

LONG TERM STUDY OF NO-TILLAGE AND ROTATION INTERACTIONS FOR SOYBEAN

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Columbia, Missouri, USA, lies in the middle of North America (38° 57' 6" N / 92° 20' 2" W). Its continental climate and highly erodible soils makes it an excellent location for studying the effects of tillage choice on soybean (*Glycine max*, L. (Merr.)) yield. The state of Missouri is unique among USA states in that its planted area of soybean is almost twice the planted area of corn (*Zea mays*, L.). So, soybean is commonly planted in a continuous cropping system of 2 to 4 years of soybean. Continuous soybean production often yields less than soybean rotated with some other crop, such as corn.

In 1992, research plots with the following treatment combinations were established: no-tillage and soybean rotated with corn (NTR); tilled and soybean rotated with corn (TR); no-tillage and continuous soybean (NTC); and tilled and continuous soybean (TC). Each plot was approximately 6 m wide and 28 m long. The plot width allowed the planting of 8 rows with an inter-row spacing of 0.76 m. Plots with the NT treatment were planted without tillage. Before planting plots with the T treatment, the land area was subjected to a primary tillage operation performed by a chisel plow and a secondary tillage operation performed by a field cultivator.

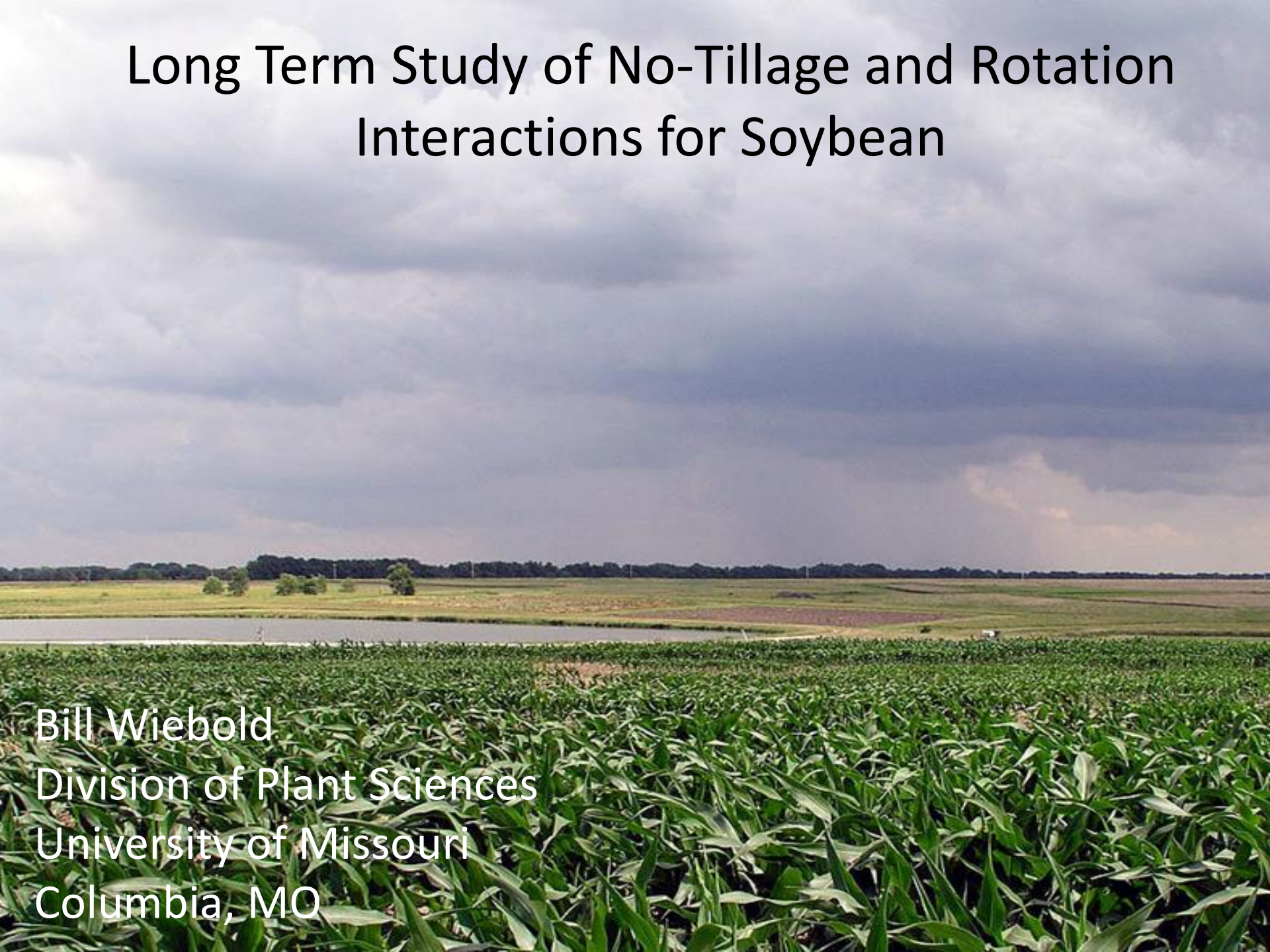
Corn hybrids and soybean cultivars have changed during the course of the experiment, but have always had high yield potential and were commonly used by Missouri farmers. Standard practices for pest management and fertility have been used. The same treatment combination has been applied to each plot from their establishment in 1992 through the current growing season. Plots were harvested by a plot combine and grain yields were corrected to 13 and 15.5% moisture for soybean and corn, respectively. Each year there were four replications.

In all but two years, soybean rotated with corn yielded more than continuous soybean. The average yield increase of rotated soybean was 7.3%. For years in which rotated soybean had a yield advantage, the advantage ranged from 2 to 28%, so variation among years was large. Increased pest pressure may explain some of the large yield advantages.

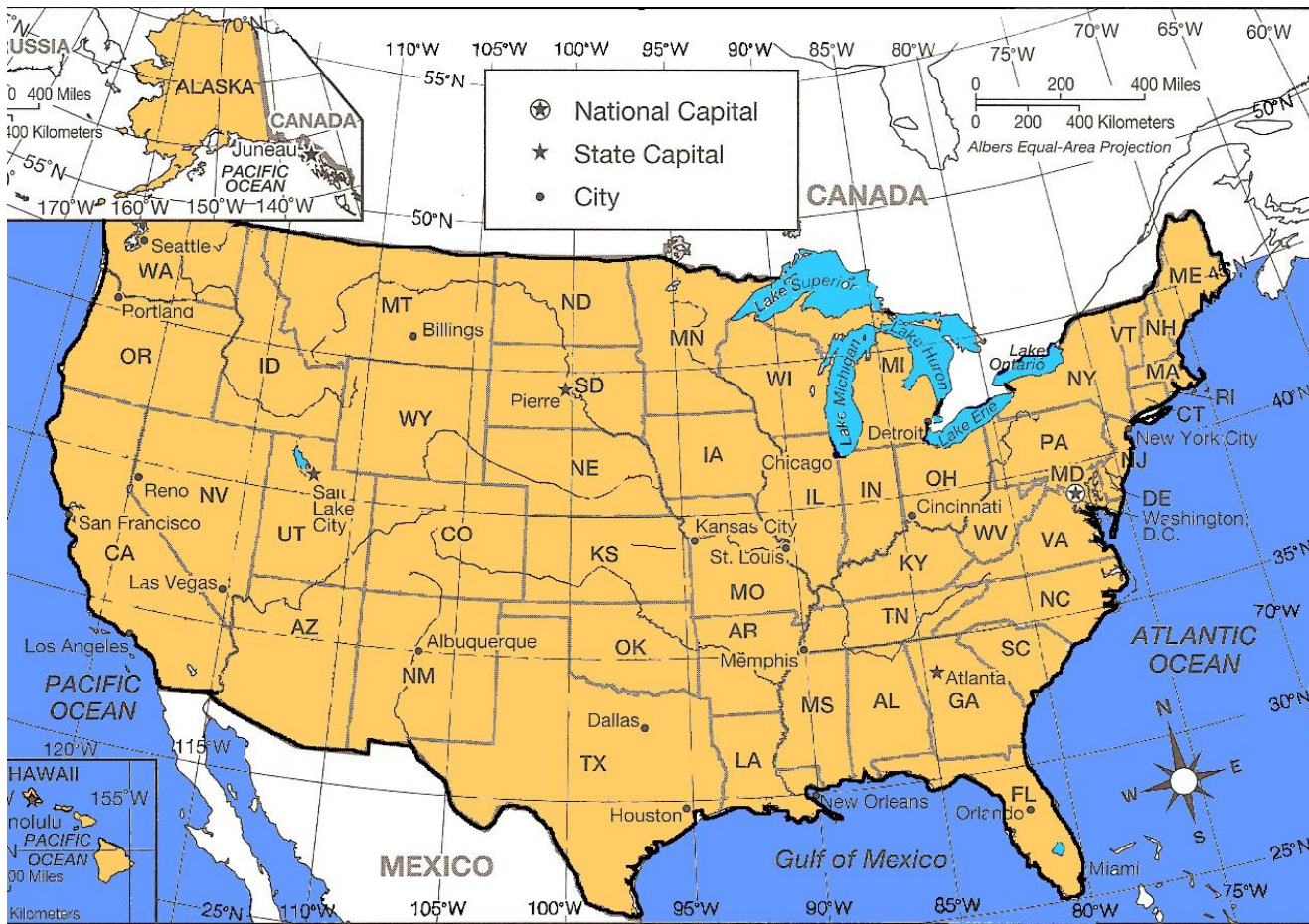
Tillage system affected soybean yield in 13 years, and in all but one of those years, no-tillage yielded more than tilled. The yield advantage for no-tillage ranged from 4%-14% and averaged 6.4%.

