

Summarizing Grid Soil Sample Data Using Excel and the PivotTable Function

Note: My tutorial uses Microsoft Excel 2013. Other versions will be similar but will have some differences.

The first step is to get a spreadsheet of the soil test results for each grid sample point. Using a map delineate areas of about 20 acres. Give them a unique identifier (1, 2, 3, 1A, 2A, Field 1, Field 3, etc.) This is a step requiring manual intervention and judgment, but typically only takes a few minutes.

I lack a good visual of a field with sample points and labels to identify the points. However, use this example and forward any questions you have to me.



Figure 1 Digital image of field with grid soil sample points.

In Fig. 1 above, points are not identified. Most grid soil sample service providers include a map with the sample points labeled with an identifier that links a soil test analysis to a specific sample point. Either manually or on a digital map, draw lines that subdivide the field into roughly 20 acre subfields. Try not to exceed 20 acres. Assign a "Field Name" to the new subfields you have drawn. This new Field Name will be the identifying tag by which the soil sample information will be sorted.

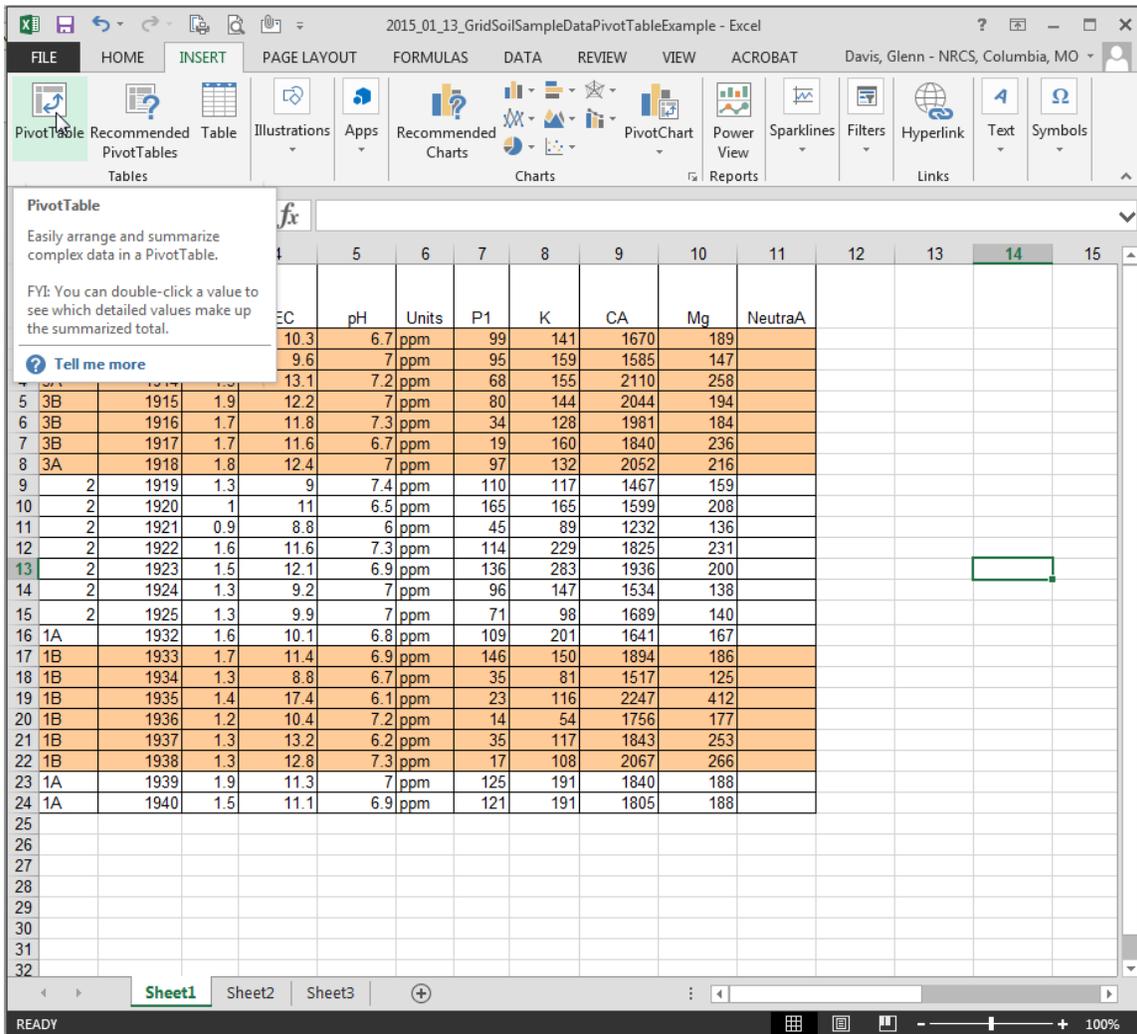
The decision on exactly where to draw the new field boundaries has to be somewhat arbitrary. If it is pretty square or rectangular, it might make sense to draw straight horizontal boundary lines. If you have other evidence that certain points represent field areas more similar than other, the boundary can be drawn with that information.

