dan O’Brien, Northwest Area Extension Economist, has a newly updated crop budget for irrigated, doublecropped sunflowers, soybeans, and forage sorghum for northwest Kansas at: http://www.agmanager.info/crops/budgets/proj_budget/decisions/

On this site, click on the download for “2008 Crop Profitability Comparison Worksheet for Northwest Kansas” to get O’Brien’s revised crop budget.

-- Kraig Roozeboom, Crop Production and Cropping Systems Specialist kraig@ksu.edu

2. Herbicide carryover considerations when doublecropping after wheat

Many of the commonly used sulfonylurea herbicides, including Ally, Ally Extra, Finesse, Glean, Amber, Peak, Rave, Maverick, Olympus, and Olympus Flex are very persistent and have fairly long crop rotation guidelines which can affect doublecropping options.

In general, the most tolerant summer crop, to residues of these herbicides, is STS soybeans, followed by grain sorghum. Product labels tend to specify grain sorghum, but forage sorghum and sudangrasses would likely have similar levels of tolerance. One major exception to this guideline is sorghum and Maverick herbicide. Sorghum is extremely susceptible to Maverick and should not be planted for at least 22 months after application.

Producers who want to doublecrop sorghum after wheat that has received one of these sulfonylurea herbicides should wait as long as possible to plant. Ideally, sorghum should not be planted on these fields until mid- to late-June.

Cotton and non-STS soybeans are generally intermediate in tolerance to these herbicides. Corn, sunflowers, canola, and alfalfa tend to be the most susceptible crops to the sulfonylurea herbicides and have rotation guidelines of 12 months or longer.

Wheat fields that have been treated with Beyond herbicide can be doublecropped with any type of soybean or Clearfield sunflowers, but not to sorghum or corn.

Most other commonly used wheat herbicides in Kansas have very short crop rotation restrictions.

Always refer to the specific herbicide label regarding crop rotation guidelines and restrictions. Label guidelines for crop rotation are often complicated by soil pH and
geography. Some product labels have very rigid crop rotation restrictions, while other labels allow shorter intervals in the case of catastrophic crop failure, as long as the producer is willing to accept the risk of crop injury. Another confusing issue may be the existence of supplemental herbicide labels with shorter crop rotation guidelines than the regular label. Herbicides with supplemental crop rotation labels include Finesse, Ally, and Ally Extra.

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3. Doublecropping options in northwest and northcentral Kansas

Soil moisture is highly variable across northwest Kansas at this time. Adequate soil moisture can typically be found in north central Kansas, but dissipates as you approach the Colorado border where much drier conditions persist. For the most part, double-cropping is a realistic option this year in most of northcentral Kansas, but only under a pivot in far northwest Kansas.

For far northwest Kansas, sunflowers, cane hay, and then soybeans would be the best doublecrop options. With the sunflower plant in Goodland and the price of sunflowers as high as they are ($28 to 30/100 lbs), it makes sense for farmers to take advantage of the relatively short drive to Goodland. I would not recommend grain sorghum in this area because it may not have sufficient time to develop before an early freeze.

For north central Kansas, grain sorghum, cane hay, soybeans, and sunflowers would all be good choices for doublecropping.
**Yield Expectations**

<table>
<thead>
<tr>
<th></th>
<th>Far Northwest (irrigated)</th>
<th>North Central (dryland)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunflower (oil)</td>
<td>1800 lbs/acre</td>
<td>1000 lbs/acre</td>
</tr>
<tr>
<td>Cane Hay*</td>
<td>3 tons/acre</td>
<td>2 tons/acre</td>
</tr>
<tr>
<td>Grain Sorghum</td>
<td>Not recommended (N/R)</td>
<td>60 bu/acre</td>
</tr>
<tr>
<td>Soybeans</td>
<td>30 bu/acre</td>
<td>20 bu/acre</td>
</tr>
</tbody>
</table>

* Cane hay yield is highly variable; the amount of water applied plays a huge role in the amount of tonnage harvested.

