

Yield Data Stability Analysis

R.K. Taylor, N. Zhang, M.D. Schrock,
J.P. Schmidt, and G.J. Kluitenberg
K-State Research and Extension

Objective

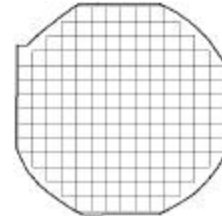
Evaluate a method for
classification of yield monitor data
to determine areas of consistent
yield potential

Methods

- Three fields in central Kansas
- Continuously cropped, sprinkler irrigated corn
- Four to seven years of yield monitor data

Yield Data Manipulation

- Data were obtained with various yield monitors
- Converted to point yield and unrealistic values were removed
- Data were block averaged to 180 foot cells



Mean Relative Difference

- A relative difference ($\delta_{i,j}$) was calculated for each cell and year.
- The mean relative difference ($\bar{\delta}_i$) was calculated across years

$$d_{i,j} = \frac{(Y_{i,j} - \bar{Y}_j)}{\bar{Y}_j}$$

$$\bar{d}_i = \frac{1}{n} \sum_{j=1}^n d_{i,j}$$

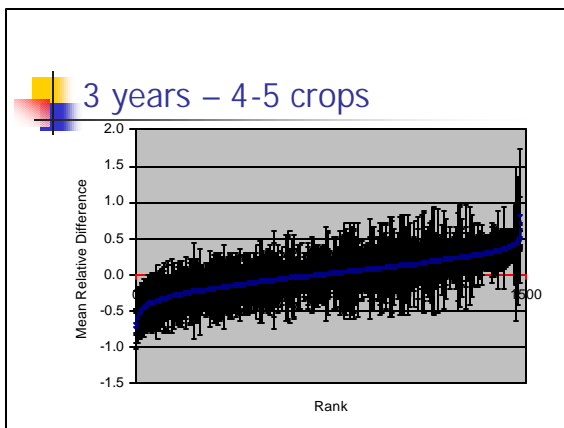
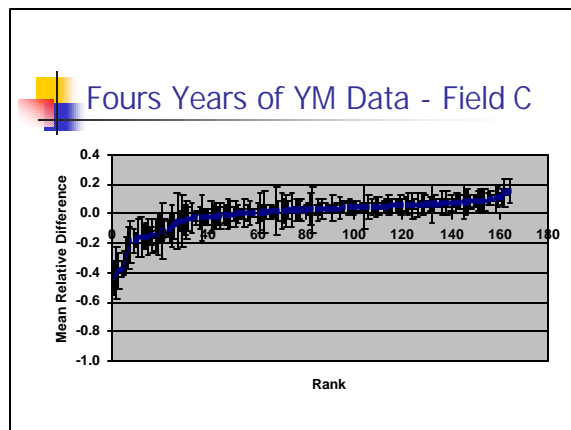
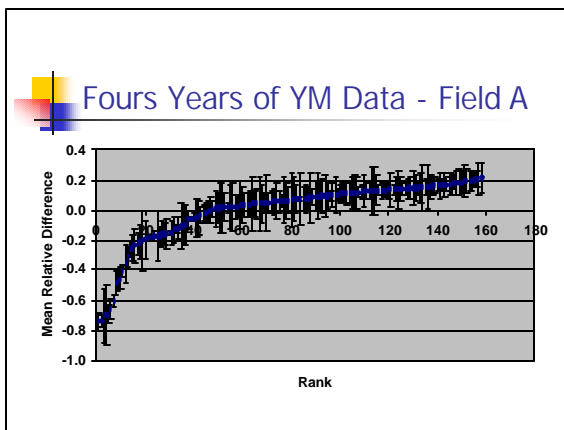
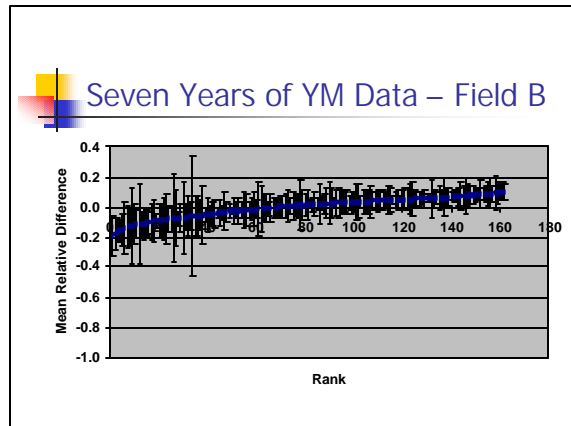
\bar{Y}_j is average yield for year j

Year	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Cell 7	Cell 8	Cell 9	Cell 10
2001	137.1	150.1	158.2	170.8	188.2	198.8	182.2	188.8	182.8	188.8
2002	150.1	158.2	170.8	188.2	198.8	182.2	188.8	182.8	188.8	188.8
2003	188.2	198.8	182.2	188.8	182.8	188.8	188.8	188.8	188.8	188.8
2004	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8
2005	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8
2006	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8
2007	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8
2008	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8
2009	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8
2010	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8
2011	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8
2012	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8
2013	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8
2014	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8
2015	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8
2016	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8
2017	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8
2018	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8
2019	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8
2020	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8	188.8