Field #	Sample ID	OM	CEC	pH	Units	P1	K	CA	Mg	NeutraA
3A	1912	1.6	10.3	6.7	ppm	99	141	1670	189	
3A	1913	1.5	9.6	7	ppm	95	159	1585	147	
3A	1914	1.5	13.1	7.2	ppm	68	155	2110	258	
3B	1915	1.9	12.2	7	ppm	80	144	2044	194	
3B	1916	1.7	11.8	7.3	ppm	34	128	1981	184	
3B	1917	1.7	11.6	6.7	ppm	19	160	1840	236	
3A	1918	1.8	12.4	7	ppm	97	132	2052	216	
2	1919	1.3	9	7.4	ppm	110	117	1467	159	
2	1920	1	11	6.5	ppm	165	165	1599	208	
2	1921	0.9	8.8	6	ppm	45	89	1232	136	
2	1922	1.6	11.6	7.3	ppm	114	229	1825	231	
2	1923	1.5	12.1	6.9	ppm	136	283	1936	200	
2	1924	1.3	9.2	7	ppm	96	147	1534	138	
2	1925	1.3	9.9	7	ppm	71	98	1689	140	
1A	1932	1.6	10.1	6.8	ppm	109	201	1641	167	
1B	1933	1.7	11.4	6.9	ppm	146	150	1894	186	
1B	1934	1.3	8.8	6.7	ppm	35	81	1517	125	
1B	1935	1.4	17.4	6.1	ppm	23	116	2247	412	
1B	1936	1.2	10.4	7.2	ppm	14	54	1756	177	
1B	1937	1.3	13.2	6.2	ppm	35	117	1843	253	
1B	1938	1.3	12.8	7.3	ppm	17	108	2067	266	
1A	1939	1.9	11.3	7	ppm	125	191	1840	188	
1A	1940	1.5	11.1	6.9	ppm	121	191	1805	188	

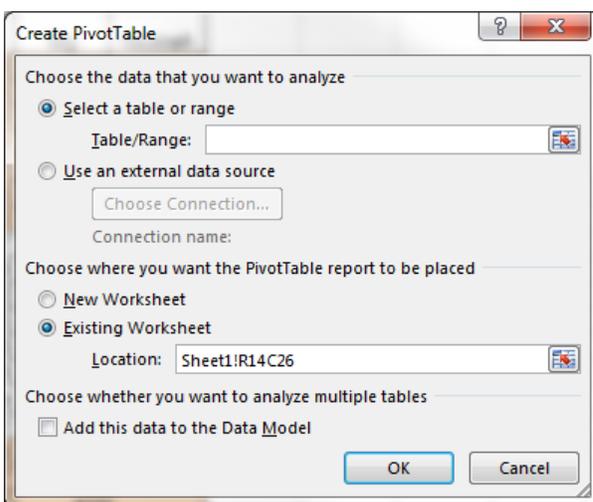
Figure 2 Example Screenshot of Grid Soil Sample Data in Excel

In Fig. 2 I show where I have assigned new Field Names to each individual point.

