South Dakota State University Cooperative Extension Service

Extension Extra

ExEx8159

COLLEGE OF AGRICULTURE & BIOLOGICAL SCIENCES / USDA

Conducting an On-Farm Research Trial in Corn

A Paired-Treatment Experiment With Results Analyzed By MS Excel Using The Anova: Two-Factor Without Replication Option

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This guide will discuss and illustrate a possible scenario for conducting an effective on-farm research trial using paired-treatments in corn. Possible treatments comparisons might include: current vs. new hybrid, no starter vs. starter fertilizer, soil-incorporated vs. post-emergence applications, and before vs. after treatments. Treatments do not have to be applied at the same time or stage; one treatment might be applied early while the second is applied late.

Some of the preliminary planning for this scenario is indicated in Table 1 along with one of many possible trial designs. Note the treatments have been randomized and the table also includes a planting order and plot number that often helps reduce the number of errors during planting and harvesting.

Table 1. Randomization, planting order, plot number, and plot design for an experiment with two paired-treatments with eight replications.

Paired -Treatment			
Block or Pair (P 1-8)	Treatment (T 1-2)	Planting Order	Plot No.
1	1	1	1
1	2	9	2
2	2	10	3
2	1	2	4
3	2	11	5
3	1	3	6
4	2	12	7
4	1	4	8
5	1	5	9
5	2	13	10
6	2	14	11
6	1	6	12
7	1	7	13
7	2	15	14
8	2	16	15
8	1	8	16

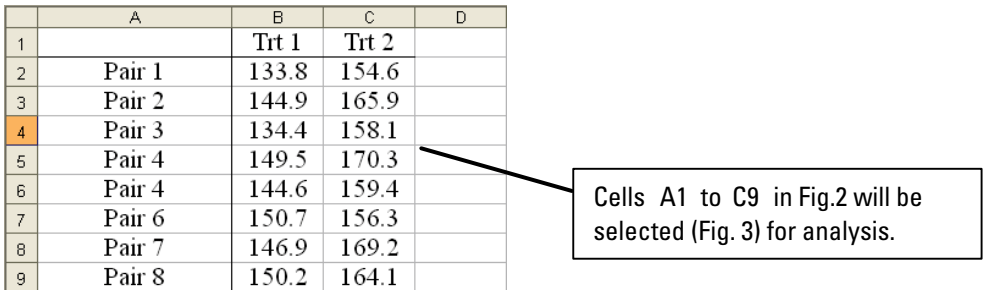
P1	T1
	T2
P2	T2
	T1
P3	T2
	T1
P4	T2
	T1
P5	T1
	T2
P6	T2
	T1
P7	T1
	T2
P8	T2
	T1

The corn yields obtained from the trial are reported in Figure 2. The **Anova: Two-factor Without Replication** option in Microsoft Excel uses analysis of variance (ANOVA) procedures to analyze the data. Access this option by clicking **Tools** and then **Data analysis**. Click the Anova: **Two-factor Without Replication** option and follow the directions (Figure 3).

Note that with this option, treatments and replications or blocks were used as the two factors; therefore, replication was already accounted for; hence the reason for selecting the Two-factor *Without Replication* option. As indicated in the Excel output summary and ANOVA results (Figure 4), the P-value for columns (treatments) was .93E-05 or 0.0000693 and is less than 0.01. Thus, the treatment differences were highly significant. Therefore, treatment 2 produced higher corn yields than treatment 1, because the yield difference between them was highly significant.

Since ANOVA indicated the treatment differences were highly significant and only two treatments were used, there is no need to make any further differentiation between the treatment means. This simple option from the Excel data analysis package provided quick, easy, and effective analysis.

Figure 2. Corn yield results (bu/ac) for a paired-treatment comparison of two treatments.



	A	B	C	D
1		Trt 1	Trt 2	
2	Pair 1	133.8	154.6	
3	Pair 2	144.9	165.9	
4	Pair 3	134.4	158.1	
5	Pair 4	149.5	170.3	
6	Pair 4	144.6	159.4	
7	Pair 6	150.7	156.3	
8	Pair 7	146.9	169.2	
9	Pair 8	150.2	164.1	

Figure 3. Anova: Two-Factor Without Replication option dialog box. Note the input range, alpha level, and output range (where output will placed on the spreadsheet) are indicated.

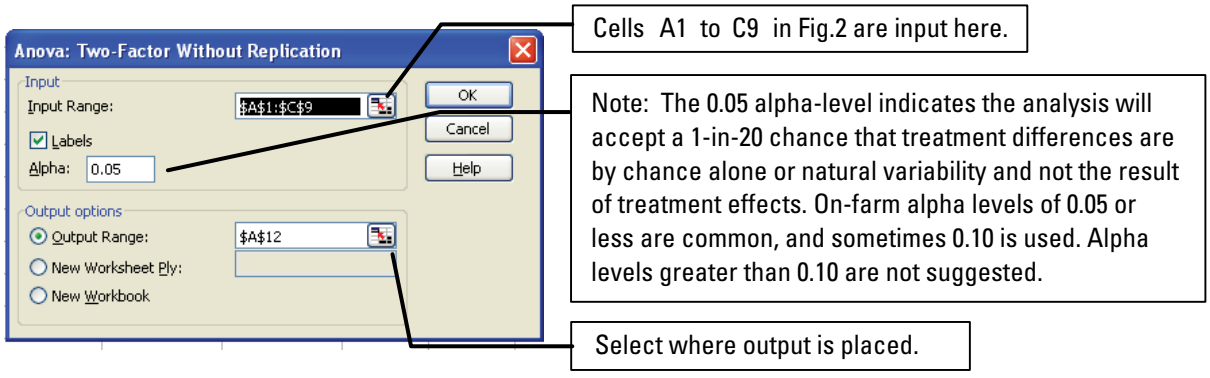


Figure 4. A summary and analysis of variance (ANOVA) output from MS Excel for the results in Figure 2 using the Two-factor Without Replication option.

	A	B	C	D	E	F	G
12	Anova: Two-Factor Without Replication						
13	*SUMMARY*	*Count*	*Sum*	*Average*	*Variance*		
14	Pair 1	2	288.4	144.2	216.32		
15	Pair 2	2	310.8	155.4	220.5		
16	Pair 3	2	292.5	146.25	280.845		
17	Pair 4	2	319.8	159.9	216.32		
18	Pair 4	2	304	152	109.52		
19	Pair 6	2	307	153.5	15.68		
20	Pair 7	2	316.1	158.05	248.645		
21	Pair 8	2	314.3	157.15	96.605		
22							
23	Trt 1	8	1155	144.375	45.4621		
24	Trt 2	8	1297.9	162.238	35.5884		
25							
26	ANOVA						
27	*Source of Variation*	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
28	Rows	439.194	7	62.7421	3.42694	0.06323	3.78704
29	Columns	1276.28	1	1276.28	69.7095	6.9E-05	5.59145
30	Error	128.159	7	18.3085			
31							
32	Total	1843.63	15				

Rows (pairs) & Columns (treatments)

P-value = 0.0000693

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