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COMMISSION REGULATION (EC) No 1091/94

of 29 April 1994

laying down certain detailed rules for the implementation of Council Regulation (EEC) No 3528/86 on the protection of the Community's forests against atmospheric pollution

(OJ L 125, 18.5.1994, p. 1)

Amended by:

		Official Journal		
		No	page	date
►M1	Commission Regulation (EC) No 690/95 of 30 March 1995	L 71	25	31.3.1995
►M2	Commission Regulation (EC) No 1390/97 of 18 July 1997	L 190	3	19.7.1997
►M3	Commission Regulation (EC) No 1545/1999 of 14 July 1999	L 180	9	15.7.1999

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COMMISSION REGULATION (EC) No 1091/94

of 29 April 1994

laying down certain detailed rules for the implementation of Council Regulation (EEC) No 3528/86 on the protection of the Community's forests against atmospheric pollution

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community,

Having regard to Council Regulation (EEC) No 3528/86 of 17 November 1986 on the protection of the Community's forests against atmospheric pollution [1], as last amended by Regulation (EEC) No 2157/92 [2], and in particular Article 3 thereof,

Having regard to Resolution No 1 of the first ministerial conference on the protection of forests in Europe [3] and its follow-up,

Whereas, pursuant to Article 2 (1) indent 3 and 4 of Regulation (EEC) No 3528/86, the purpose of the Community scheme is to help the Member States to:

— conduct intensive, continuous surveillance of forestry ecosystems,

— establish or extend, in a coordinated and harmonious way, a network of permanent observation plots required for such intensive, continuous surveillance;

Whereas, pursuant to Article 2 (2) of Regulation (EEC) No 3528/86 the Member States shall forward to the Commission the data gathered by the network of observation plots for intensive, continuous suveillance;

Whereas this network of observation plots is installed in order to obtain detailed data on the evolution of forest ecosystems in the Community; whereas this approach allows correlations to be established between the variation of environmental factors, especially atmospheric pollution and the reaction of forest ecosystems; whereas the data it provides, allows a better interpretation of the findings derived from the systematic network of observation plots as specified in Commission Regulation (EEC) No 1696/87 [4], as last amended by Regulation (EEC) No 836/94 [5];

Whereas applications for aid submitted under Regulation (EEC) No 3528/86 for the purpose of carrying out an intensive, continuous surveillance referred to in Article 2 (1) should contain all the information needed for an examination of these measures in the light of the objectives and criteria of that Regulation; whereas this information should be presented in a standardized form to facilitate examination and a comparison of applications;

Whereas the measures provided for in this Regulation are in accordance with the opinion of the Standing Forestry Committee,

HAS ADOPTED THIS REGULATION:

Article 1

1. A network of permanent observation plots shall be installed by the Member States. By 30 June 1994, the selection of the plots shall be completed and over 50 % of the plots shall be installed, according to the common methods for the establishment of a network of permanent observation plots for intensive, continuous monitoring (see Annex I). The last plots shall be installed before 30 June 1995. For all plots the Member States shall forward to the Commission by 15 December 1994 a

(1) OJ No L 326, 21. 11. 1986, p. 2.
(2) OJ No L 217, 31. 7. 1992, p. 1.
(3) December 1990, Strasbourg.
(4) OJ No L 161, 10. 6. 1987, p. 1.
(5) OJ No L 97, 15. 4. 1994, p. 4.

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review of the selection criteria and a complete list of the selected plots, including basic information such as location (longitude, latitude, altitude) and species, as well as the general plot information for each installed observation plot in a standardized form as specified in Annex VIIa.

►M2 2. ◄ ►M3 On the permanent observation plots intensive and continuous surveillance of the forest ecosystems shall be carried out. This contains the continuous inventory on the crown condition, the inventory of soil and foliar condition and measurements on increment changes, deposition rates, meteorology, soil solution sampling and analysis and ground vegetation assessment in accordance with objective sampling methods and analysed in accordance with established methods ◄.

▼M2

3. Member States shall forward to the Commission in standardized form before the end of every year at least all data measured during the year before for each permanent observation plot as specified in Annex VIIa together with a data accompanying report as specified in Annex VIIb. In addition, an annual progress report on evaluations and interpretations of results carried out on national level shall be forwarded to the Commission before 31 December every year as specified in Annex VIIb.

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►M2 4. ◄ ►M3 Technical details pertaining to the provisions of this Article are set out in Annexes III to XI ◄.