**Seeding Rates**

<table>
<thead>
<tr>
<th></th>
<th>Far Northwest (irrigated)</th>
<th>North Central (dryland)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunflower (oil)</td>
<td>17,000 seeds/acre</td>
<td>17,000 seeds/acre</td>
</tr>
<tr>
<td>Cane Hay</td>
<td>15 lbs/acre</td>
<td>15 lbs/acre</td>
</tr>
<tr>
<td>Grain Sorghum</td>
<td>N/R</td>
<td>50,000 seeds/acre</td>
</tr>
<tr>
<td>Soybeans</td>
<td>150,000 seeds/acre</td>
<td>125,000 seeds/acre</td>
</tr>
</tbody>
</table>

**Best maturities**

<table>
<thead>
<tr>
<th></th>
<th>Far Northwest (irrigated)</th>
<th>North Central (dryland)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunflower (oil)</td>
<td>Maturity &lt; 90 day (the shorter the better)</td>
<td>Maturity &lt; 90 day</td>
</tr>
<tr>
<td>Cane Hay</td>
<td>Flowering &lt; 90 day</td>
<td>Flowering &lt; 90 day</td>
</tr>
<tr>
<td>Grain Sorghum</td>
<td>N/R</td>
<td>Maturity &lt; 90 day</td>
</tr>
<tr>
<td>Soybeans</td>
<td>Group III</td>
<td>Group III</td>
</tr>
</tbody>
</table>

For all of these crops, planting them as soon as possible after wheat harvest will provide the best opportunity for them to mature before an early fall freeze.

As mentioned in the first article, Dan O’Brien, Northwest Area Extension Economist, has a newly updated crop budget for irrigated, doublecropped sunflowers, soybeans, and forage sorghum for northwest Kansas at: [http://www.agmanager.info/crops/budgets/proj_budget/decisions/](http://www.agmanager.info/crops/budgets/proj_budget/decisions/)

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4. Doublecropping options for southeast Kansas

With the excessive moisture experienced in the Southeast part of the state, many producers are still waiting to put in their first crop let alone their double crop options. However, once wheat harvest is complete, there are three good options for doublecropping in the southeast part of the state: soybean, sunflower, and grain sorghum.
Additional considerations may be made for a forage that will provide late summer to winter grazing.

* Doublecrop soybeans are the most common option in southeast Kansas. If weather is favorable, doublecrop soybeans planted in late June or even early July can produce respectable yields ranging from 10 to 30 bu/acre. The seeding rate of late-planted soybean should not change much from full-season soybean. However, if the producer increases the seeding rate slightly, there may be potential to increase pod formation per acre on soybean that will not reach its maximum vegetative growth.

Soybean maturities in the southeast range from early group 4’s to early group 5’s, and should not be varied much from the normal full-season variety. A change to a slightly earlier variety may be considered if it is believed that there will not be enough time to mature before the first fall freeze.

A yield range of 10 to 30 bu/acre contracted at $14.00/bu would gross $140 to $420/acre, with approximate inputs of $30/acre for seed and $20/acre herbicide costs. Net profit per acre could range from $90 to $370/acre.

* Sorghum is another option for a double crop, generally yielding between 30 and 70 bu/acre. Grain sorghum should be seeded at a rate of 50,000 to 75,000 seeds/acre and will require approximately 60 lb/acre N. With the summer progressing later, it would be advised to switch to an early- to mid-maturing hybrid to reduce the risk of an early fall freeze before maturity. A yield of 30 to 70 bu/acre contracted at $6.00 would gross between $180 and $360/acre with approximately $10/acre for seed, $45/acre for N, and $35/acre for herbicide. Net profit per acre could range from $90 to $270/acre.