Now, in Excel Choose Insert | PivotTable |



Clicking on PivotTable gives the Create PivotTable dialog:



Select the Table or Range where your source data are located:

The screenshot shows the Microsoft Excel interface with a data table and the 'Create PivotTable' dialog box open. The data table is as follows:

Field #	Sample ID	OM	CEC	pH	Units	P1	K	CA	Mg	NeutraA
3A	1912	1.6	10.3	6.7	ppm	99	141	1670	189	
3A	1913	1.5	9.6	7	ppm	95	159	1585	147	
3A	1914	1.5	13.1	7.2	ppm	68	155	2110	258	
3B	1915	1.9	12.2	7	ppm	80	144	2044	194	
3B	1916	1.7	11.8	7.3	ppm	34	128	1981	184	
3B	1917	1.7	11.6	6.7	ppm	19	160	1840	236	
3A	1918	1.8	12.4	7	ppm	97	132	2052	216	
2	1919	1.3	9	7.4	ppm	110	117	1467	159	
2	1920	1	11	6.5	ppm	165	165	1599	208	
2	1921	0.9	8.8	6	ppm	45	89	1232	136	
2	1922	1.6	11.6	7.3	ppm	114	229	1825	231	
2	1923	1.5	12.1	6.9	ppm	136	283	1936	200	
2	1924	1.3	9.2	7	ppm	96	147	1534	138	
2	1925	1.3	9.9	7	ppm	71	98	1689	140	
1A	1932	1.6	10.1	6.8	ppm	109	201	1641	167	
1B	1933	1.7	11.4	6.9	ppm	146	150	1894	186	
1B	1934	1.3	8.8	6.7	ppm	35	81	1517	125	
1B	1935	1.4	17.4	6.1	ppm	23	116	2247	412	
1B	1936	1.2	10.4	7.2	ppm	14	54	1756	177	
1B	1937	1.3	13.2	6.2	ppm	35	117	1843	253	
1B	1938	1.3	12.8	7.3	ppm	17	108	2067	266	
1A	1939	1.9	11.3	7	ppm	125	191	1840	188	
1A	1940	1.5	11.1	6.9	ppm	121	191	1805	188	

The 'Create PivotTable' dialog box is open, showing the following options:

- Choose the data that you want to analyze:
 - Select a table or range
 - Table/Range: Sheet1!R1C1:R24C11
 - Use an external data source
 - Choose Connection...
 - Connection name:
- Choose where you want the PivotTable report to be placed:
 - New Worksheet
 - Existing Worksheet
 - Location: Sheet1!R14C26
- Choose whether you want to analyze multiple tables:
 - Add this data to the Data Model

Buttons: OK, Cancel

You can also select where the output PivotTable will be placed. The PivotTable dialog window appears to the side:

The screenshot shows an Excel spreadsheet with a PivotTable and the PivotTable Fields task pane. The PivotTable is located in the range R3C16 and contains the following data:

Field #	Sample ID	OM	CEC	pH	Units	P1	K	CA	Mg	NeutraA
3A	1912	1.6	10.3	6.7	ppm	99	141	1670	189	
3A	1913	1.5	9.6	7	ppm	95	159	1585	147	
3A	1914	1.5	13.1	7.2	ppm	68	155	2110	258	
3B	1915	1.9	12.2	7	ppm	80	144	2044	194	
3B	1916	1.7	11.8	7.3	ppm	34	128	1981	184	
3B	1917	1.7	11.6	6.7	ppm	19	160	1840	236	
3A	1918	1.8	12.4	7	ppm	97	132	2052	216	
2	1919	1.3	9	7.4	ppm	110	117	1467	159	
2	1920	1	11	6.5	ppm	165	165	1599	208	
2	1921	0.9	8.8	6	ppm	45	89	1232	136	
2	1922	1.6	11.6	7.3	ppm	114	229	1825	231	
2	1923	1.5	12.1	6.9	ppm	136	283	1936	200	
2	1924	1.3	9.2	7	ppm	96	147	1534	138	
2	1925	1.3	9.9	7	ppm	71	98	1689	140	
1A	1932	1.6	10.1	6.8	ppm	109	201	1641	167	
1B	1933	1.7	11.4	6.9	ppm	146	150	1894	186	
1B	1934	1.3	8.8	6.7	ppm	35	81	1517	125	
1B	1935	1.4	17.4	6.1	ppm	23	116	2247	412	
1B	1936	1.2	10.4	7.2	ppm	14	54	1756	177	
1B	1937	1.3	13.2	6.2	ppm	35	117	1843	253	
1B	1938	1.3	12.8	7.3	ppm	17	108	2067	266	
1A	1939	1.9	11.3	7	ppm	125	191	1840	188	
1A	1940	1.5	11.1	6.9	ppm	121	191	1805	188	

