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ON SOIL SAMPLING GUIDELINE FOR SOIL STUDIES

D. K. Kachhara* and Govinda Bhatt**

**, **Mandsaur Institute of Pharmacy, Mandsaur (M.P.) 458001*

E-mail: dkkachhara@rediffmail.com

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ABSTRACT

In the frame of the international soil sampling project, funded and coordinated by the Italian Environmental Protection Agency, The soil sampling guidelines used in European countries ESSG. As kindly provided by the national institutions which participated in the project, have been recorded, studied, evaluated and presented. It was characterized for trace element content in soil, in terms of the spatial and temporal variability of their mass fraction. They suggest mass- and volume-related soil sampling, while the sampling pattern is not presented in all national guidelines. The criteria for area, site, unit, sub-unit, and point selection are mainly based on pedology and land use, following the history and pre-screening information or geology, or are site related. Some guidelines suggest the division of sampling units into sub-units. The aim has been to ascertain what soil sampling guidelines exist in Europe; to detect similarities and differences advantages and deficiencies; to identify incompatible strategies and evaluate how methodologies might affect data quality; to investigate sources of deviations or uncertainties; to improve comparability and representative ness of soil sampling; to investigate the need for harmonized sampling guidelines; and to develop suggestions for standard operating procedures SOP. The purpose for sampling, in descending order of frequency, is soil pollution, soil fertilization, general soil monitoring, background risk assessment, or else it is not specified. The majority of countries do not sample the top organic matter separately. The sampling pattern is mainly grid sampling, grid and random sampling, or not mentioned. Sampling density inside the sampling unit either varies greatly or it is not mentioned, while the size of the sampling unit varies widely. Most guidelines require the collection of composite instead of simple samples, while some prefer sampling soil profiles. in the pre-analysis treatment quality assurance QA.And quality control QC. Approaches are used either both in the lab and in the field, or only in the field, or are not mentioned. It characterized in term of trace elements, can be also used to compare the soil sampling strategies developed for radionuclide investigations.

***Keywords**: European soil sampling guidelines; Soil pollution; Soil sampling; Soil quality.*

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1. INTRODUCTION:

In environmental sciences, sampling is a difficult task, and is considered by some to be almost an art. However, in the interests of achieving reproducibility, compatibility and consistency, sampling must be done in a properly scientific way. Soil sampling operations can be performed following different strategies and using different sampling techniques; for this purpose there are standard operating procedures (SOPs), guidelines and international rules. The sampling procedure, as an important part of the measurement process, can affect the quality, comparability and reliability of the results. The concept of quality control, which has been well defined in the analytical field, should therefore also be applied to the maximum possible extent in the sampling field. Reproducibility of the results is another key issue that has to be ensured, especially if attempts are made to compare results for soils from different European countries that have been sampled, treated, and analyzed by different people and with different methodologies. Although soil sampling in the field and the sample treatment before analysis are crucial steps in the description of the type, pattern and spatial distribution of soil pollution, their study has lagged behind in relation to soil analysis techniques.

The term was recently defined in IUPAC Recommendations De Zorzi [4], as ‘‘an area, one or more of whose element concentrations are well characterized in terms of spatial and temporal variability’’. Such a definition includes the terms ‘‘spatial and temporal variability’’ that replace the terms ‘homogeneity and stability’ used in the context of reference material. for the testing of soil sampling procedures (strategies, techniques, devices, etc.),and their harmonization at different levels (regional, national and international).For this the sampling guidelines were registered, studied, compared, and evaluated in terms of the concepts, approaches, criteria, methodological procedures, similarities or differences, and the diagnosis of potential or expected restrictions or deficits.

****Corresponding author: D. K. Kachhara*, E-mail: dkkachhara@rediffmail.com***

2. MATERIALS AND METHODS:

In the frame of the international soil sampling project, funded and Coordinated by the Italian Environmental Protection Agency, an agricultural area was established as a suitable for performing soil sampling inter-comparison method. Sample preparation:

(i) Mixing and stone handpicking;

(ii) Drying;

(iii) Sieving, homogenizing and splitting

(iv) Milling.

This is carried out of 100 test sample methods for Soil sampling.

The site, of area 10, 000m^2 was subdivided into 100 sub-areas for cells, each of 10m$\times$10 m. The spatial variability (distribution) of the mass fraction (mass of substance divided by the mass of the mixture, ISO, [5,6] of trace elements was assessed two dimensional, by performing reference sampling, as adapted from the sampling scheme proposed by Barbizzi [1]. One hundred composite soil samples each comprising a pooling of 25 increments, as defined according to De Zorzi [4] were collected. A single sampling team carried out the reference sampling. To verify that the spatial variability of trace element mass fractions is comparable among the different cells, and to have information on the within-cell variability, two cells were sampled again during the reference sampling and the resulting 25 samples per cell were analyzed separately.

Now we shall given the two method of soil sampling.

2.1 DOUBLE SAMPLING:

The term double sampling should not be confused with two-staged sampling. The latter is really subsampling. Double sampling makes use of sampling an area in phases. Estimates of the mean and variance obtained in Phase 1 of a study are used to develop the design used in Phase 2. The phases of the study may occur within a day or two of each other or there may be several months between the phases. The lag time is dependent upon analytical time and the time for review of the Phase 2 sampling plan. Barth (2) recommends that double or multi-phased sampling be used when there is little or no information about the site. This provides the data needed to develop a more focused sampling plan. Cochran (3) noted that double sampling is often used when stratification is deemed necessary to control some of the sources of variation within the data.

2.2 COMPOSITE SAMPLING:

The standard deviation around a mean estimate obtained from a series of samples taken from a block or batch of soil material is often quite large. This is especially true with wastes that have been deposited on the soil. A well homogenized sample made up of a number of increments of material or from several samples collected from the block of soil will normally exhibit a smaller variance. This sample is called a composite sample. The use of composite samples is often recommended as a means of reducing the cost of sampling at a particular site. One often encounters sampling plans that composite samples of soil taken over the entire depth of the sampled profile. This can be useful in some cases but should be used only after considerable thought. Properly used, compositing can provide a means of quickly assessing if an area needs further sampling, but it must be used with caution. One of the problems with compositing samples is the loss of information and the loss of sensitivity because of dilution of the samples.

3. RESULT AND DISCUSSION:

The measurement uncertainties comprise the variance associated with the analysis, including sub-sampling (from test samples to test portions). To this end, 30 test portions from three independent test samples (10 test portions from each test sample) were sub-sampled and analyzed to verify the repeatability of the sub-sampling and measurement procedure. The three test samples represent three different cells. As a result of this sampling process, a substantial soil data set is obtained. The distribution of the mass fraction values of As, Sc, and Cr has been obtained for the whole area (within the defined depth). The adoption of the stratified random sampling, single sampler and sampling protocol, and single analytical laboratory and the use of both composite samples for each cell and of single samples for selected cells allowed the variability among the cells as well as the with in cell variability to be assessed The one hundred mass fraction values obtained (one for each cell 10mx10 m) represent the assigned values, with the associated uncertainties. For As, Sc, and Cr the uncertainties range, respectively, from 2.2% to 2.9%, 1.6% to1.9% and 2.1% to 4.5%. Patterns of the variability of the mass fractions of Cr and Sc were also determined. For each cell (of 100) a mass fraction value related to all the elements considered, with its measurement uncertainty, is available.

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