

Forest Condition Monitoring in Finland – National report

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Quality Assurance for laboratory results from Forest Condition Monitoring in Finland

By [Kirsti Derome](#)

Summary

The value of forest monitoring data greatly depends on their quality. Within the ICP Forests Programme, The Working Group on Quality Assurance and Quality Control in Laboratories has been established to improve the comparability and evaluability of the analytical data produced. The most important step in improving quality assurance and control has been the introduction of regular ring tests for water, soil and plant samples. The laboratories of the Finnish Forest Research Institute in Vantaa (foliar, soil, water), Parkano (foliar) and Rovaniemi (soil, water) have regularly participated in the ring tests and gained excellent results.

Background

The overall quality of data collected during ecological monitoring is crucial, especially to integrating the European database and making large-scale assessments. The need for a comprehensive Quality assurance (QA) programme for ecological monitoring has been reported several times (e.g. Ferretti 2009).

Since 2007, a concept for a new QA perspective has been developed and implemented within the ICP Forests (Ferretti et al. 2009). This concept includes four main tasks:

- the revision and harmonisation of the Standard Operative Procedures (i.e. [the ICP Forests Manual 2010](#))
- a new set of Data Quality Requirements (DQRs);
- an extended series of training sessions and
- inter-comparison ring tests. The quality of laboratory work has been developed during this project, particularly with respect to the type of analytics and sample material used. In addition, quality control has been developed for the database, based on a number of checks.

This chapter will focus on the quality of laboratory results with respect to forest condition monitoring.

Quality improvement in the laboratories

The Working Group on Quality Assurance and Quality control in Laboratories was established as part of the ICP Forests programme in 2004. Within this Working Group, laboratory oriented professionals from Expert panels on foliar, soil, deposition and soil solution are working together to improve the comparability and evaluability of the analytical data produced by the ICP Forests programme and the FutMon project.

The aims of this group are

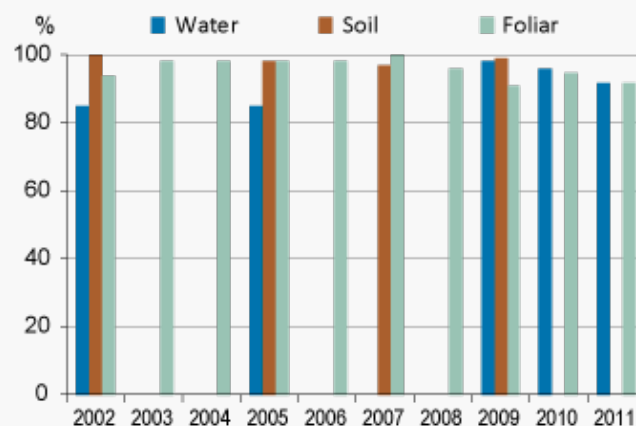
- the evaluation of the analytical methods used, in terms of their comparability and acceptability, and the elimination of unqualified methods
- the amendment of the ICP Forests Manuals with information on methods of sample pre-treatment and analysis
- the development and introduction of new methods of quality control within the laboratories
- the organisation of practical help for laboratories experiencing analytical problems and
- the organisation of ring tests to control the development of quality within the laboratories.

The analytical parts of the ICP Forests manual have been completely revised and unqualified methods eliminated. A review of possible checks and other supporting measures for quality assurance and control in laboratories has been compiled and published. Meetings of the heads of the laboratories have been organised, in order to exchange analytical knowledge and discuss analytical problems and their solutions. An assistance programme has been organised for laboratories with unacceptable ring test results, through co-operation and visits to and from these laboratories. The use of reference methods, various quality checks such as control charts, or ion balance calculations and participation in ring tests, has become mandatory within the ICP Forests programme and the FutMon project. Nowadays, each laboratory involved in the programme must send quality forms containing information on the methods used, on quantification limits, the use of control charts and ring test results, when submitting analytical data to the ICP Forests database.

The most important step in improving quality assurance and control has been the introduction of regular ring tests for water, soil and plant samples. For years previously, foliar and soil ring tests had been conducted more or less regularly, but deposition (esp. throughfall) and soil solution ring tests began as part of the ICP Forests programme. To date, six soil, five water and 14 foliar ring tests have been organised within the ICP Forests and Forest Focus programmes and the EU Life+/- FutMon project. [The results of these ring tests](#) show the development of data quality in the laboratories. In water ring tests, the percentage of results outside the tolerable limits has been reduced from 20–60 % to 5–30 % over eight years. A similar improvement can be seen for the results of the last four soil ring tests, where the coefficient of variation (CV in %) for the results of all participants has been reduced from 15–65 % to 10–35 % over seven years. In the case of the foliar ring tests, the improvement in results stabilised in 2005, where 3–10 % results exceeded the tolerable limits, a level that would be difficult to improve upon.

Ring test results suggest lower comparability and quality of soil analysis data, compared to water and plant analysis data. But it is also clear that the quality of water analyses can still be improved. Regular ring tests therefore remain important to improving the quality of analyses in the ICP Forests programme.

The laboratories of the Finnish Forest Research Institute in Vantaa (foliar, soil, water), Parkano (foliar) and Rovaniemi (soil, water) have participated in the ring tests since the beginning.



Over ten years, the results of these laboratories have been excellent: 85 to 100 % of the results have been acceptable (Fig. 1). The Rovaniemi laboratory has been an organiser of water ring tests, by acquiring, preparing and delivering samples to participants.

Figure 1. The percentage of the acceptable intercalibration results of Metla laboratories (Parkano, Rovaniemi, Vantaa) in Water, Soil and Foliar ring tests of ICP Forests/ FutMon -programmes during the years 2002–2011.

Quality improvement in field measurements

ICP Forests measurements cover approximately 260 variables. Before the FutMon project and the manual revision, 33% of the variables were covered by DQRs. Afterwards, coverage was extended to 66% of the variables. In practical terms, this means that it is now possible to document and report on data quality for 2/3 of the variables measured within the ICP Forests. It is remarkable that field measurements such as tree condition, ground vegetation, litter fall, ozone injury, tree growth and phenology are now covered by explicit DQRs (Ferretti et al. 2011).

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