Article 2

1. Applications for aid from the Community:

— to establish or extend the network of permanent observation plots for the intensive and continuous surveillance,

— to carry out the inventory of crown condition,

— to carry out the soil inventory,

— to carry out the foliage inventory,

— to carry out the increment measurements,

— to carry out the deposition measurements,

— to carry out the meteorological measurements,

▼M2

— to carry out the sampling and analysis of soil solution,and

▼M3

— to carry out the assessment of ground vegetation,

▼B

within the meaning of Article 2 (1) of Regulation (EEC) No 3528/86 shall contain the information and documents specified in Annex II to this Regulation.

Applications shall be submitted in triplicate and in accordance with Annex II.

Member States shall submit applications to the Commission before 1 November each year in respect for the following year.

2. Applications not meeting the requirements set out in paragraph 1 of this Article shall not be considered.

Article 3

This Regulation shall enter into force on the third day following its publication in the *Official Journal of the European Communities*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

▼M3

ANNEX I

COMMON METHODS FOR THE ESTABLISHMENT OF A NETWORK OF PERMANENT OBSERVATION PLOTS FOR INTENSIVE, CONTINUOUS MONITORING

(Article 2(1) of Regulation (EEC) No 3528/86 and its amendments)

I. **General remarks**

The purpose of the scheme mentioned in Article 2(1) to Regulation 3528/86 and its amendments is to establish a network of permanent observation plots in the Member States of the Community and to collect data by intensive and continuous surveillance.

The objectives of the scheme are:

— to conduct an intensive and continuous monitoring of forest ecosystems in relation to the damage caused by atmospheric pollution and other factors influencing forest condition,

— to improve the understanding of the causal relationship between changes in forest ecosystem and the factors influencing it especially atmospheric pollution, by concentrating at a single location various measurements and monitoring of forest ecosystems and its components,

— to obtain relevant information on the evolution of a number of forest ecosystems in the Community.

II. **Establishment of the network of permanent observation plots**

II.1. *Selection of plots*

Member States selected by 30 June 1994 a sufficiently large number of permanent observation plots in their country. Since then some Member States have completed their national intensive monitoring programme by additional plots. The maximum number of these plots should be in principle limited for each Member State up to 15 plots, but Member States are allowed to select a larger number of plots under the condition that the number will not exceed 20 % of the number of national plots of the Community's 16 x 16 km gridnet (Regulation (EEC) No 1696/87).

The selection of these plots are in the responsibility of the Member States, although the following criteria for the selection should be applied:

— the plots should be located in such a way that the more important forest species and more widespread growing conditions in the respective country are represented,

— the minimum size of a plot shall be 0,25 hectares measured on a horizontal plane,

— to minimise the effects from activities on surrounding areas the plot shall be surrounded by a buffer zone. The actual width of the zone depends on the type and age of the forest. If the area of the plot and its surroundings is uniform with regard to height and age structure, the width of the buffer zone can be restricted to 5 or 10 m. If the forest area in which the plot is located consists of mixed stands, different species or age structure, the buffer zone shall be enlarged to up to five times the potential maximum height of the forest in the plot,

— as the plot will have to be available for long duration monitoring, it is necessary that the corners and/or boundaries are clearly marked and that each sample tree in the plot is numbered in a permanent way,

— the plots should be easily accessible at all times and no restriction with regard to the access and sampling should exist,

— there should be no differences in the management of the plot, its buffer zone and the surrounding forest (e.g. management operations should be comparable), and disturbances caused by the monitoring should be kept to a minimum),

— direct pollution from known local sources should be avoided. Plots should not be located in the immediate vicinity of farms, very close to main roads or in direct vicinity of polluting industries,

▼M3

— a sufficient number of trees should be available for sampling in or near the plot,

— the plots and the buffer zone should be as uniform as possible regarding, e.g. species or species mixture, age, size, soil and slope,

— the plots should be located sufficiently far away from the forest edge.

It is recommended to select plots which have been monitored in recent years within the framework of Regulation (EEC) No 3528/86 or other programmes. When additional plots have to be selected it is recommended that plots are identical to or located near one of the existing plots of the Community's 16 x 16 km network and that plots are located in such a way that information from other sources (e.g. meteorological stations) can be used.

II.2. *Installation and documentation of the plot*

Member States submitted to the Commission in 1994 the general data and a detailed description of each plot.

The detailed description of the plot includes; the exact location of the plot, a sketch map showing the permanent marking other plot corners and/or boundaries, the number of trees in the plot and any other relevant permanent elements in or near the plot (e.g. access road, rivers). In the future, the exact location of sample sites (e.g. soil pits) shall also be recorded on this map.