Long Term Study of No-Tillage and Rotation Interactions for Soybean

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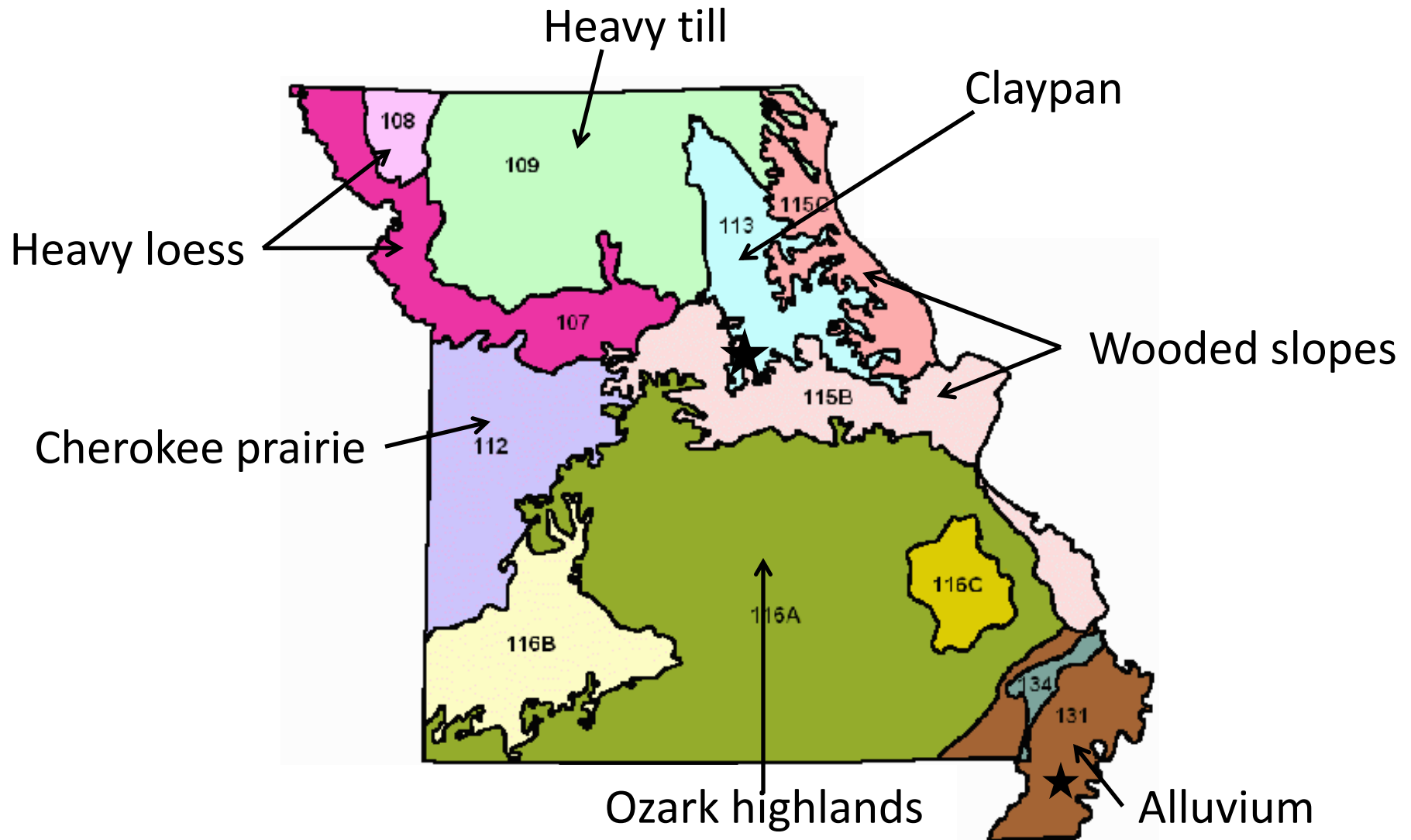


Context of Research



Columbia, MO, USA:
38 57' 6" N / 92 20'
2" W

Context of Research



Mexico Silt Loam

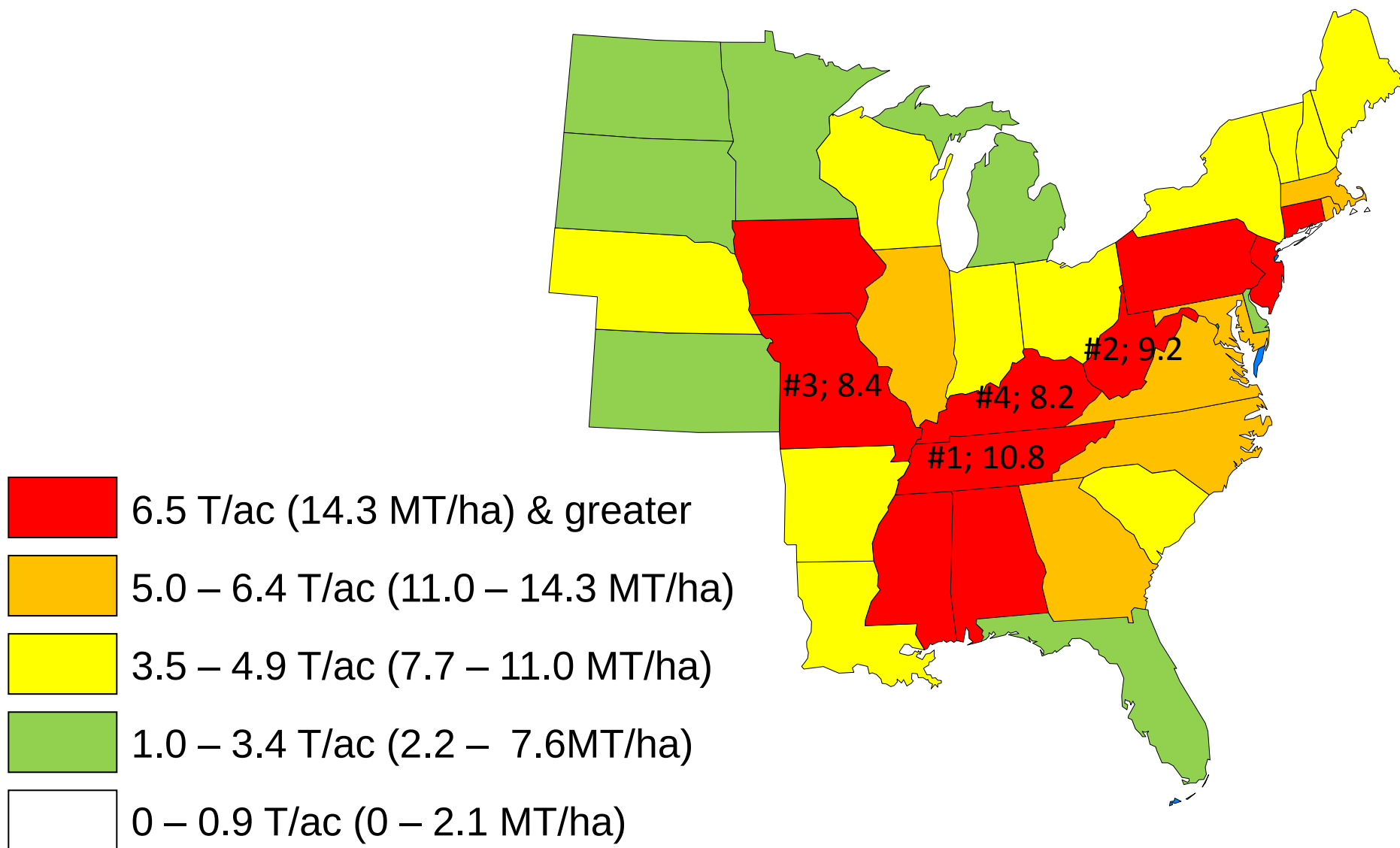
The Mexico series consists of very deep, poorly drained soils formed in loess over loamy sediments derived from till. These soils are on ridge and hillsides of the Central Claypan Till Plains and have slopes of 0 to 4 percent.