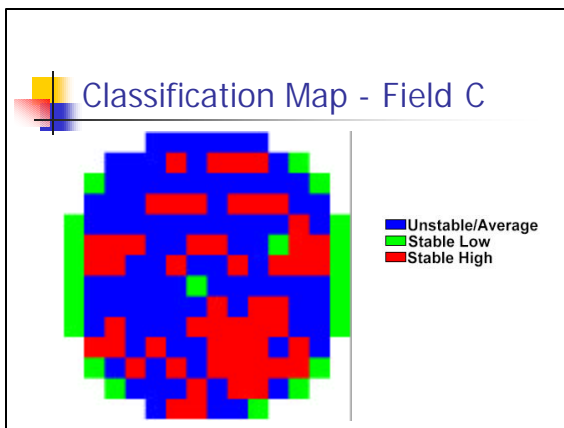
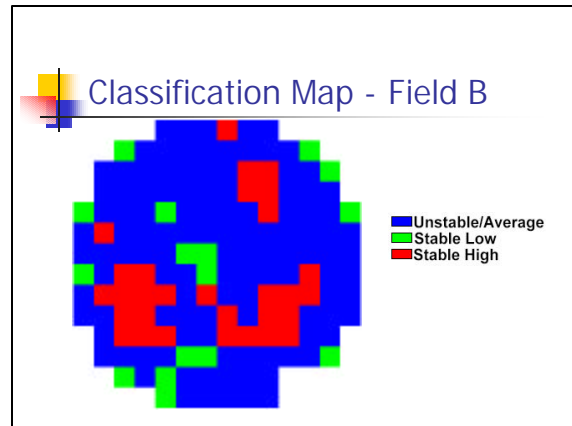
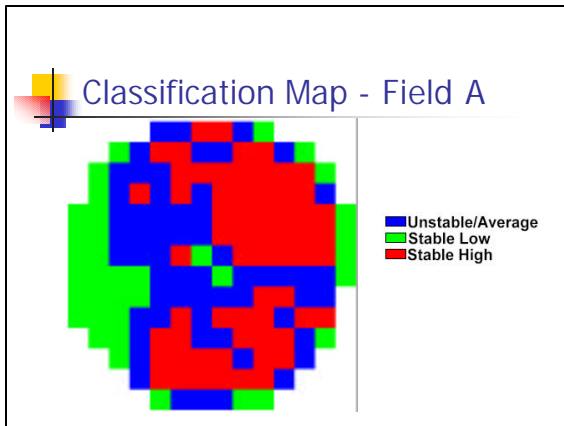
$Y_{i,j}$ is the yield for cell i in year j

Mean Relative Difference

	data0	data1	data2	data3	data4	data5	data6	data7	data8	data9	data10	mean	std	rank	Cov
1	-0.0746	-0.1680	-0.1970	-0.0821	-0.2622	35	-0.1842	0.0847	0.9826	1	1				
2	0.0884	-0.0219	-0.2636	-0.2481	-0.2664	183	-0.0852	0.1441	0.9181	2	0				
3	0.1336	-0.0148	0.2624	-0.1928	-0.2263	82	-0.0201	0.1321	0.9123	3	0				
4	0.1258	-0.0188	-0.0140	-0.0898	-0.2141	157	-0.0624	0.0804	0.9188	4	0				
5	-0.0188	0.0228	-0.2601	0.0818	-0.2381	130	-0.0827	0.0841	0.9226	5	0				
6	-0.1482	-0.1982	-0.2486	0.0808	-0.2274	115	-0.1848	0.1086	0.9145	6	0				
7	0.0234	-0.1929	-0.1486	0.0828	-0.2649	103	-0.0753	0.1225	0.9182	7	0				
8	0.0142	-0.0383	0.2222	0.1198	-0.2603	127	0.0893	0.0882	0.9084	8	0				
9	-0.1734	-0.0382	0.2126	0.0788	-0.2620	39	-0.0388	0.1088	0.9133	9	0				
10	0.0816	0.0395	0.1982	0.0895	-0.2424	185	0.0341	0.0413	0.9174	10	0				
11	0.0888	0.0288	0.1235	-0.2144	-0.2085	124	-0.0223	0.1484	0.9286	11	0				
12	0.0336	0.0404	0.1285	0.0286	-0.2481	79	0.0361	0.0444	0.9173	12	0				
13	0.0328	0.0719	0.1080	0.0816	-0.2238	137	0.0828	0.0285	0.9075	13	2				
14	0.0132	0.1925	0.0421	0.0828	-0.2382	88	0.0378	0.0435	0.9043	14	0				
15	-0.0286	0.1464	0.2026	-0.0828	-0.2178	58	0.0228	0.0286	0.9283	15	0				
16	-0.1880	-0.1152	-0.2134	-0.0287	-0.2152	134	-0.1101	0.0808	0.9080	16	1				
17	-0.2698	-0.2628	-0.2476	-0.2278	-0.1054	89	-0.2141	0.0680	0.8243	17	1				
18	0.0285	-0.0582	-0.2119	-0.1123	-0.2211	141	-0.0288	0.0722	0.9025	18	0				
19	0.0426	-0.0312	-0.2021	-0.0828	0.2065	80	-0.0288	0.0880	0.9122	19	0				
20	-0.0855	0.0514	0.2026	-0.0828	-0.2274	108	-0.0852	0.0428	0.9197	20	0				
21	-0.0459	0.0884	-0.2085	-0.1818	-0.2152	132	-0.0828	0.1085	0.9084	21	0				



- ### Data Classification
- If the mean relative difference was greater than the temporal standard deviation, the cell yield was deemed consistently different than the mean. These cells were then classified as high or low if they were greater or less than the mean.
 - Cells with a standard deviation greater than the mean relative difference were classified as average or unstable.



- ### Conclusions
- Standard statistical analysis offers minimal insight into spatial data
 - Low yielding cells tend to be more variable
 - There is a better opportunity to classify