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

• 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 ?

First soil survey level I

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

Forest soil condition report

FSCC

FSCC@INBO

Biosoil survey >>
   • Pedological characterisation LI: O, LII: M following FAO guidelines and in buffer zone
   • Particle size distribution <2, 2 – 63, 63 -2000 \( \mu \)m
   • 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

   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
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

- 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 of type C.

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<th>parameter</th>
<th>unit</th>
<th>maximum permissible absolute difference</th>
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#### Between the mineral surface layer and its overlying organic layer

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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)
1st intercalibratration 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
  - **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

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<th>Training course</th>
<th>Year</th>
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<td><strong>EU - Soil classification training course FAO 1989</strong></td>
<td>1995</td>
<td>Gent</td>
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<td><strong>EU – Soil classification training course WRB 1998</strong></td>
<td>2004</td>
<td>Warsaw</td>
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<tr>
<td><strong>Training course on WRB Soil Profile Description and Classification within the BioSoil programme</strong></td>
<td>2005</td>
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<td>Madrid</td>
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<tr>
<td><strong>BioSoil workshop on WRB 2006</strong></td>
<td>2007</td>
<td>Belgium</td>
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More information on 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
• **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
2. Physical and chemical characterisation

2.1. SA01: Pretreatment 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)
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 BaCl₂ 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)