K-STATE Research and Extension

# Double-crop Soybeans After Wheat: A Review

**Department of Agronomy** **MF3461** **Crop Production**

Many production and environmental factors influence soybean development when the crop is planted immediately after wheat harvest (so-called double-cropped soybean). Some of these influences are:

- Soil moisture after wheat harvest.
- Amount and distribution of wheat residue.
- Nutrient availability.
- Soybean planting time.
- Soybean maturity group.

## Objectives

- Identify double-crop yield gap, using full-season soybean yield as a benchmark.
- Identify and rank factors affecting double-crop soybean yield.
- Establish decision routes, as a guide for expected yield.
- Share data collected among Kansas farmers and provide tips for improving management practices.

## Methods

- Worldwide data collection.
- Dividing data in sub-datasets by objective.
- Unfolding a yield gap evaluation and probability analysis.

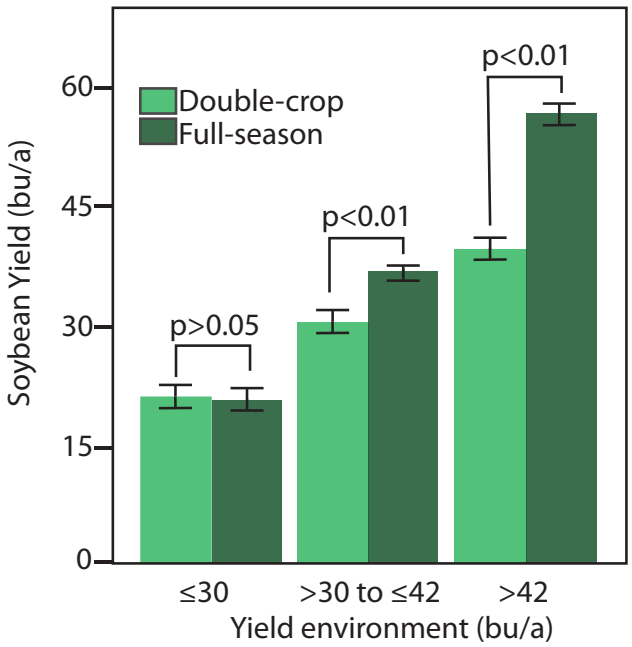


**Figure 1.** *Double-crop compared to full-season soybean yields. Yield environments were divided in three yield ranges, ≤30 bushels per acre, >30 to ≤42 bushels per acre, and >42 bushels per acre.*

## Results

The difference between double-crop and full-season soybean yields showed that as yield environment improves, greater differences in yield are observed between these soybean systems. Double-crop soybean yield is greater in better environments.

Double-crop soybean yield can be estimated based on the previous wheat yield. When wheat yield is greater, double-crop soybean yield has lower probability of yielding more than wheat.

The factors affecting double-crop soybean yield are: previous wheat yield, soybean planting date, and maturity group. The inference tree (Figure 3) estimates the proportion

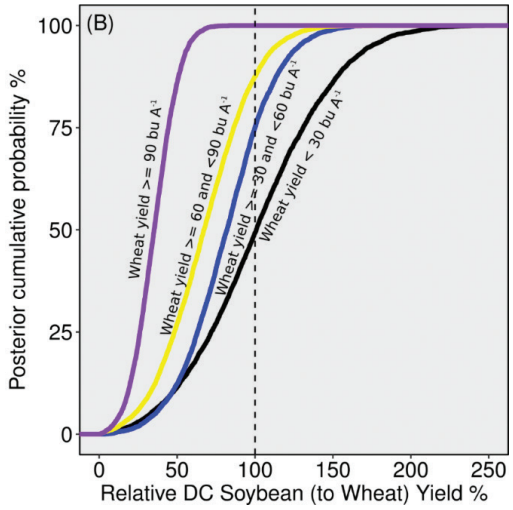


**Figure 2.** *Posterior predictive probability for double-crop soybean (to wheat) yields for four yield environments of previous wheat yield, < 30 bushels per acre, ≥ 30 to <60 bushels per acre, ≥ 60 to <90 bushels per acre and ≥ 90 bushels per acre.*

**Table 1.** *Posterior predictive probability for double-crop soybean (to wheat) yields for four yield environments of previous wheat yield, < 30 bushels per acre, ≥ 30 to <60 bushels per acre, ≥ 60 to <90 bushels per acre, and ≥ 90 bushels per acre.*

| Wheat yield bu/a | Probability of double-crop soybeans yielding at least the same as wheat (%) | Probability of double-crop soybean being at least 50% of wheat yield (%) |
|---|---|---|
| ≥ 90 | 0 | 15 |
| ≥ 60 and < 90 | 15 | 75 |
| ≥ 30 and < 60 | 25 | 90 |
| <30 | 50 | 90 |

of times double-crop soybean will yield more or less than the previous wheat yield in the same field.