The PivotTable Fields task pane on the right shows the following fields to be added to the report:

- Field #
- Sample ID
- OM
- CEC
- pH
- Units
- P1
- K
- CA
- Mg
- NeutraA

The task pane also includes sections for FILTERS, COLUMNS, ROWS, and VALUES, and an UPDATE button at the bottom.

Select (check) the items that you want in the PivotTable:

The screenshot shows an Excel spreadsheet with a PivotTable. The PivotTable is located in the range R2C14. The data source is a table with columns for various parameters: OM, CEC, pH, P1, K, CA, Mg, and NeutraA. The PivotTable is currently set up with 'Field #' in the ROWS area and the other parameters in the Σ VALUES area. The task pane on the right shows the 'PivotTable Fields' task pane with 'Field #' in the ROWS area and the other parameters in the Σ VALUES area. A tooltip for 'Insert Slicer' is visible over the data table.

	OM	CEC	pH	P1	K	CA	Mg	NeutraA
2	1.6	10.3	6.7	ppm	99	141	1670	189
3	1.5	9.6	7	ppm	95	159	1585	147
4	1.5	13.1	7.2	ppm	68	155	2110	258
5	1.9	12.2	7	ppm	80	144	2044	194
6	1.7	11.8	7.3	ppm	34	128	1981	184
7	1.7	11.6	6.7	ppm	19	160	1840	236
8	1.8	12.4	7	ppm	97	132	2052	216
9	1.3	9	7.4	ppm	110	117	1467	159
10	1	11	6.5	ppm	165	165	1599	208
11	0.9	8.8	6	ppm	45	89	1232	136
12	1.6	11.6	7.3	ppm	114	229	1825	231
13	1.5	12.1	6.9	ppm	136	283	1936	200
14	1.3	9.2	7	ppm	96	147	1534	138
15	1.3	9.9	7	ppm	71	98	1689	140
16	1.6	10.1	6.8	ppm	109	201	1641	167
17	1.7	11.4	6.9	ppm	146	150	1894	186
18	1.3	8.8	6.7	ppm	35	81	1517	125
19	1.4	17.4	6.1	ppm	23	116	2247	412
20	1.2	10.4	7.2	ppm	14	54	1756	177
21	1.3	13.2	6.2	ppm	35	117	1843	253
22	1.3	12.8	7.3	ppm	17	108	2067	266
23	1.9	11.3	7	ppm	125	191	1840	188
24	1.5	11.1	6.9	ppm	121	191	1805	188

When I selected “Field #” PivotTable placed it into “ROWS.” When I selected the other items (OM, CEC, pH, P1, K, Ca, Mg, and NeutraA) it placed them in COLUMNS under “Σ VALUES.” Sums of values are clearly not what we want...we are after mean values of these parameters. Click on the down arrow for each of the “Σ VALUES” and select “Value Field Settings.”

The screenshot shows an Excel spreadsheet with a PivotTable. The PivotTable is located in the range R2C14 and has the following data:

