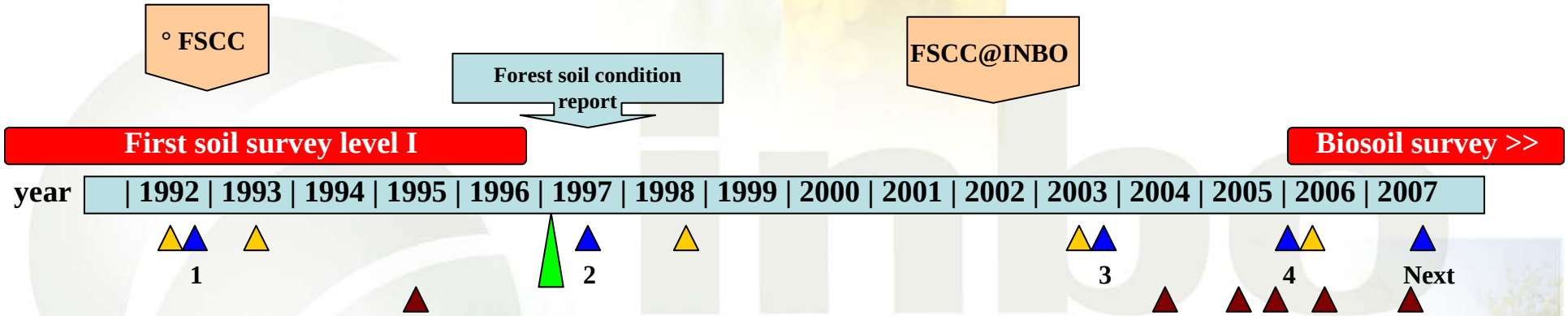
a. Report of the QC/QA work and the previous ring tests of the Soil Expert Panel

1. Development of Manuals
2. Development of data integrity rules
3. Organisation of Ring Tests
4. Soil Classification Training Courses

Bruno de Vos (Co-Chair FSEP) and Nathalie Cools (FSCC)

Historical perspective

Timeline



- Manual update
- Data integrity rules
- Ringtest event
- Field Training courses

- Periodicity soil surveys ≠foliar/depo surveys (10 yr ?)
- Ringtests mostly linked with revision manual
- Ringtest 3 & 4 based on manual major update 2003
- More regular interlaboratory comparisons after 2002
- Future ?

Manual - development

1. **Version 1992 (11 pages, no annex). Adopted TF Avignon**
   - Pedological characterisation LI: O, LII: M following FAO guidelines and in buffer zone
   - Particle size distribution <2, 2 – 63, 63 -2000 μm
   - Sampling fixed depths or horizons
   - Composite samples but no minimum N° of subsamples
   - Set of mandatory and optional parameters was limited
   - Reference method: name and sometimes ref. to literature
2. **Version 1993. Adopted TF Budapest**

   Annex with method descriptions has been added:

   3-1 - moisture content

   3-2 - particle size distribution

   3-3 - $CaCO_3$

   3-4 - pH($CaCl_2$)

   3-5 – OC

   3-6 - Total N

   3-7 - Exch. Acidity, exch. Cations, CEC and BS

   3-8 - Aqua regia – P, K, Ca, Mg

Manual - development

3. **Version 1998.**
   - **Adoption of submanual on Soil Solution Collection and Analysis (cf WG John Derome)**

4. **Version 2003.** **Adopted TF Zagreb**
   - **Update Part IIIa: Sampling and Analysis of Soil**

     Major revisions on sampling procedures and on analytical methods (ISO-based)
   - **Update Part IIIb: Soil Solution Collection and Analysis**

5. **Version 2006.** **Adopted TF Tallinn**
   - **Testing phase by FSCC 2004 – 2005**
   - **Specific amendments/clarifications**
   - **Basis for Biosoil soil survey 2006-2008**

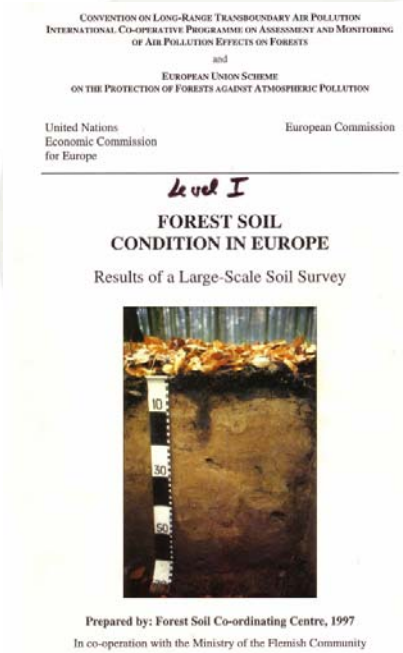
Development of manuals

- 5 editions so far
- trends:
  - Methods become gradually more specified (method description, reporting, …)
  - More parameters become mandatory
  - More standardization (reference methods mainly ISO)
  - More harmonisation between labs needed
  - More emphasis on QA/QC measures

    – Resulting in better soil data quality ?