From the dataset used in this study, 20 reports mentioned limiting factors that influence double-crop soybean yields negatively. The most cited was water or soil moisture (15) (Figure 4). Planting date, soil nutrients, temperature, solar radiation, residue, early frost, and machinery requirements were cited from four times to once.

Despite water being the most cited limiting factor, of the 15 that mentioned the limitation, only five measured lack of water in the system. There is still much to be studied in relation to water availability in the soil and the influences of weather to double-crop soybean yields.

From the studies that tested how management practices can limit double-crop yields, the factors that affected double-crop soybeans were: previous wheat yield, soybean planting date, and maturity group.

The inference tree (Figure 3) estimates the proportion of times double-crop soybean will yield more or less than the previous wheat yield in the same field.

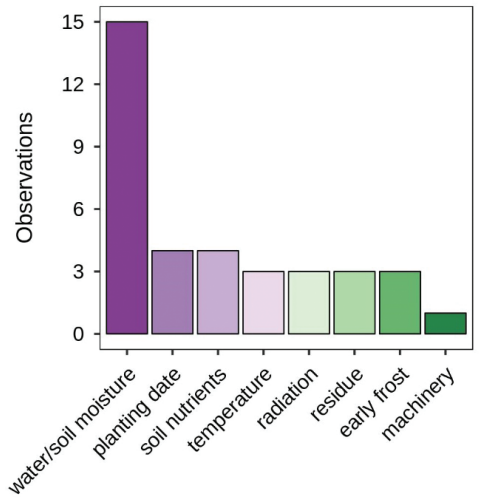


**Figure 4.** *Limiting factors for double-crop soybean yield. Yield environments were divided in three yield ranges, ≤30 bushels per acre, >30 to ≤42 bushels per acre, >42 bushels per acre.*

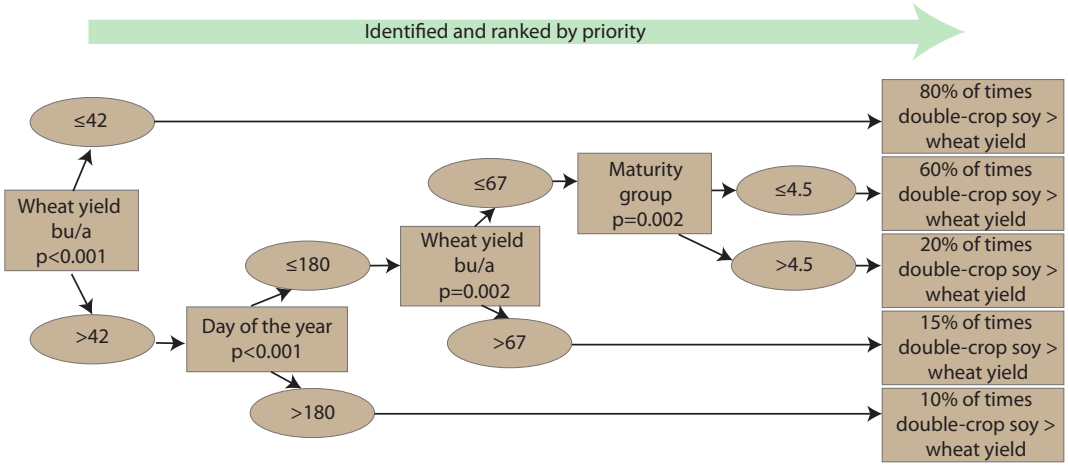


**Figure 3.** *Inference tree showing the hierarchical order of importance in the relative response of soybean to wheat yields to management factors (wheat yield, day of the year, and maturity group). (DOY 180 = June 29)*

Based on: Hansel, D.S.S., Schwalbert, R.A., Shoup, D.E., Holshouser, D.L., Parvej, R., Prasad, P.V.V., Ciampitti, I.A. *A Review of Soybean Yield when Double-Cropped after Wheat*. Agronomy Journal, 111(2).

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