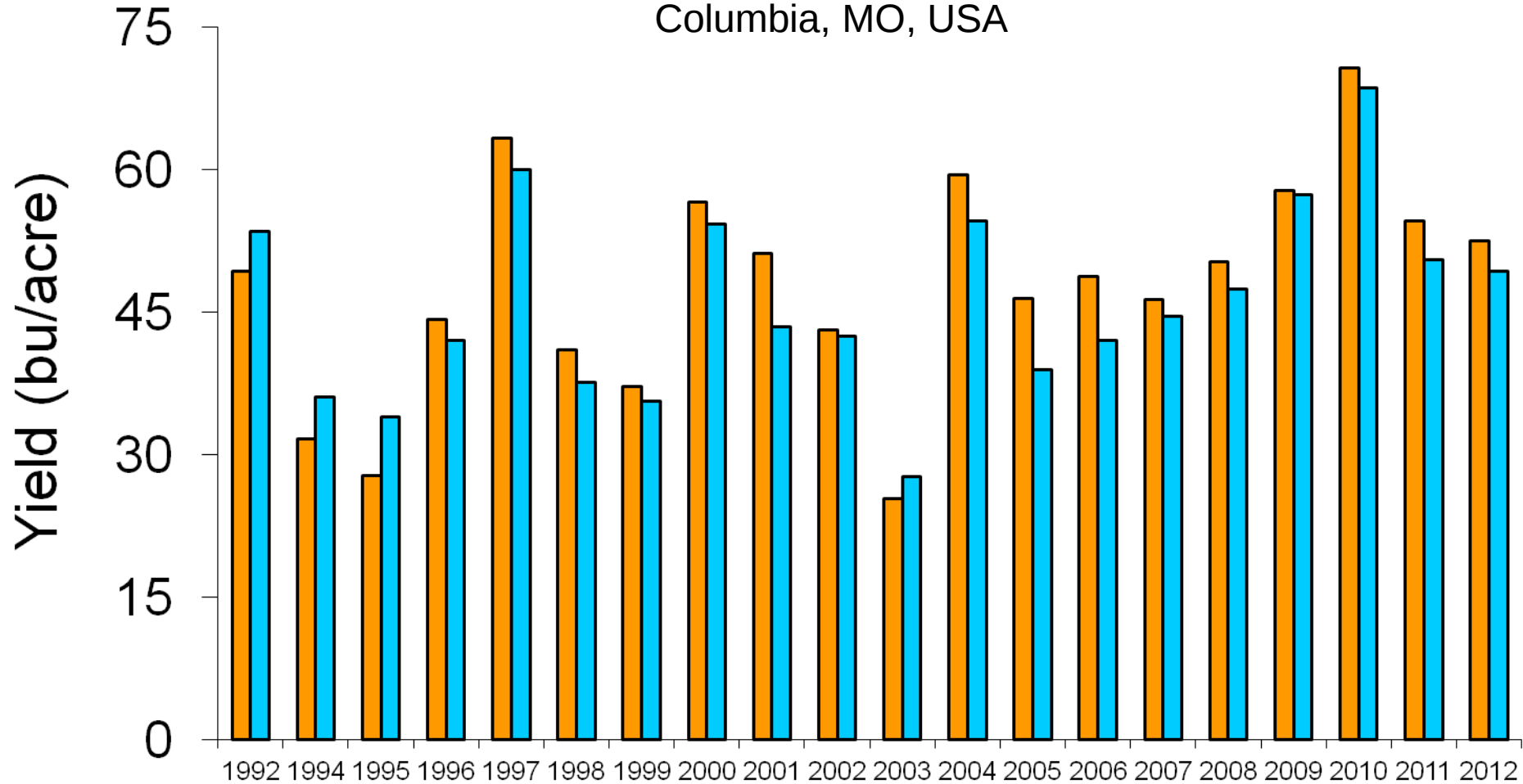


Water Caused Soil Erosion State Averages 1987



Effect of Tillage on Soybean Grain Yield

Columbia, MO, USA



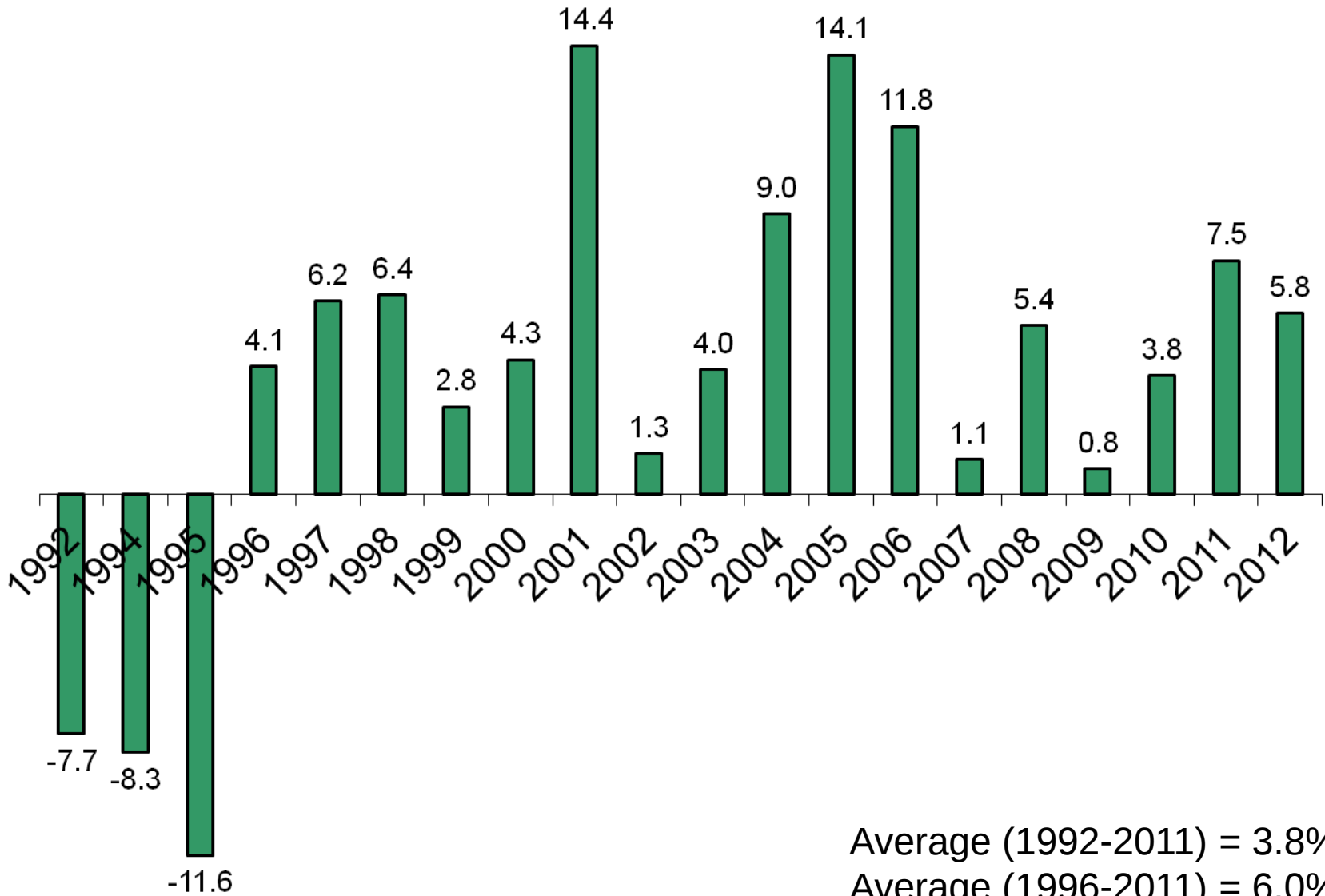
Average (1992-2012) No-till = 48.0 bushels/acre (3.2 MT/ha)