Data integrity expert rules

Forest soil condition report 1997


CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION
INTERNATIONAL CO-OPERATIVE PROGRAMME ON ASSESSMENT AND MONITORING OF AIR POLLUTION EFFECTS ON FORESTS
and
EUROPEAN UNION SCHEME ON THE PROTECTION OF FORESTS AGAINST ATMOSPHERIC POLLUTION

United Nations Economic Commission for Europe

European Commission

Level I

FOREST SOIL CONDITION IN EUROPE

Results of a Large-Scale Soil Survey

Prepared by: Forest Soil Co-ordinating Centre, 1997

In co-operation with the Ministry of the Flemish Community

- **development of data integrity check**
  - **Datafile integrity check (missing values, characters, coordinates)**
  - **Data integrity check**
    - Results within expected range
    - Based on simple relationships between individual soil properties
    - Types A – B – C – D
      - A (parameter ratio's in plausible range)
      - B (results within required range in the presence of a specific soil property)
      - C (relations between overlying layers)
      - D (correct determination of CEC/BS)
  - **17 rules (types A & B); 23 rules (type C & D)**

Data integrity expert rules

Table C-2. Data integrity expert rules of type C.

rule type	rule no.	para-meter	unit	maximum permissible absolute difference	minimum permissible ratio	maximum permissible ratio
Between overlying mineral layers - between overlying organic layers						
C	18	pH		2.0		
C	19/20	C_Org	g/kg	150	0.25	20
C	21/22	N	g/kg	10	0.25	20
C	23/24	P	mg/kg	400	0.25	20
C	25/26	K	mg/kg	4000	0.1	10
C	27/28	Ca	mg/kg	25000	0.01	100
C	29/30	Mg	mg/kg	25000	0.01	100
C	31	$CaCO_3$	g/kg	500		
C	32/33	Na	mg/kg	250	0.01	100
C	34/35	Al	mg/kg	15000	0.01	100
C	36/37	Fe	mg/kg	20000	0.01	100
C	38/39	Cr	mg/kg	40	0.01	100
C	40/41	Ni	mg/kg	40	0.01	100
C	42/43	Mn	mg/kg	2000	0.01	100
C	44/45	Zn	mg/kg	100	0.01	100
C	46/47	Cu	mg/kg	40	0.01	100
C	48/49	Pb	mg/kg	100	0.01	100
C	50/51	Cd	mg/kg	1.6	0.01	100
C	52/53	CEC	cmol(+)/kg	50	0.25	20
C	54/55	BaseSat	%	50	0.1	5
Between the mineral surface layer and its overlying organic layer						
C	56	pH		2.5		

Data integrity expert rules

- **Integrity rules were applied for data quality checks of FSCDB (2002)**

Possible use in future => see proposal at lab level (Nathalie)

Previous ring tests

- 1st intercalibratrion exercise: 1992 (before 1st soil survey, before FSCC)
  - Conducted by Van der Velden & Van Orshoven & Flemish soil expert group
  - 22 countries = labs, 4 samples (3 min 1 org), 36 parameters, confidential
  - Aims:
    - Comparison of the methods, no interlaboratory comparison !
    - Which methods are expected to give strong deviating results and should not be stored in a common database ?
    - Assess differences between national methods and reference methods
  - **Recommendations (15 yrs ago !)**
    - Training courses for laboratories
    - Establishment of a reference laboratory analysing local reference material of national labs
    - Regular participation to international laboratory comparison (CV of labs performance)
    - Analysis of a standard sample on a regular basis
    - Correlation exercises between reference and national methods
    - Better description of laboratory methods

Previous ring tests

- 2nd intercalibration exercise: 1997 (during 1st survey)
  - Reported in Forest soil condition report (1997) – Annex A
  - 26 laboratories, 19 countries, 2 mineral samples, 26 parameters
  - Aim: Assessing transnational comparability
- 3rd intercalibration exercise: 2002 - 2003
  - 52 laboratories, 3 samples, 42 parameters
  - Aim: Quality of the soil analysis results, test of the revised manual
    - Additional information ⇒ Questionnaire
    - New, clear statistical procedure (ISO standard)
    - 1st test of the revised manual (FSCC 2003, ISO reference methods)
    - 1st ICP-Forest soil ring test on this scale
- 4th FSCC Interlaboratory Comparison (2005-2006)
  - 52 laboratories, 7 samples: 4 soil, 1 organic layer, 2 digested aqua regia
  - Same methods as in 3rd RT (laboratory and statistical methods)
  - Aim: follow-up of 3rd FSCC RT: comparison, progress been made?