	Field #	OM	CEC	pH	Units	P1	K	CA	Mg	NeutraA
1										
2	1.6	10.3	6.7	ppm	99	141	1670	189		
3	1.5	9.6	7	ppm	95	159	1585	147		
4	1.5	13.1	7.2	ppm	68	155	2110	258		
5	1.9	12.2	7	ppm	80	144	2044	194		
6	1.7	11.8	7.3	ppm	34	128	1981	184		
7	1.7	11.6	6.7	ppm	19	160	1840	236		
8	1.8	12.4	7	ppm	97	132	2052	216		
9	1.3	9	7.4	ppm	110	117	1467	159		
10	1	11	6.5	ppm	165	165	1599	208		
11	0.9	8.8	6	ppm	45	89	1232	136		
12	1.6	11.6	7.3	ppm	114	229	1825	231		
13	1.5	12.1	6.9	ppm	136	283	1936	200		
14	1.3	9.2	7	ppm	96	147	1534	138		
15	1.3	9.9	7	ppm	71	98	1689	140		
16	1.6	10.1	6.8	ppm	109	201	1641	167		
17	1.7	11.4	6.9	ppm	146	150	1894	186		
18	1.3	8.8	6.7	ppm	35	81	1517	125		
19	1.4	17.4	6.1	ppm	23	116	2247	412		
20	1.2	10.4	7.2	ppm	14	54	1756	177		
21	1.3	13.2	6.2	ppm	35	117	1843	253		
22	1.3	12.8	7.3	ppm	17	108	2067	266		
23	1.9	11.3	7	ppm	125	191	1840	188		
24	1.5	11.1	6.9	ppm	121	191	1805	188		
25										
26										
27										
28										
29										
30										
31										
32										

The PivotTable Fields task pane on the right shows the following configuration:

- Choose fields to add to report:** Field #, OM, CEC, pH, Units, P1, K, CA, Mg, NeutraA.
- ROWS:** Field #
- VALUES:** Sum of OM

A context menu is open over 'Sum of OM' with the following options:

- Move Up
- Move Down
- Move to Beginning
- Move to End
- Move to Report Filter
- Move to Row Labels
- Move to Column Labels
- Move to Values
- Remove Field
- Value Field Settings...

Then select “Average” under “Summarize Values By:”

The screenshot shows an Excel spreadsheet with a PivotTable. The PivotTable is based on the data in columns 3 through 11, with 'OM' as the source. The PivotTable Fields task pane on the right shows the following configuration:

- Field #:** Sample ID, OM, CEC, pH, Units, P1, K, CA, Mg, NeutraA
- FILTERS:** (Empty)
- COLUMNS:** Values
- ROWS:** Field #
- VALUES:** Sum of OM, Sum of CEC, Sum of pH, Sum of P1

The Value Field Settings dialog box is open, showing the following details:

- Source Name:** OM
- Custom Name:** Average of OM
- Summarize Values By:** Show Values As
- Summarize value field by:** Average (selected)
- Number Format:** (Default)

Repeat for each of the Column Values.

After completing this step click “Update” and you will see the raw data output:

The screenshot shows an Excel spreadsheet with a PivotTable. The PivotTable is located in the range R2C14:R8C21. The PivotTable has 'Row Labels' as the row field and several data fields: Average of OM, Average of CEC, Average of pH, Average of P1, Average of K, Average of CA, and Average of Mg. The data is summarized in a table below.

Row Labels	Average of OM	Average of CEC	Average of pH	Average of P1	Average of K	Average of CA	Average of Mg
2	1.271428571	10.22857143	6.871428571	105.2857143	161.1428571	1611.714286	173.1428571
1A	1.666666667	10.83333333	6.9	118.3333333	194.3333333	1762	181
1B	1.366666667	12.33333333	6.733333333	45	104.3333333	1887.333333	236.5
3A	1.6	11.35	6.975	89.75	146.75	1854.25	202.5
3B	1.766666667	11.86666667	7	44.33333333	144	1955	204.6666667
Grand Total	1.469565217	11.26521739	6.873913043	80.60869565	145.9130435	1790.173913	199.9130435

You can reformat this Table using the normal Table formatting tools in Excel:

Row Labels	Average of OM	Average of CEC	Average of pH	Average of P1	Average of K	Average of CA	Average of Mg
2.0	1.3	10.2	6.9	105.3	161.1	1611.7	173.1
1A	1.7	10.8	6.9	118.3	194.3	1762.0	181.0
1B	1.4	12.3	6.7	45.0	104.3	1887.3	236.5
3A	1.6	11.4	7.0	89.8	146.8	1854.3	202.5
3B	1.8	11.9	7.0	44.3	144.0	1955.0	204.7
Grand Total	1.5	11.3	6.9	80.6	145.9	1790.2	199.9

This gives you the average soil test values for each subfield area (about 20 acres). You can now insert these values into the Recommendations Online tool or into Manure Management Planner to get University of Missouri-Columbia Extension fertilizer recommendations.