Average (1992-2012) Till = 46.2 bushels/acre (3.1 MT/ha)

■ No-till ■ Tilled

Yield Advantage of No-tillage over Tilled (Soybean)

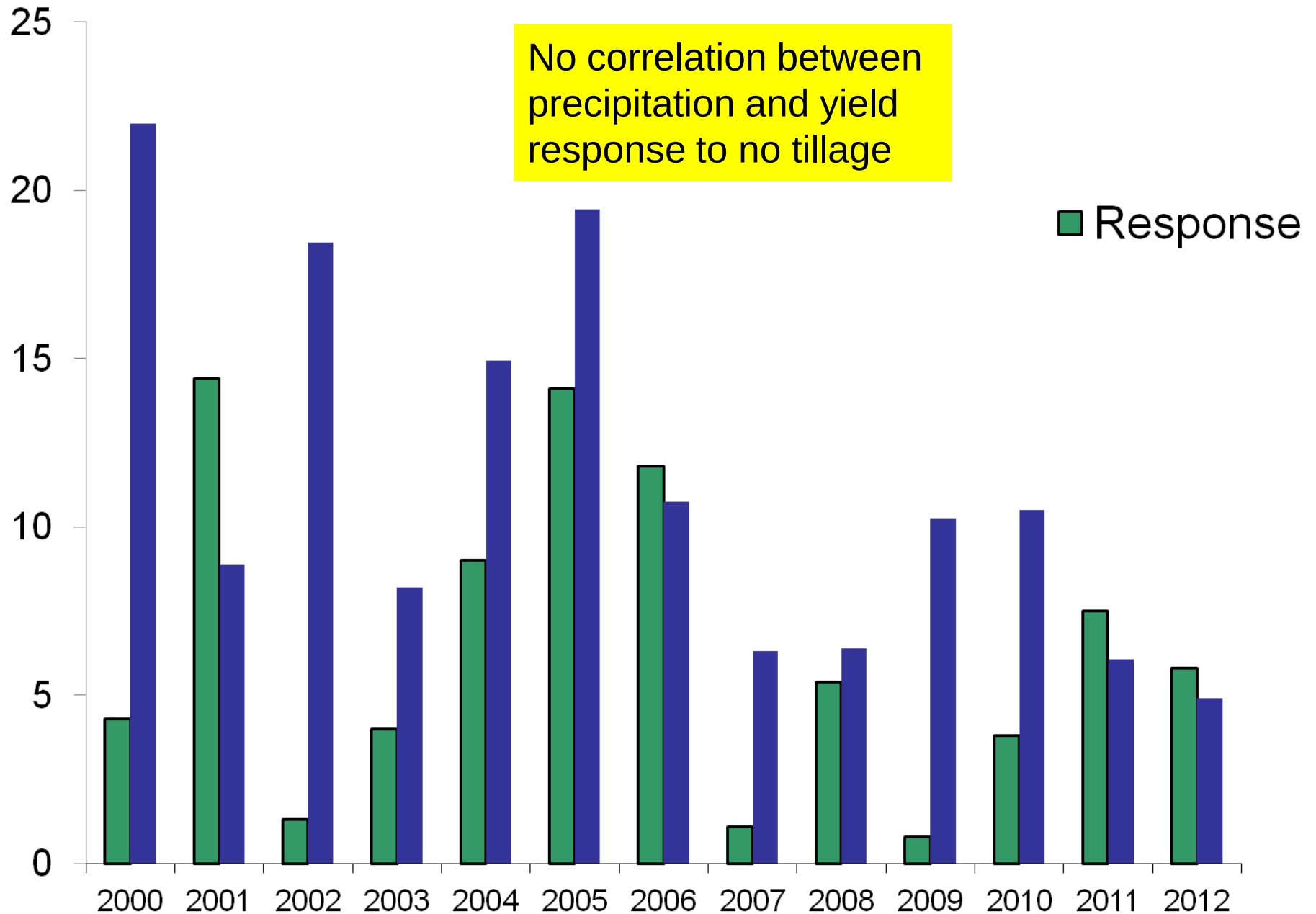
Columbia, MO





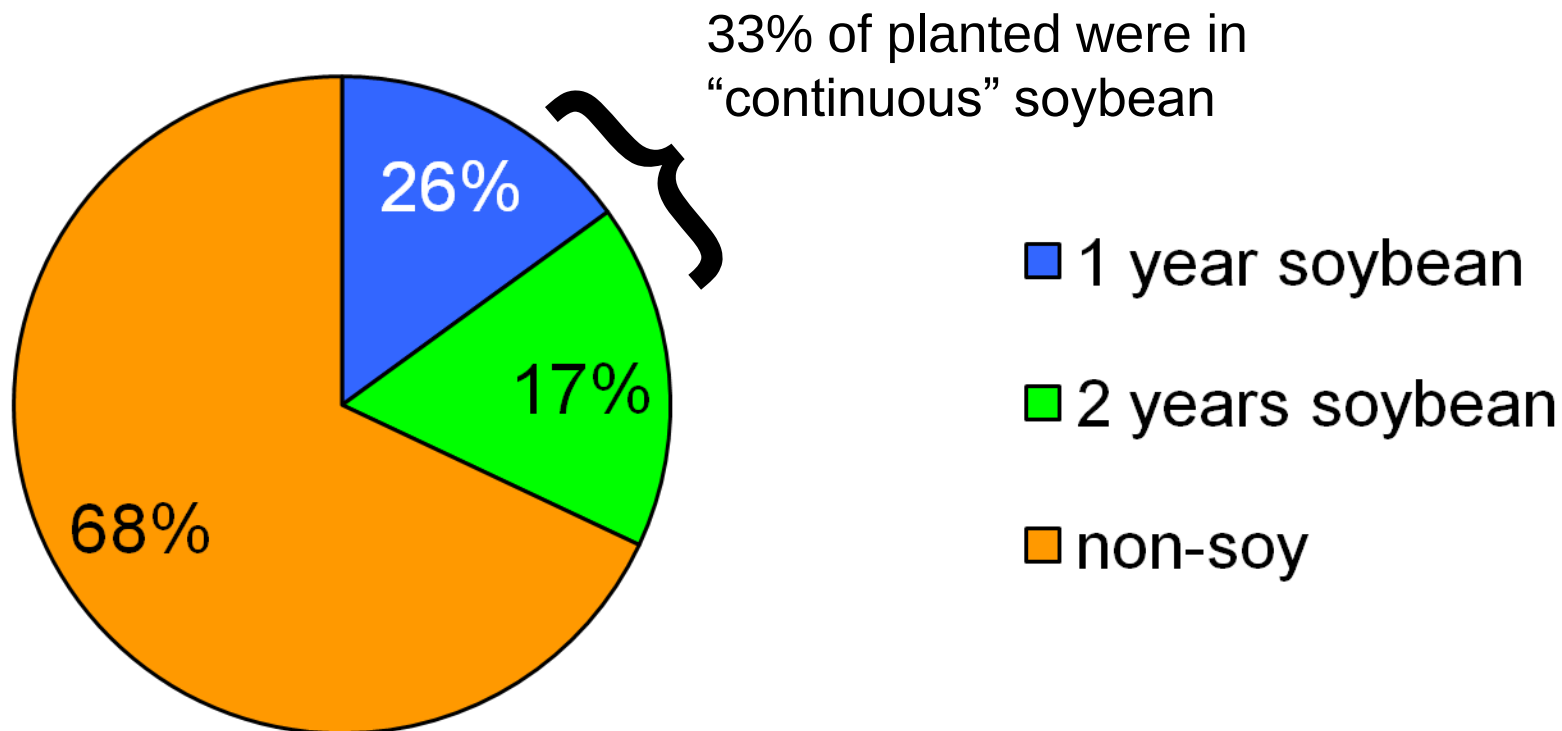
Yield Advantage of No-tillage over Tilled (Soybean)

