Final report STM2016

Short-term mobility period spent at CNR

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Proponent STM2016: Dr. Gabriele Buttafuoco CNR-ISAFOM

The activities carried out during the 10 working days have included the analysis of two set of data: (1) Salt affected soil and (2) Polluted soil. Both analysis have been carried out using the geostatistical methods in collaboration with Dr. Gabriele Buttafuoco (Proponent STM2016) and Dr. Annamaria Castrignanò (associated CNR ISAFOM).

Salt affected soil data set

Different analysis have been carried out using a geostatistical approach which included exploratory data analysis, Gaussian anamorphosis modelling, variography (Fig. 1), estimation of different soil variables by using cokriging in order to produce thematic maps (Fig. 2). Delineation of management zones by using factorial cokriging (Fig. 3).

Fig. 1. Results of variographic analysis of salt affected soil data set

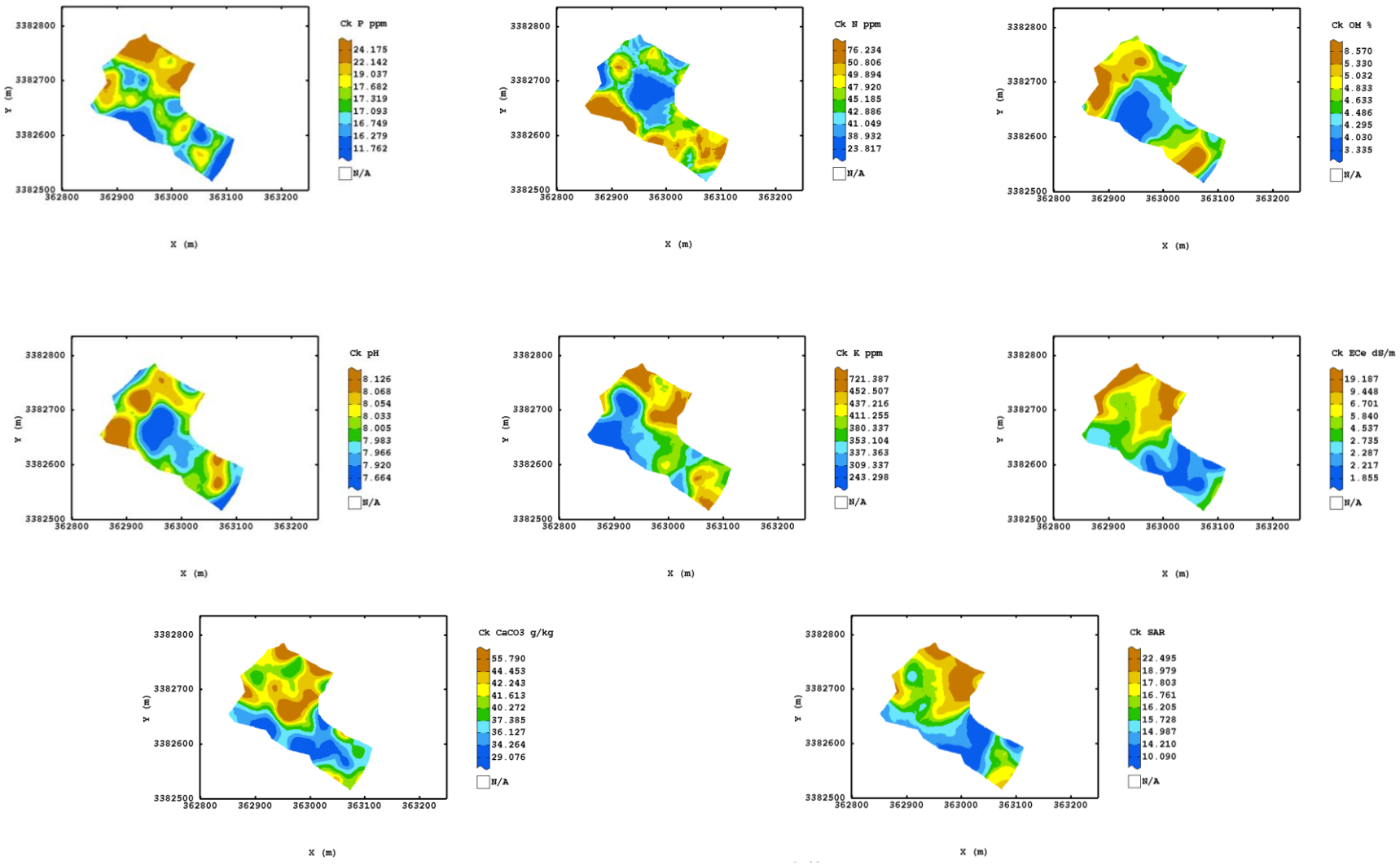

Fig. 2. Thematic maps of the soil variables under study

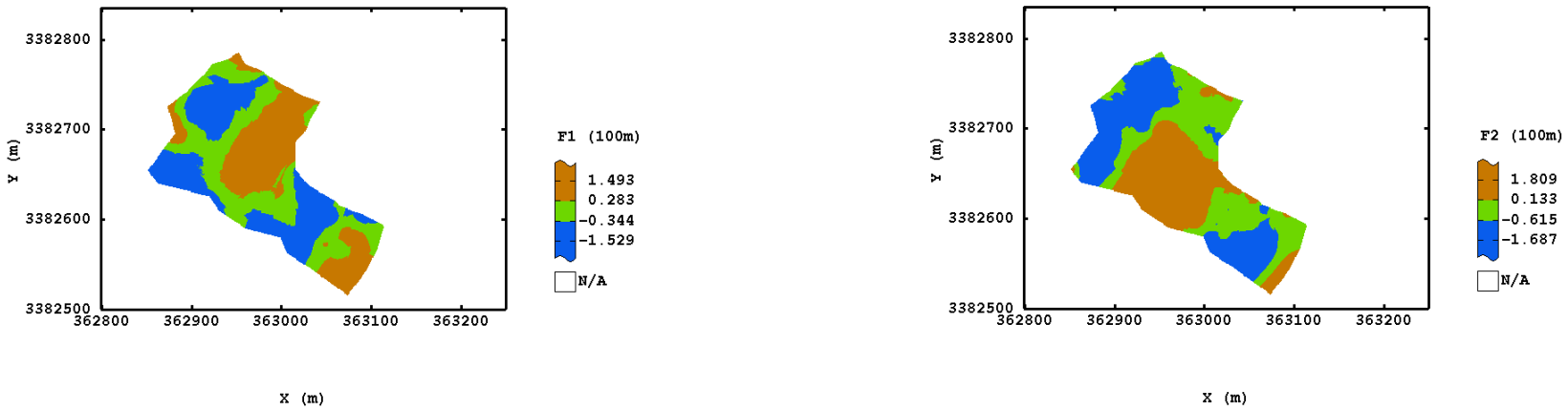

Fig. 3. Maps of the management zones delineated according to the rationalized factors F1 and F2

Soil contaminants dataset

Soil contaminants data have been analysed in order to assess the risk of different soil contamination using indicator kriging algorithm. The method included exploratory data analysis, indicator pre-processing, and indicator post-processing to determine the cumulative distribution of probability and to obtain the local probability of exceedance of a specific contaminant. Moreover, all soil contaminants have been mapped (Fig. 4).