II.3. *Definition of a subplot*

In principle all trees in the total plot are to be included in the sample for the tree assessment (e.g. crown inventory, increment assessment). Where the plot has many trees (i.e. dense stands), a subplot may be defined to be used for these surveys. The size of the subplot at the time of the installation of the plot should be large enough to give reliable estimates for these surveys for a minimum of 20 years, preferably throughout the life of the stand. A minimum of at least 20 trees in the subplot should be available in this period.

II.4. *General information on each plot*

The following general information on each permanent observation plot for intensive and continuous monitoring shall be collected during the installation and the first surveys:

Installation	First surveys
— Descriptive code	
	Country
	Observation plot number
	Actual latitude and longitude
— Site data	
	Altitude
	Orientation
	Total plot size
	Number of trees in plot
	Subplot (if any)
	availability of water to the principal species
	humus type
	soil unit (estimate)
— Stand data	
	Mean age of dominant storey,
	Main tree species
	Yield (estimate)

▼M3

Installation	First surveys
— Other observation	History of the plot Other monitoring station situated nearby

Where additional plots are installed in order to complete the national intensive monitoring programme the Member States shall forward to the Commission for each installed plot the information collected during the installation using a datafile (see Annex VIIa, Form la) and reports (see Annex VIIa, Form 1b) by the end of the same year in which (re-)installation took place. Important information obtained during the years of monitoring shall be submitted yearly using Forms 1a and 1b (Annex VII). The other information shall be submitted immediately after the first relevant survey has been carried out and will be updated when necessary.

III. **Replacement of destroyed plots**

III.1. *General remarks*

The selection of the plots for intensive monitoring is the responsibility of Member States. For this selection a number of criteria is laid down in this Annex. Most Member States have developed their own strategy for monitoring their national forest ecosystems, aiming at the observation of the more important tree species and growing conditions.

Although the plots were to be selected to be available for long term monitoring a premature destruction of the plot is always possible, due to fire etc. In some cases a number of final samplings can still be carried out before all trees of the plot have disappeared. The next step would be to review the strategy behind the selection criteria and to decide what criteria are to be applied to the selection procedure of the new plot.

III.2. *Closure of a plot*

The opportunity should be taken to make some final measurements/assessments. If still possible before the (final) destruction of the plot, a (destructive) sampling of the monitored trees in the plot can be made. After felling the exact tree length can be measured, stemdisks can be taken and precise foliar sampling can be carried out.

III.3. *Strategy*

The monitoring strategy in most Member States includes aspects on the forest area, forest ecosystem, species and often aspects of soil, meteorology and deposition levels. When a plot needs to be replaced the opportunity should be taken to verify whether the original strategy is still valid and how the gap can best be filled. In this context it should be considered that besides the original surveys (crown condition, soil, foliar and increment) additional surveys have been added to the programme in recent years (deposition, meteorology, soil solution, ground vegetation, remote sensing [1]). It is therefore recommended to take into account the evolution of the intensive monitoring programme when planning the replacement of plots.

In general, however, it might be advisable that the new plots are situated in the same region and have the same soil type, deposition level and tree species as the destroyed plots.

III.4. *Reinstallation of the plot*

For the selection of new plots the same criteria apply as for the destroyed plots. After installation of new plots some surveys, which are not repeated quickly should be carried out as soon as possible (i.e. soil and remote sensing). As the crown condition and foliage surveys are done yearly or two-yearly no additional survey of this kind directly after plot installation is necessary. Where the next regular increment survey is scheduled more

[1] The technical details for the optional application of aerial photography on intensive monitoring plots are laid down in the Manual on remote sensing applications edited by the European Commission.

▼M3

than three years after plot installation increment measurements should be carried out directly after plot installation.

III.5. *Special attention points*

The reinstalled plots will be given a new number. Member States will submit to the Commission together with the next regular data submission information on the reason for the plot replacement, the results of last observations/measurements made and the criteria applied for the selection of the new plots.

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ANNEX II

APPLICATION FOR AID FROM THE COMMUNITY IN RESPECT OF THE MEASURES TO BE CARRIED OUT PURSUANT TO ARTICLE 2 OF REGULATION (EEC) No 3528/86 AND ITS AMENDMENTS

Applications for aid must be presented in accordance with Annex A to Commission Regulation (EEC) No 526/87 ([1]) together with a summary of the information listed below and the completed table as included in this Annex as form 2a.