Columbia, MO

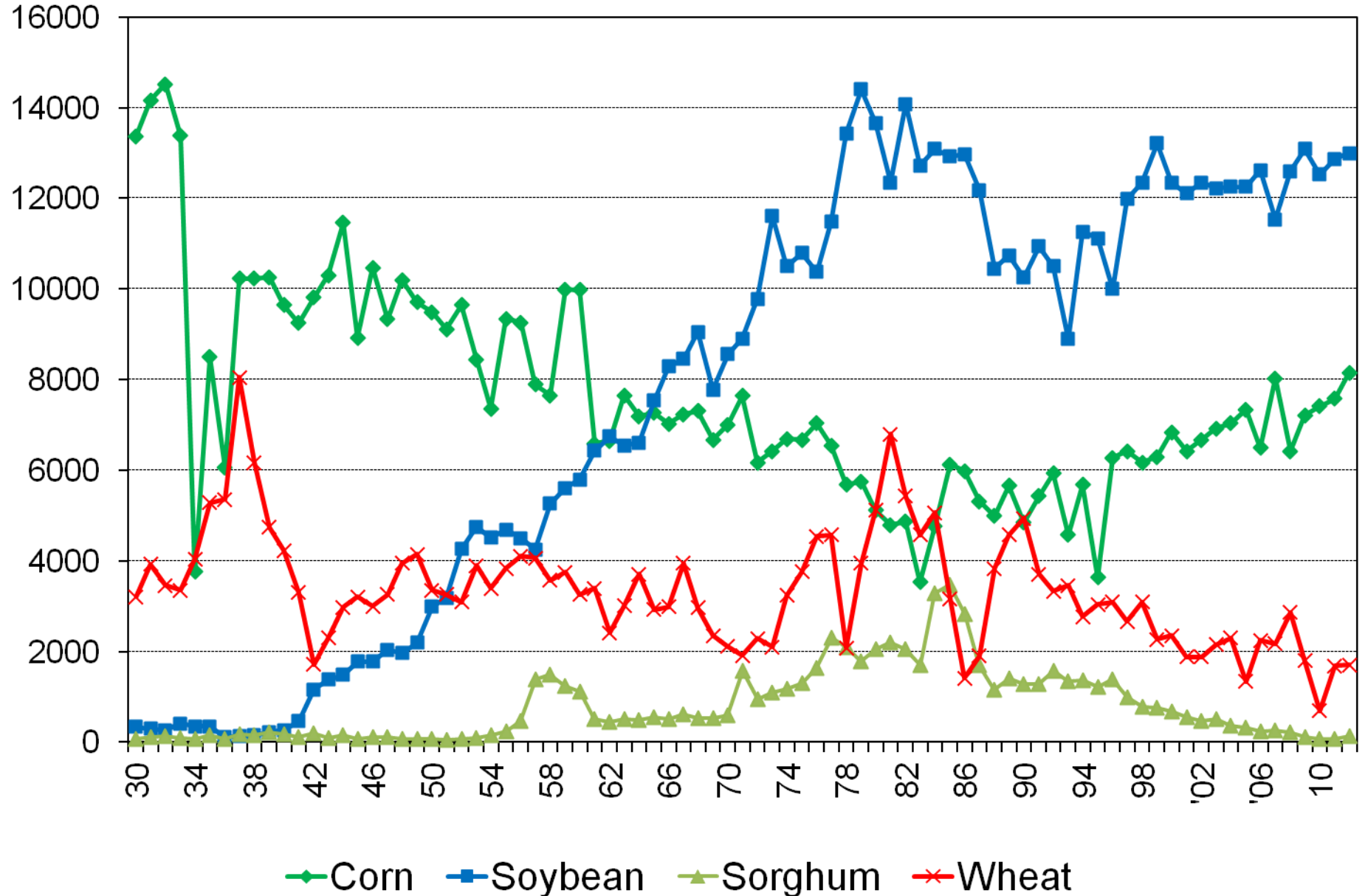




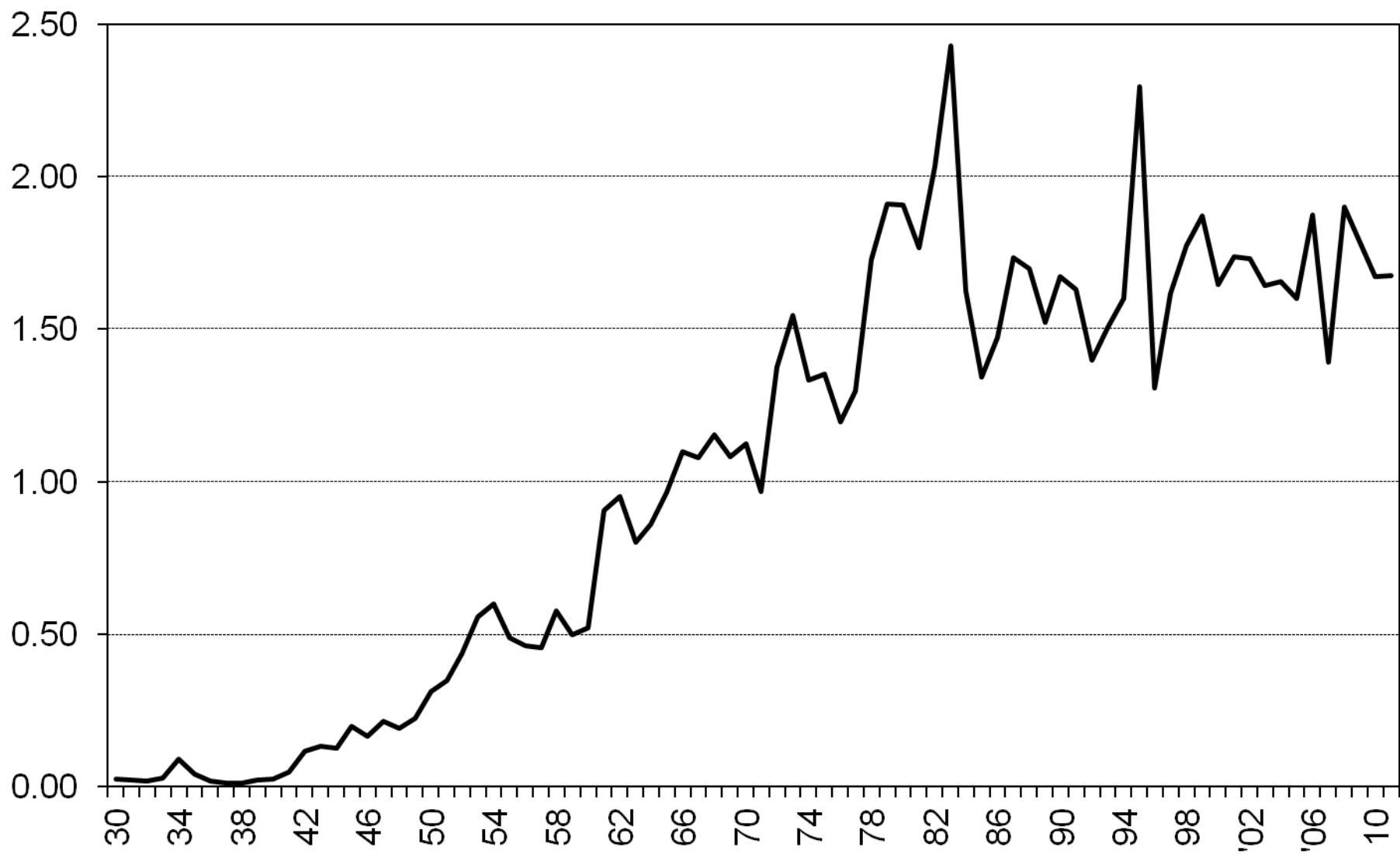
Portion of Missouri Soybean Crop with Indicated Crop Previous to Soybean