Training courses

Focus primarily on field assessment:

- **Profile description and soil classification**
- **Field crew & responsible scientists**

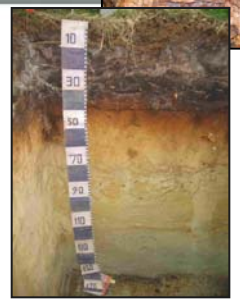
No training courses for laboratory personnel were organized till now

Bruno de Vos (Co-Chair FSEP) and Nathalie Cools (FSCC)

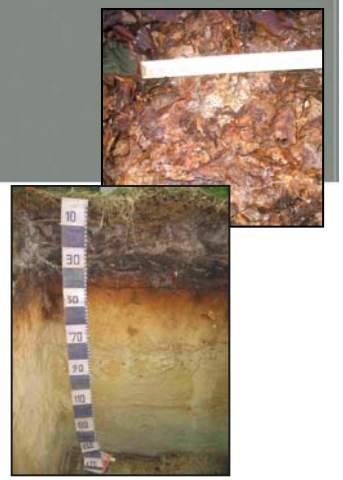
Training courses on Soil Classification

Training course	Year	Location
EU - Soil classification training course FAO 1989	1995	Gent
EU – Soil classification training course WRB 1998	2004	Warsaw
Training course on WRB Soil Profile Description and Classification within the BioSoil programme	2005	Austria
	2005	Belgium
	2006	Madrid
BioSoil workshop on WRB 2006	2007	Belgium

More information on manual 2006



Update Soil Manual 2006



1.Sampling

1.1. Georeferencing

Datum WGS84 and GPS if available

All Level I soil plots should coincide with Crown Condition plots

1.2. Pedological characterisation

Profile description and analytical data for correct characterisation should be reported

Humus characterisation following definitions of European Humus Research Group

Parent Material Codes adapted from Soil Geographical Database of Europe and the Mediterranean

1.3. Soil sampling

- Organic layers: definitions of water saturated organic layers have been harmonised with European Humus Classification

Update Soil Manual 2006

- **Sampling of peatlands**
  - **Peatland sampling design if H > 40 cm**
    Fixed depths:
    Mandatory: H01, H12
    Optional: H24, H48

- **Sampling for bulk density**
  - **5 subsamples to be taken**
  - **1 Mean value should be reported**
  - **Stony soils: combined method for estimation of coarse fragments and bulk density**

- **N° of samples**
  - **Level I: 5 subsamples but in stony soils 1 composite of 3 subsamples for the optional depths (20 – 40 and 40 – 80 cm) can be accepted**
  - **At least 5 m distance between 2 subsamples**

Update Soil Manual 2006

2. Physical and chemical characterisatio

2.1. SA01: Pretreament of Samples

Organic layer:

- Removal of living material (such as mosses, roots, etc.)
- Removal of objects > 2 cm
- Crushed or milled to < 2 mm

Mineral layer:

- Should not be milled, only sieving on 2 mm sieve allowed
- Except for total analysis further grinding can be allowed: TOC, Total N, Total Elements and Carbonates

2.2. SA02: Soil Moisture Content

- Organic layer: 5 – 10 g dried at 105°C for 24 hours
- Mineral layer: 5 – 15 g dried at 105°C till constant mass is reached
- Automated apparatus allowed as long as based on same principle

2.3. Combined approach to estimate bulk density, coarse fragments and fine earth stock in stony soils (SA04 and SA05)

Update Soil Manual 2006

2.4. SA05: Coarse fragments

- Rod penetration method described more into detail

2.5. SA10: Exchangeable cations

- German calculation method for free acidity accepted as alternative method to titration method
- Single $BaCl_2$ extraction becomes reference method (instead of triple)

2.6. SA11: Aqua regia extractable elements

- No milling of soil samples

2.7. SA13: Acid oxalate extractable Fe and Al

- Description method has been corrected

3. Forms

- **Content of reduced plot file**
  - **Soil unit: all WRB qualifiers should be reported**
  - **Parent material codes are added**
  - **New definition and coding for the humus forms**
  - **Reference to profile ID**
- **Content of datafile**
  - **Level I:**

    1 form combining mandatory and optional parameters as required for BioSoil
  - **Level I and II:**

    Cu and Hg: reporting more digits (2 for Cu, 3 for Hg)

    Observation field: 25 characters (more space for comments)