For each of the measures to be carried out in accordance to Article 2, information on the following items shall be given:

1. *Brief description of the measures*

2. *Applicant*

   Links between the applicant and the measures

3. *Agency responsible for carrying out the measures*

   Object and scope of the agency's main activities

4. *Detailed description of the measures*

   where:

   (a) the measures relate to establishing or extending the network of permanent observation plots for the intensive and continuous surveillance:

      1. description of existing situation

      2. geographical location and area of the region(s) concerned (plus cartographical document)

      3. number of permanent observation plots;

   (b) the measures relate to the establishment and execution of an inventory of the crown condition on the permanent observation plots:

      1. description of existing situation

      2. number of observation plots, which are be included in the the crown condition inventory (form 2a)

      3. detailed description of the sampling procedure used at plot level (number of trees, markings, etc.)

      4. indication of timetable for the execution of the projected measures (form 2b);

   (c) the measures relate to the establishment and execution of an inventory of the soil condition on the permanent observation plots:

      1. description of the existing situation

      2. Number of permanent observation plots, which are to be included in the soil condition inventory (form 2a)

      3. detailed description of the sampling procedures used at plot level (number of single samples, soil profile description, etc.)

      4. detailed description of parameters to be determined and the analysis methods to be applied including a clear description of any calibration, correction, and/or recalculation needed to make the results compatible with the results analysed according to the approved methods

      5. indication of the timetable for the execution of the projected measures (form 2b);

   (d) the measures relate to the establishment and execution of an inventory of the foliar condition on the permanent observation plots:

      1. description of the existing situation

      2. number of permanent observation plots, which are to be included in the foliar condition inventory (form 2a)

      3. detailed description of the sampling procedures used at plot level (number of single samples, description, etc.)

([1]) OJ L 53, 21.2.1987, p. 14.

▼M3

4. detailed description of parameters to be determined and the analysis methods to be applied including a clear description of any calibration, correction, and/or recalculation needed to make the results compatible

5. indication of the timetable for the execution of the projected measures (form 2b);

(e) the mesures relate to the establishment and execution of the measurements of increment changes on the permanent observation plots:

1. description of the existing situation

2. number of permanent observation plots, which are to be included for the increment measurements (form 2a)

3. detailed description of the measurement procedures used at plot level (number of measurements, description, etc.)

4. detailed description of parameters to be determined and the analysis methods to be applied including a clear description of any calibration, correction, and/or recalculation needed to make the results compatible with the results analysed according to the approved methods

5. indication of the timetable for the execution of the projected measures (form 2b);

(f) the measures relate to the establishment and execution of the measurements of deposition rates on the permanent observation plots:

1. description of the existing situation

2. number of permanent observation plots, which are to be included for the deposition measurements (form 2a)

3. detailed description of the measurement procedures used at plot level (number of measurements, description, etc.)

4. detailed description of parameters to be determined and the analysis methods to be applied including a clear description of any calibration, correction, and/or recalculation needed to make the results compatible with the results analysed according to the approved methods

5. indication of the timetable for the execution of the projected measures (form 2b);

(g) the measures relate to the establishment and execution of the meteorological measurements on the permanent observation plots:

1. description of the existing situation

2. number of permanent observation plots, which are to be included for the meteorological measurements (form 2a)

3. detailed description of the measurement procedures used at plot level (number of measurements, description, etc.)

4. detailed description of parameters to be determined and the analysis methods to be applied including a clear description of any calibration, correction, and/or recalculation needed to make the results compatible with the results analysed according to the approved methods

5. indication of the timetable for the execution of the projected measures (form 2b);

(h) the measures relate to the establishment and execution of the measurements of soil solution on the permanent observation plots:

1. description of the existing situation

2. number of permanent observation plots, which are to be included for the measurements of soil solution (form 2a)

3. detailed description of the measurement procedures used at plot level (number of measurements, description, etc.)

4. detailed description of parameters to be determined and the analysis methods to be applied including a clear description of any calibration, correction, and/or recalculation needed to make the results compatible with the results analysed according to the approved methods

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5. indication of the timetable for the execution of the projected measures (form 2b);

(i) the measures relate to the establishment and execution of an assessment of the ground vegetation on the permanent observation plots:

1. description of the existing situation

2. number of permanent observation plots, which are to be included in the ground vegetation assessment (form 2a)

3. detailed description of the sampling procedures used at plot level (number of sub-samples, description, etc.)

4. detailed description of parameters to be determined and the analysis methods to be applied including a clear description of any calibration, correction, and/or recalculation needed to make the results compatible

5. indication of the timetable for the execution of the projected measures (form 2b).