Harvested Area (1000s of hectares) of Corn (*Zea mays*), Soybean, Grain Sorghum (*Sorghum bicolor*) and Wheat (*Triticum aestivum*) in Missouri

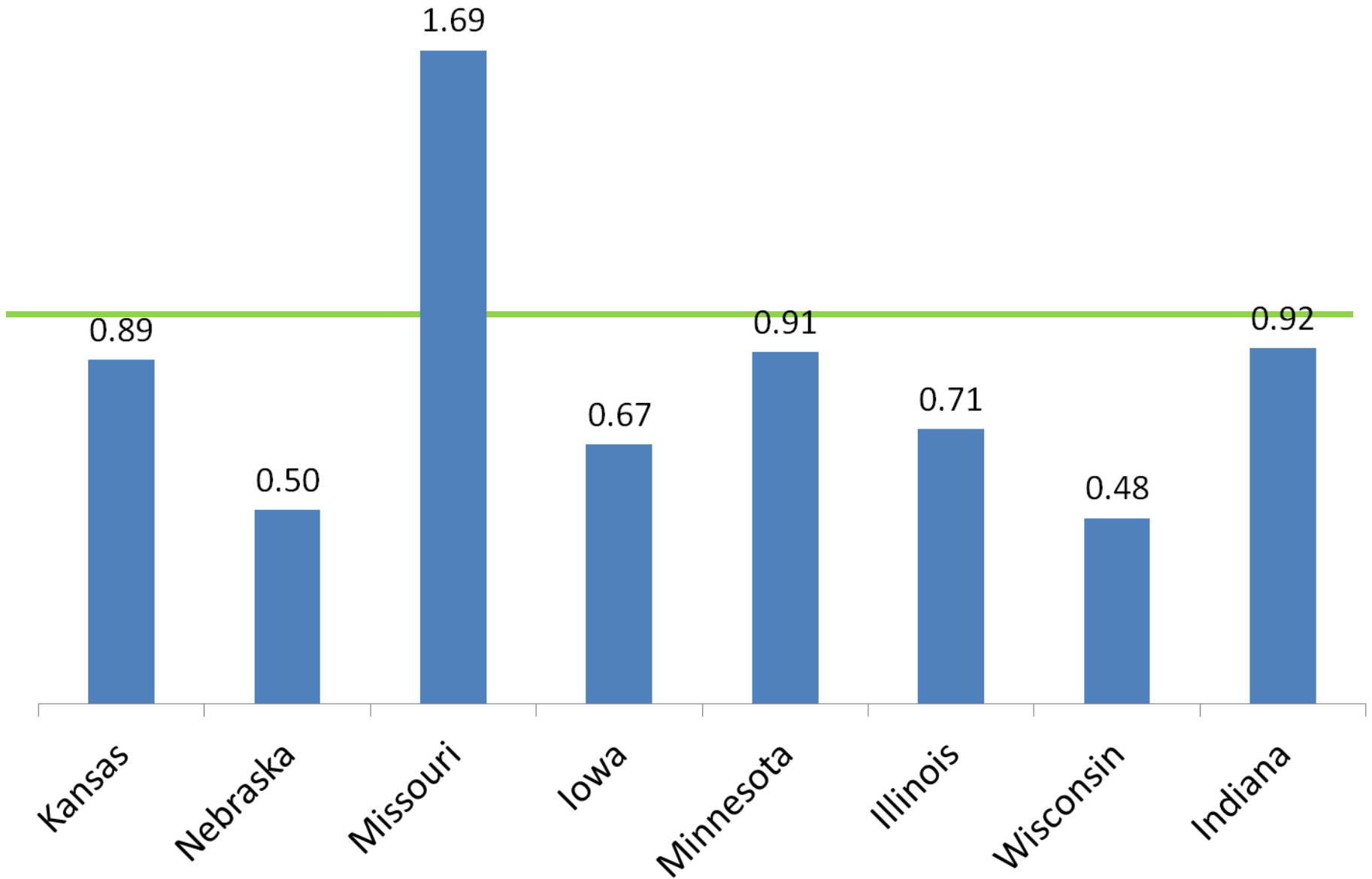


Ratio of Soybean to Corn Harvested Areas in Missouri



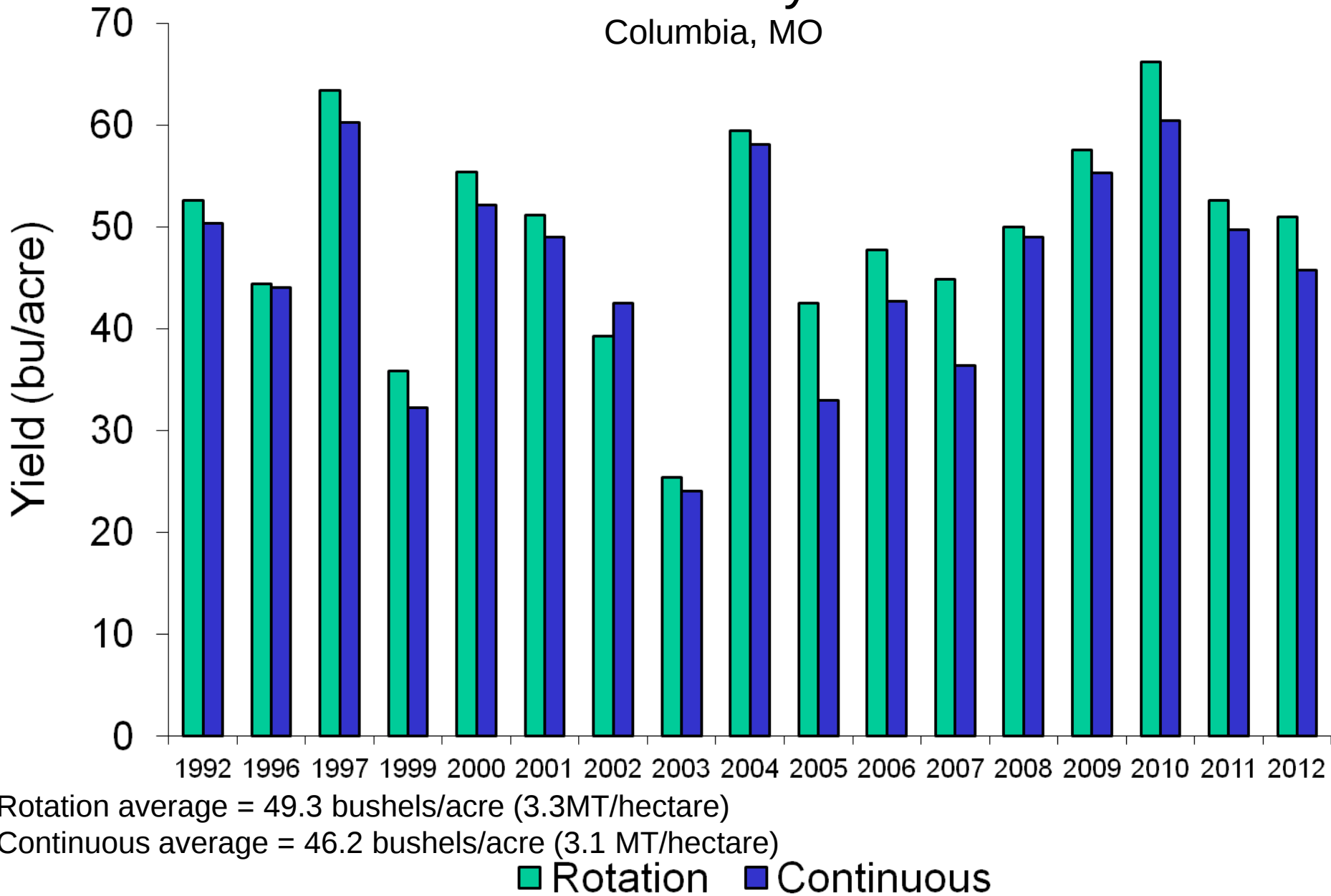
Ratio of Soybean and Corn Harvested Areas for 9 States