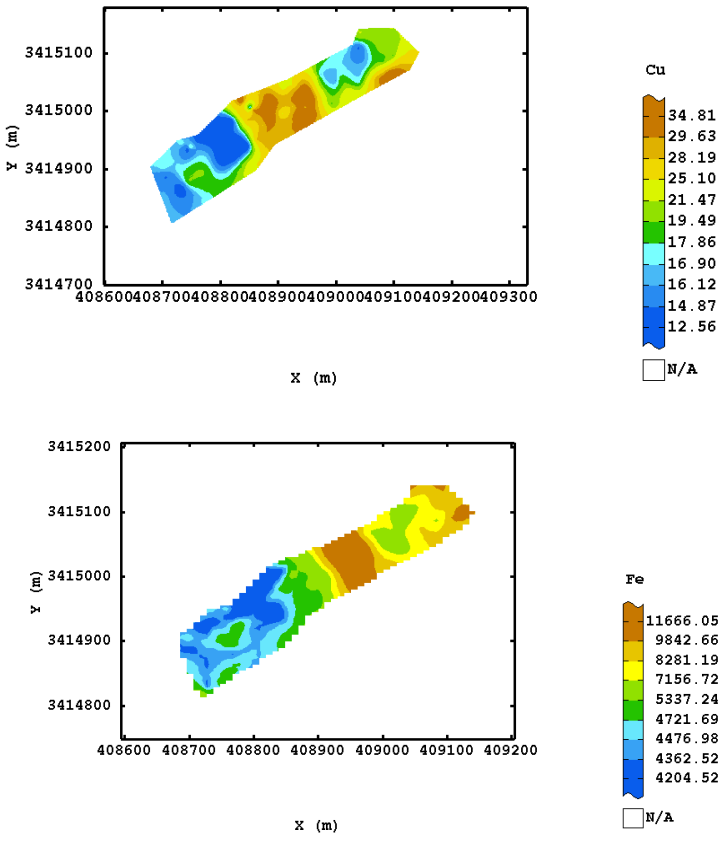

Fig. 4. Maps of iron and copper using the indicator kriging

Remote sensing data analaysis

An additional activity have been carried out to analyse and quantify the correlation among the analysed soil variables and the most used vegetation indices. The analysis have been carried out using ArcGIS 9.3 software.

The following indices have been computed (Table 1):

- ✓ normalized difference vegetation index (NDVI)
- ✓ normalized difference red edge index (NDRE)
- ✓ soil-adjusted vegetation index (SAVI)
- ✓ transformed soil-adjusted vegetation index (TSAVI)
- ✓ optimised soil-adjusted vegetation index (OSAVI)
- ✓ modified soil-adjusted vegetation index (MSAVI)

Table 1. Values of the different vegetation indices

Sample	MSAVI	NDRE	NDVI	OSAVI	SAVI
1	0.1193	0.4527	0.6589	0.5414	0.4323
2	0.0961	0.4388	0.5678	0.4610	0.3641
3	0.1126	0.3371	0.6249	0.5147	0.4119
4	0.1403	0.3364	0.6967	0.5885	0.4823
5	0.1604	0.4388	0.7278	0.6278	0.5256
6	0.0473	0.4739	0.3029	0.2440	0.1913
7	0.0704	0.5512	0.4653	0.3669	0.2823
8	0.1410	0.4961	0.6866	0.5840	0.4819
9	0.1284	0.5059	0.6816	0.5656	0.4557
10	0.1430	0.4527	0.7028	0.5949	0.4886
11	0.1164	0.2411	0.6466	0.5311	0.4239
12	0.0547	0.3950	0.3570	0.2847	0.2213
13	0.0672	0.2384	0.3969	0.3270	0.2617
14	0.1136	0.5059	0.6612	0.5342	0.4200
15	0.1290	0.4940	0.6921	0.5716	0.4586
16	0.1249	0.4445	0.6833	0.5616	0.4485
17	0.0895	0.5005	0.5718	0.4521	0.3486
18	0.0930	0.4940	0.5661	0.4552	0.3563
19	0.1363	0.5389	0.7094	0.5900	0.4764
20	0.1555	0.5005	0.7347	0.6262	0.5178
21	0.1402	0.4812	0.7071	0.5937	0.4838
22	0.0600	0.5097	0.3406	0.2852	0.2318
23	0.0728	0.2684	0.4936	0.3846	0.2930
24	0.0356	0.4039	0.3059	0.2195	0.1568
25	0.0919	0.5097	0.5034	0.4215	0.3425
26	0.1558	0.4039	0.7387	0.6287	0.5191
27	0.1673	0.5295	0.7444	0.6440	0.5407
28	0.1146	0.5270	0.6468	0.5287	0.4200
29	0.0960	0.5295	0.5815	0.4677	0.3662
30	0.1176	0.5599	0.6721	0.5455	0.4306
31	0.1348	0.5674	0.7053	0.5860	0.4727
32	0.1361	0.4931	0.6977	0.5837	0.4741
33	0.1230	0.4039	0.6697	0.5521	0.4421
34	0.1173	0.4631	0.6639	0.5411	0.4287
35	0.1277	0.3955	0.6909	0.5692	0.4555
36	0.0849	0.3814	0.5624	0.4394	0.3354
37	0.0875	0.4631	0.5469	0.4366	0.3395
38	0.1308	0.5247	0.6917	0.5738	0.4622
39	0.0284	0.5211	0.2547	0.1798	0.1269
40	0.1197	0.5247	0.6742	0.5496	0.4355

Finally, Dr. Shaddad has held two seminars at CNR-ISAFOM Rende and CREA-SCA di Bari on proximal soil sensors and geostatistical tools in precision agriculture:

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