* Sunflower is a third option for a doublecrop, generally yielding between 750 and 1,500 lb/acre. There are several elevators that buy sunflowers in southeast Kansas. Sunflower should be seeded at 18,000 to 24,000 seeds/acre and will require approximately 60 lb/acre N to maximize yields. In addition to herbicide applications, growers should plan for at least one treatment of an insecticide to control head moth. With the summer progressing later, it would be advised to switch to an early- to mid-maturing hybrid to reduce the risk of an early fall freeze before maturity. A yield of 750 to 1,500 lb/acre contracted at $0.25/lb would gross between $188 to $375/acre with approximate inputs of $20/acre for seed, $45/acre for N, and $45/acre for pest control. Net profit per acre could range from $78 to $265/acre.

* Summer annual forages such as forage sorghums, sudangrasses, or millets are another option for producers looking for late-summer grazing options. Seeding rates range from 100,000 to 250,000 depending on the forage, and may require N fertilizer at approximately 50 lb/acre.

* A second grazing option later in the season is turnips. In late July to early August, turnips can be seeded at 3 to 4 lbs/acre for fall and winter grazing. This will require an
additional 50 lb/acre of N and can provide an excellent quality forage in a time of year when many other grazing options are not available.

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5. Using plant analysis to monitor your corn fertilization program

Plant analysis is an excellent "quality control" tool for growers interested in high yield corn production. It can be especially valuable for managing secondary and micronutrients which don't have high quality soil tests available, and providing insight into how efficiently you are using applied nutrients. Plant analysis can be used both for monitoring purposes and/or as a diagnostic tool.

Here are some common questions about using plant analysis on corn for monitoring purposes.

* What and when should I sample? For general monitoring or quality control purposes, 15-20 ear leaves (or the leaf below and opposite the ear) should be collected at random from the field at some point between silk emergence and when the silks turn brown. Sampling under stress conditions for monitoring purposes can give misleading results, and is not recommended.

* How do I handle samples, and where should I send the samples? The collected leaves should be allowed to wilt overnight to remove excess moisture, placed in a paper bag or mailing envelope, and shipped to a lab for analysis. Do not place the leaves in a plastic bag or other tightly sealed container, as they will begin to rot and decompose during transport, and the sample won't be usable. Most of the soil testing labs working in the region provide plant analysis services, including the K-State lab.

* What nutrients should I analyze for? In Kansas, nitrogen (N), phosphorus (P), potassium (K), sulfur (S), zinc (Zn) and iron (Fe) are the nutrients most likely to be deficient. Recently, questions have been raised by consultants and others concerning copper (Cu), manganese (Mn) and molybdenum (Mo). Most labs can analyze for most of these. Normally the best values are the "bundles" or "packages" of tests offered through many of the labs. A bundle can be as simple as N, P and K; or it can be all of the 13 mineral elements considered essential to plants.

* What will I get back from the lab? The data returned from the lab will be reported as the concentration of nutrient elements, or potentially toxic elements, in the plants. Units reported will normally be in percent for the primary and secondary nutrients (N, P, K, Ca, Mg, S, and Cl) and ppm, or parts per million, for the micronutrients (Zn, Cu, Fe, Mn, B, Mo, and Al). Most labs/agronomists compare plant nutrient concentrations to published sufficiency ranges. A sufficiency range is simply the range of concentrations normally
found in healthy, productive plants during surveys. It can be thought of as the range of values optimum for plant growth. The medical profession uses a similar range of normal values to evaluate blood work. The sufficiency ranges change with plant age (generally being higher in young plants), vary between plant parts, and can differ between hybrids. So a value slightly below the sufficiency range does not always mean the plant is deficient in that nutrient, but it is just an indication that the nutrient is relatively low. Values on the low end of the range are common in extremely high yielding crops. However, if that nutrient is significantly below the sufficiency range, then one should ask some serious questions about the availability and supply of that nutrient.

Keep in mind also that any plant stress (such as drought, heat, and soil compaction) can have a serious impact on nutrient uptake and plant tissue nutrient concentrations. So a low value in the plant doesn't always mean the nutrient is low in the soil and the plant will respond to fertilizer; rather, that the nutrient may not be available to the plant.