2011



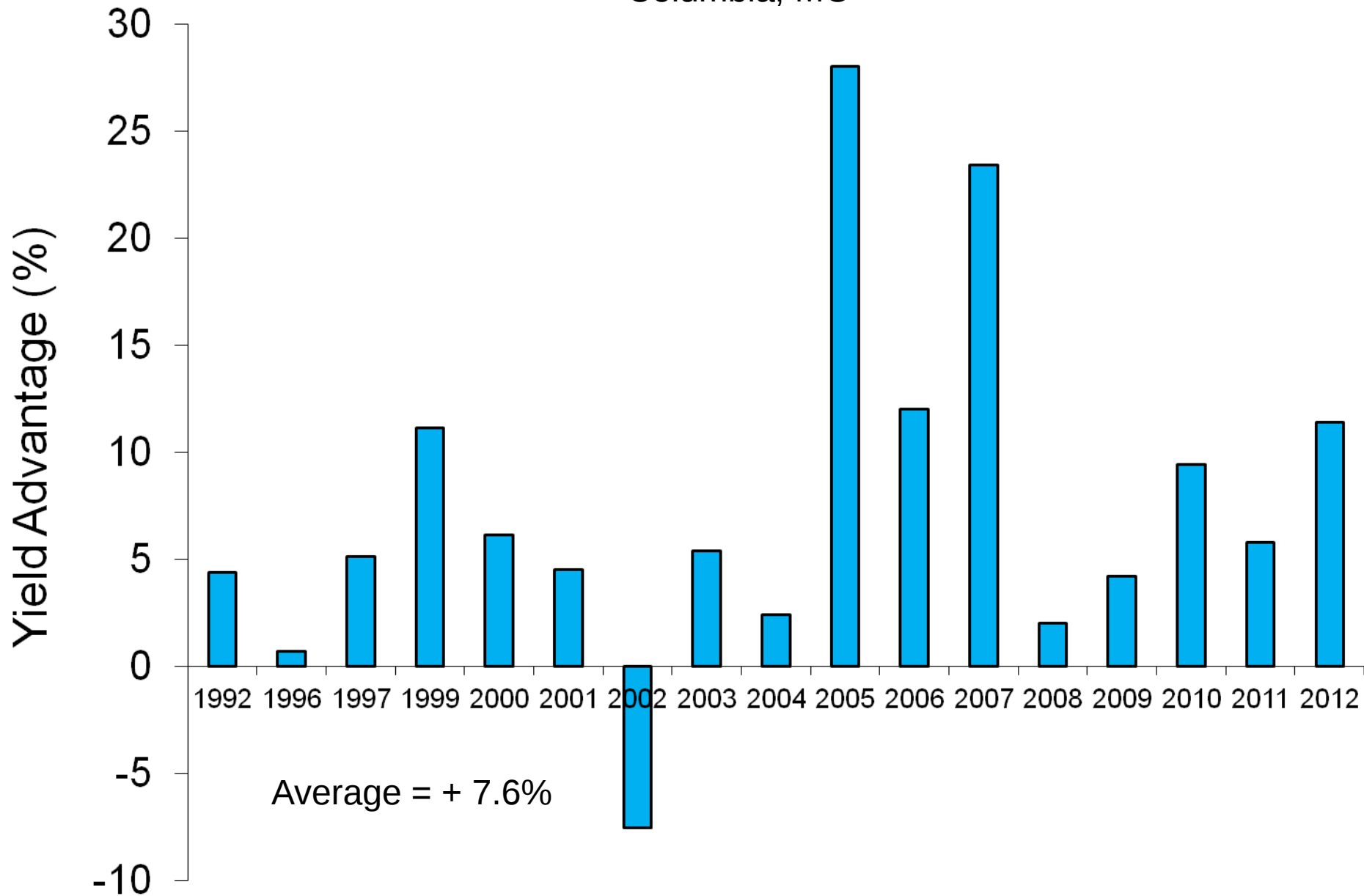
Effect of Rotation on Soybean Grain Yield

Columbia, MO



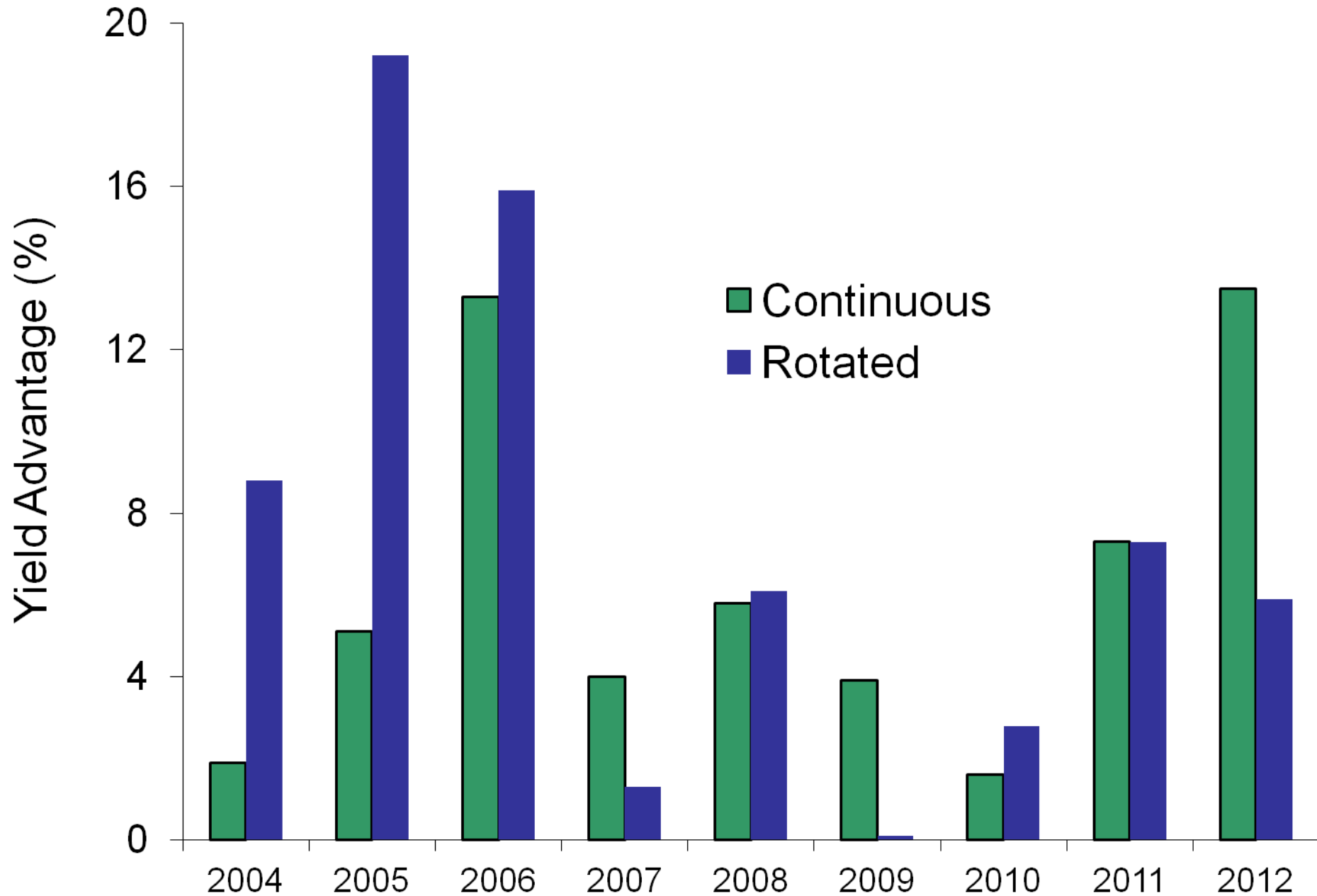
Yield Advantage of Soybean Rotated with Corn

Columbia, MO



Yield Advantage of No-tillage over Tilled

Columbia, MO



Corn & Soybean Rotations without Tillage

Treatments:

