

## Understanding productivity variation on unirrigated Claypan soil field

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### Objective

Understanding soil productivity variation could help to prescribe optimum soil management. The objective of this research was to identify characteristics of soil productivity variation on an unirrigated claypan soil field.

### Material and Methods

- Materials
  - Research site: 4-ha research field. 3km north of Centralia Missouri U.S.
  - Soil: Mexico series (fine smectitic, mesic, Aeric, Vertic, Epiaqualfs)
  - Cropping system: corn-soybean rotation with mulch tillage since 1991
- Methods
  - Crop yields data were obtained at 30m grid with combine yield monitoring system
  - Soil cores were obtained at the corresponding yield grid positions
  - To identify relationship of yield data, soil properties, and precipitation

### Results and Discussion

- A high production variability have been observed for a unirrigated claypan soil field.
- Some soil properties such as, clay content, were significant correlated to crop yield data. while some year's yield were negatively correlated and the other year's yield were positively correlated to soil properties.
- Amount of precipitation from July to August was critical to determine the sign of correlation between soil properties and crop yield.
- In conclusion, we found that a drought boundary (i.e., 150 mm of precipitation from July to August) was the most critical factor for productivity variation.

Table 1. Descriptive statistics of crop yield in a claypan soil field from 1993 to 2002. Yield data were obtained by combine monitoring system and averaged in a 30-m grid.

	Corn				Soybean				
	1993	1997	1999	2001	1994	1996	1998	2000	2002
	----- kg ha <sup>-1</sup> -----								
Avg.	7120	6373	2321	5904	1477	3051	2005	2517	1962
Median	7177	6497	2187	5854	1449	3076	2036	2533	1956
Min.	5527	4203	1375	4704	1028	2735	1543	1915	1527
Max.	8199	8997	3979	7286	2452	3185	2235	2871	2374
SD	536	1267	556	620	294	107	145	197	162
CV	8	20	24	11	20	4	7	8	8
Precipitation, mm (July to August)	294	131	43	110	49	192	191	294	140

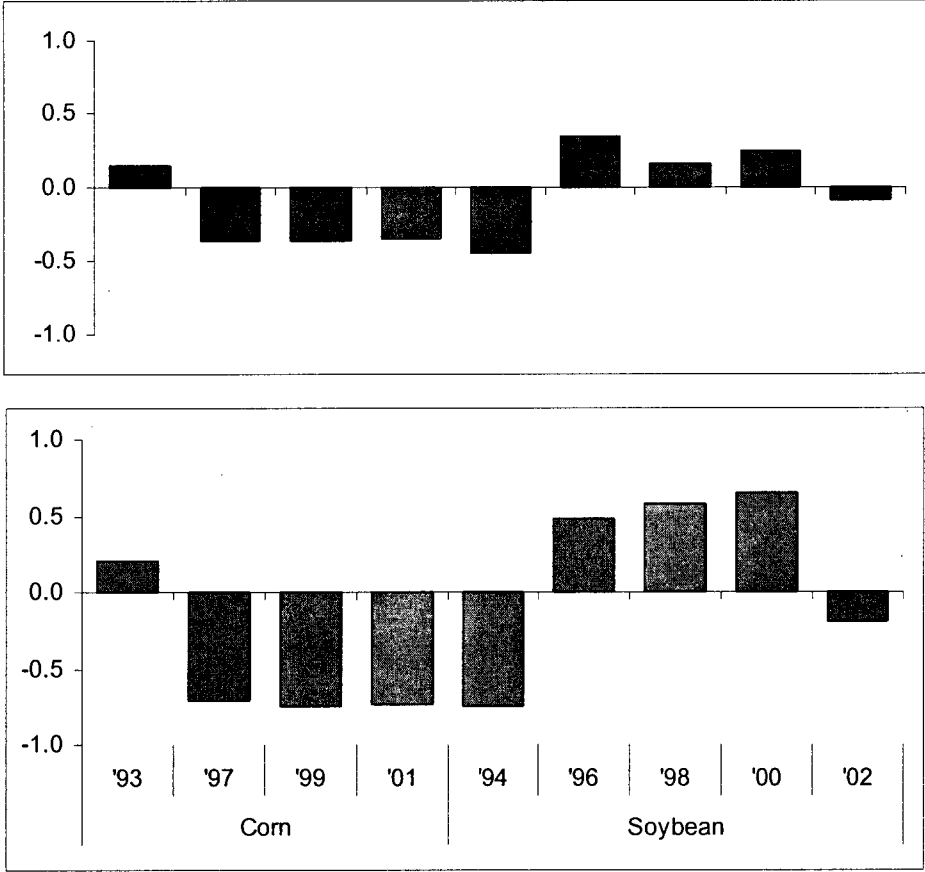


Figure 1. Correlation relationship of clay content at 7.5- to 15-cm soil depth (upper) and 15- to 30-cm soil depth (bottom) to crop yield data. Negative correlations between clay content and crop yield were observed when precipitation of July-August is less than 150 mm.