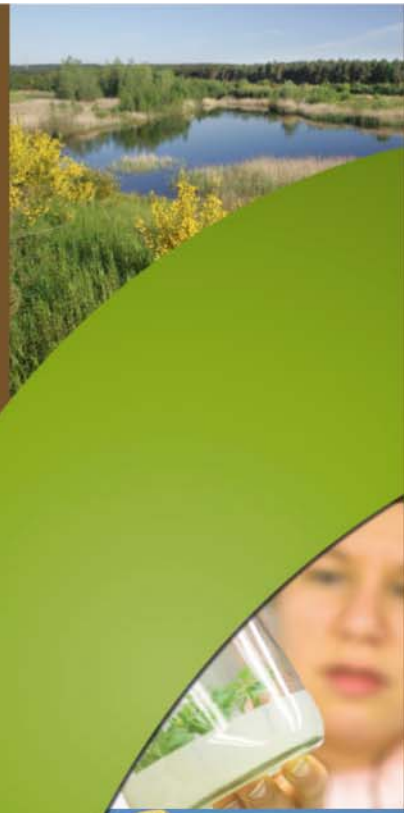
F4: BioSoil Flanders – Soil Component – FSCC
Forest Focus BE 2005 – 2006 Programme phase 2006

Long-term storage of soil samples

Experience from the ICP Forests programme and the EU Forest Focus BioSoil demonstration project



Nathalie Cools, Forest Soil Co-ordinating Centre

http://fscc.inbo.be

Introduction

- Manual IIIa: very limited information on storage of soil samples
  - No preservatives should be used
  - Under normal room conditions
  - With minimum temperature and humidity fluctuations
  - Shielded from incident light
- FSCC questionnaire in 2008 on current storage practices at institutes involved in ICP Forests and/or BioSoil
- Aim: prepare more detailed guidelines to be included in the FutMon manual

Storage conditions (ISO/DIS 18512, 2006)

When soil samples are stored, following conditions should be specified:

1. Light
2. Temperature
3. Humidity
4. Accessibility, security, documentation and quality control
5. Duration of storage
6. Containers and amount of storage
7. Preparing the samples after storage

Current practices in 20 countries (25 institutes)

Type of stored samples	Yes	No	Partly/Sometimes
Fresh mineral	3	22	
Dried mineral, not sieved	8	17	
Dried mineral, sieved	24	1	
Coarse fraction	1	20	4
Special samples (core samples)	1	24	
Fresh organic	3	22	
Dried organic, not sieved	9	15	1
Dried organic, sieved	23	2	
Coarse organic	3	19	3

1. Light conditions

- Most labs protect the samples from incident light be either:
  - Store room located in cellar
  - Room protected by blinds
  - Double packaging

Two countries did not protect the samples from incident light and considered the semi-transparent bottle to protect sufficiently.

We should put minimum requirement. Semi-transparent and/or white plastic bottles is not sufficient!

2. Temperature

- Most labs keep samples at room temperature though high differences dependent on general climatic conditions, seasonal fluctuations,…: range 2 till 20°C
- Ireland: cold storage (4°C) of soil samples ICP Forests and BioSoil
- Austria: between 16 and 20°C (cellar)

Minimum requirement: record the temperature to document seasonal fluctuations

3. Humidity

- Important source of chemical changes in soil samples during storage
- Only 2 labs controled humidity level

- Minimum requirement:
  - store in air-tight containers!?
  - Measure the humidity of the room!?

4. Accesibility, security, documentation and quality control

- What means 'sufficiently protected from dust'?
- Put minimum requirements to the content of the labels?
  - Laboratory number
  - Plot ID or name
  - Sampling date
  - Sampling depth

  Other:
  - Project/experiment code
  - Profile number
  - Horizon/ layer symbol
  - Type of sample (organic, mineral, stone,…)
  - Sampling year
  - Responsible person
  - Date of storage

5. Duration of storage

Age of eldest samples	< 10 yr	10-19 yr	20-29 yr	30-39 yr	40-49 yr	50 yr
N° institutes	4	9	5	3	2	2

Experience with re-analysis:

	Exchangeable cations:											
Study	**Ca**	**Mg**	**K**	**Na**	**Al**	**Fe**	**Mn**	**H**	**CEC**	**OC**	**TotN**	**pH**
1				-35%		+32%	+81%	+21%				
2						YES?	YES?			NO	NO	
3				YES?								YES?
4				NO								NO
5							YES?	YES?				
6										NO	NO	
7	NO	NO										
8				YES						YES	YES	YES
9									NO	NO	NO	NO

6. Containers and amount of storage

- Containers:
  - Plastic boxes (68 %)
  - Plastic bags (40 %)
  - Cardboard boxes (32%)
  - Paper bags (2 labs)
  - Glass bottles (1 lab)
  - Textile bags (short time storage only)
  - Batches of samples of the same survey are stored in larger containers to protect from dust and light
- Amount
  - Organic samples smaller than mineral
  - Most keep 100 – 200 g (usually sieved)
  - Minimum should be set at 50 g for homogeneity reasons

The BioSoil samples

- 24 of the 25 respondents participated in BioSoil
- 16 of stored (part of) the samples of the first inventory.
- All of them will store (at least a part) of the BioSoil samples for future analysis.

	Yes	No	Partly
Stored samples from first forest soil inventory	15	8	1
Fixed depth	12	11	1
Genetic horizons	8	14	2
Forest floor	5	18	1
Will store BioSioil Samples	22	0	2
Fixed depth	22	1	1
Genetic horizons	15	7	2
Forest floor	9	14	1
Coarse fraction	2	21	1
Bulk density	1	22	1
Same methodology as described above	1	18	5

Conclusions and recommendations

- Most countries store the samples of the long-term soil monitoring.
- Experience with change of soil properties in stored samples is limited.
- The 7 storage conditions are to be documented in the DAR.
- To all of the storage conditions a minimum/maximum required value could/should be set to harmonise the storage conditions between the countries