Levels above sufficiency can also indicate problems. High values might indicate over fertilization and luxury consumption of nutrients. Plants will also sometimes try to compensate for a shortage of one nutrient by loading up on another. This occurs at times with nutrients such as iron, zinc and manganese. In some situations, very high levels of a required nutrient can lead to toxicity. Manganese is an example of an essential nutrient which can be toxic when present in excess. This can occur at very low soil pH levels.

Plant analysis is also an excellent diagnostic tool to help understand some of the variation seen in the field. When using plant analysis to diagnose field problems (as opposed to monitoring corn condition), try to take comparison samples from both good/normal areas of the field, and problem spots. Collect soil samples from the same good and bad areas. Don't wait for tasseling or silking to sample. Early in the season (prior to the eighth leaf or roughly knee high) collect whole plants from 15 to 20 different places in your sampling area. Later in the season, but prior to tasseling, collect 15-20 top, fully developed leaves (those with leaf collars visible). Handle the samples the same as those for monitoring, allowing them to wilt to remove excess moisture and avoiding mailing in plastic bags.

The following table gives the range of nutrient content considered to be "normal" or "sufficient" for corn early in the season (less than 12" tall) and later in the season, at silking. Keep in mind that these are the ranges normally found in healthy, productive corn.
### Nutrient Content Considered “Normal” or “Sufficient” for Corn at Two Growth Stages

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Units</th>
<th>Whole plant, less than 12” tall</th>
<th>Ear leaf at green silk stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>%</td>
<td>3.5-5.0</td>
<td>2.75-3.50</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>%</td>
<td>0.3-0.5</td>
<td>0.25-0.45</td>
</tr>
<tr>
<td>Potassium</td>
<td>%</td>
<td>2.5-4.0</td>
<td>1.75-2.25</td>
</tr>
<tr>
<td>Calcium</td>
<td>%</td>
<td>0.3-0.7</td>
<td>0.25-0.50</td>
</tr>
<tr>
<td>Magnesium</td>
<td>%</td>
<td>0.15-0.45</td>
<td>0.16-0.60</td>
</tr>
<tr>
<td>Sulfur</td>
<td>%</td>
<td>0.20-0.50</td>
<td>0.15-0.50</td>
</tr>
<tr>
<td>Chloride</td>
<td>%</td>
<td>not established</td>
<td>0.18-0.60</td>
</tr>
<tr>
<td>Copper</td>
<td>ppm</td>
<td>5-20</td>
<td>5-25</td>
</tr>
<tr>
<td>Iron</td>
<td>ppm</td>
<td>50-250</td>
<td>30-200</td>
</tr>
<tr>
<td>Manganese</td>
<td>ppm</td>
<td>20-150</td>
<td>20-150</td>
</tr>
<tr>
<td>Zinc</td>
<td>ppm</td>
<td>20-60</td>
<td>15-70</td>
</tr>
<tr>
<td>Boron</td>
<td>ppm</td>
<td>5-25</td>
<td>4.0-25</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>ppm</td>
<td>0.1-10</td>
<td>0.1-3.0</td>
</tr>
<tr>
<td>Aluminum</td>
<td>ppm</td>
<td>&lt;400</td>
<td>&lt;200</td>
</tr>
</tbody>
</table>

In summary, plant analysis is a good tool to monitor the effectiveness of a fertilizer and lime program, and a very effective diagnostic tool. Producers should consider adding this to their toolbox.
CORN EAR LEAF

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These e-Updates are a regular weekly item from K-State Extension Agronomy and Steve Watson, Agronomy e-Update Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Steve Watson, 785-532-7105 swatson@ksu.edu, or Jim Shroyer, Research and Extension Crop Production Specialist and State Extension Agronomy Leader 785-532-0397 jshroyer@ksu.edu