- continuous corn (C)
- corn rotated with soybean (S-C)
- one year soybean two years corn (S-C-C)
- two years soybean one year corn (S-S-C)
- continuous soybean (S)
- soybean rotated with corn (C-S)
- one year corn two years soybean (C-S-S)
- two years corn one year soybean (C-C-S)

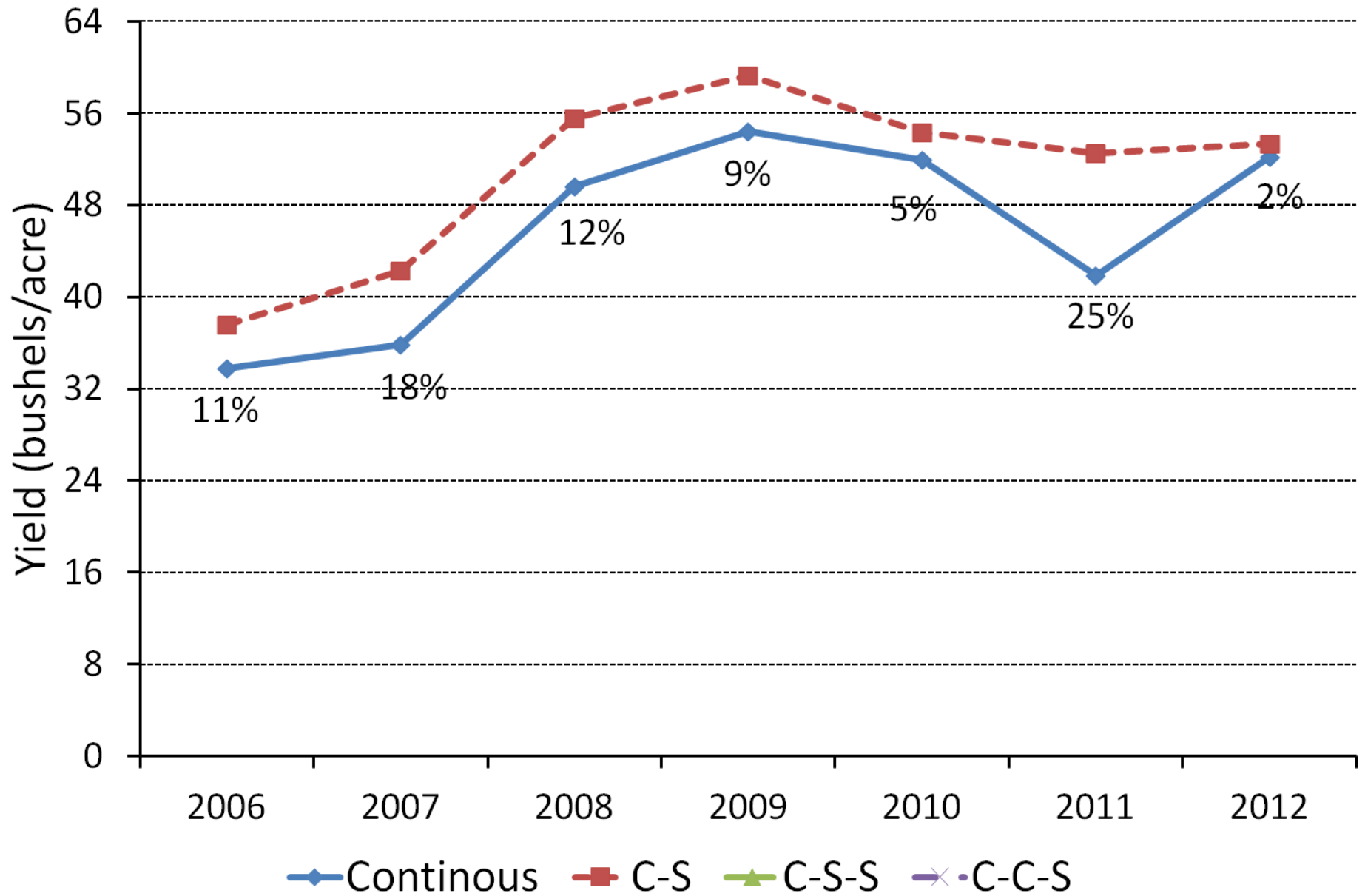
Plots established in 2005 with first data in 2006

Plot size 9 meters wide and 12 meters long

Treatments in same plots since establishment

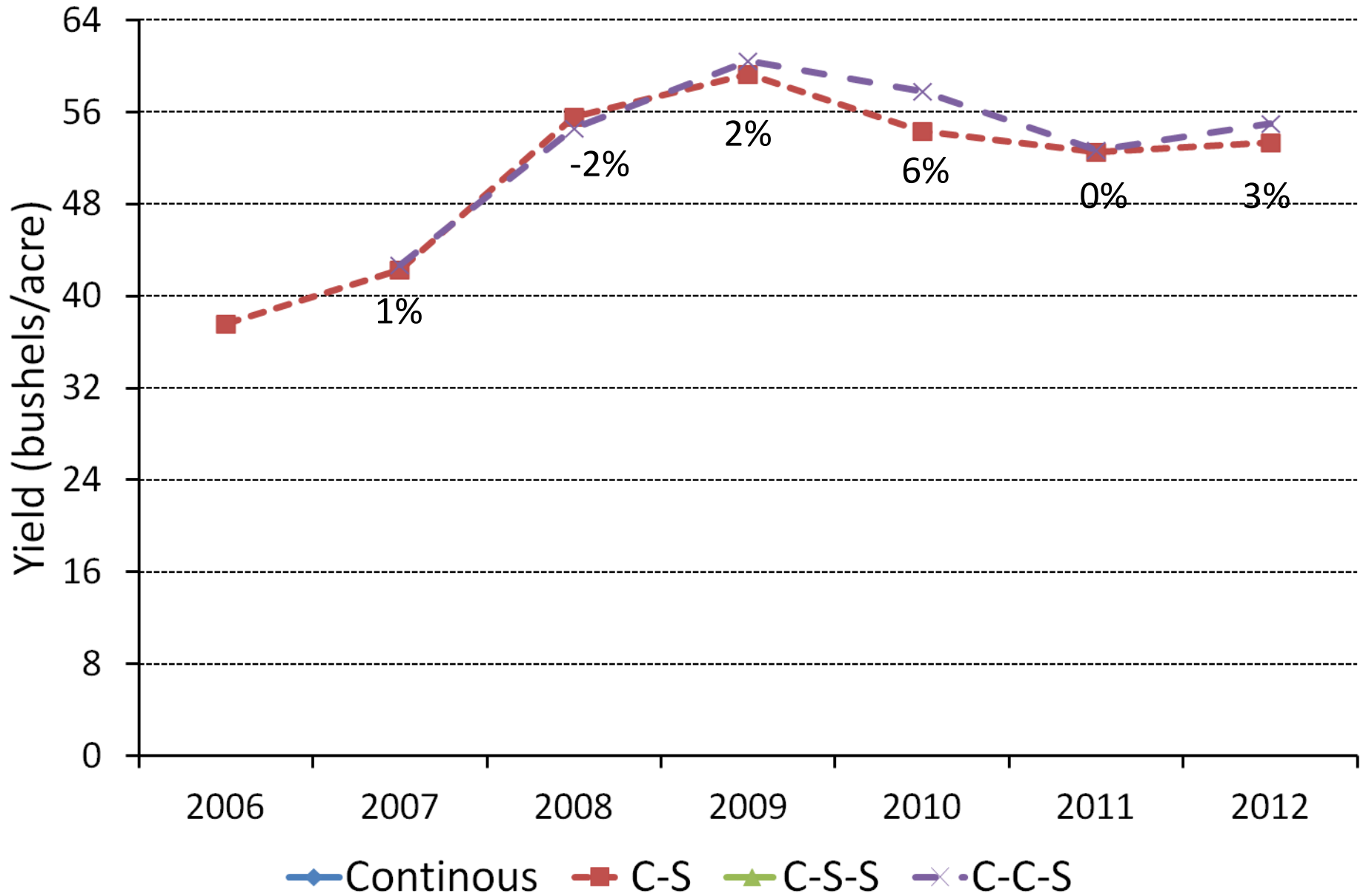
Effect of Crop Rotation on Soybean Yield

Columbia, MO



Effect of Crop Rotation on Soybean Yield

Columbia, MO



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