5. Cost of measures under 4(a) to 4(i) (form 2a)

1. Costs for the establishment or extending the network (4a)

1.1. costs per plot

1.2. total costs

1.3. aid applied for from the Community

2. Costs of establishment, observation or sampling for each survey 4(b) to 4(i)

2.1. costs per plot

2.2. total costs

2.3. aid applied for from the Community

3. Costs of analysis and evaluation for each survey 4(b) to 4(i)

3.1. costs per plot

3.2. total costs

3.3. aid applied for from the Community

4. Total project costs (sum of costs for 1.2 (establishment), 2.2 (observations and/or sampling), and 3.2 (analysis and evaluation))

5. Total aid applied for from the Community (sum of costs for 1.3 (establishment), 2.3 (observations and/or sampling), and 3.3 (analysis and evaluation))

6. Complete forms 2a and 2b

Date and signature

Form 2a

COST BREAKDOWN AND PROPOSED FINANCING *(intensive monitoring)*

Measure	Number of intensive monitoring plots	Cost breakdown					Total cost	Non-Community participation				aid requested
		Personnel	Equipment	Materials	Travel	Other		State	Region	Other public funds	Private	
		(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
To install and maintain plots for intensive monitoring												
To establish and execute an inventory of the crown condition												
To establish and execute an inventory of the forest soil condition												
To establish and execute a survey on the chemical contents in the needles and leaves												
To establishment and execute increment-change measurements												
To establish and execute deposition monitoring												
To establish and execute meteorologic monitoring												
To establish and execute soil solution monitoring												
To establish and execute ground vegetation surveys												
To apply aerial photography techniques (2)												
Integrated data management and data evaluation												

(1) In national currency.
(2) Reference is made to the manual on Remote sensing applications edited by the European Commission.

Form 2b

FORWARD PLAN FOR THE EXECUTION OF THE PROJECT

to be completed for each project proposal

	Year	200.												200.												200.											
Measures	Month	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
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ANNEX III

COMMON METHODS FOR THE INVENTORY OF THE CROWN CONDITION ON THE PERMANENT OBSERVATION PLOTS

I. **General remarks**

The inventory shall be carried out on all permanent observation plots in 1994 and shall be repeated annually.

II. **Inventory methodology**

II.1. *Selection of sample trees*

In principle all pre-dominant, dominant and co-dominant trees (Kraft: class 1 to 3) in the total plot are to be monitored. In the case that the plot has many trees (e.g. dense stands), the number of sample trees for the crown assessment could be reduced by using a sub-plot (see Annex I (II.3)). In the case of a sub-plot all the pre-dominant, dominant and co-dominant trees (Kraft: class 1 to 3) in the sub-plot are to be monitored. In certain cases it could be allowed that a different, but objective and unbiased system is used to reduce or to select the number of trees to be sampled. The same methods shall be applied every year and a minimum of 20 trees shall be assessed each survey.

II.2. *Date of assessment*

The inventory is to be undertaken between the end of the formation of new needles and leaves and before the autumnal leaf discolouration.

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II.3. *General background information*

The following plot and tree information shall be collected:

— plot number,

— exposure,

— tree number,

— information on removals and mortality,

— tree species,

— social class,

— crown shading,

— visibility,

and the date of assessment.

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II.4. *Assessment of sample trees*

1. Visual assessment of defoliation

Defoliation shall be estimated in 5 % steps in relation to a tree with full foliage in local condition. The classification of trees into degrees of defoliation shall be carried out during the observation and shall be registered in 5 % steps.

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A tree with between 95 % and 100 % defoliation, which is still alive, is scored as 99. The score 100 is reserved for dead trees.

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2. Visual assessment of discolouration

The classification of trees into degrees of discolouration shall be carried out after the observations have been made.

The degrees of discolouration are defined as follows:

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Class	Discolouration	Indicative percentage of leaves discoloured
0	None or negligible	0—10
1	Slight discolouration	11—25
2	Moderate discolouration	26—60
3	Severe discolouration	> 60
4	Dead	

3. Additional parameters

The additional parameters are listed below:

— damage due to easily identifiable causes (insect, fungi, abiotic agents…),

— identification of damage type,

— observations on the tree in the plot.

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II.5. *Methods*

In the sub-manual on visual assessment of tree condition on intensive monitoring plots (ICP Forests) additional details on the selection of trees and the execution of assessments are laid down. Moreover, the sub-manual contains technical information on the additional parameters to be assessed as well as on the submission of these parameters. It is advised to follow the technical details laid down in this sub-manual and to submit on optional basis the results of the assessments of the optional parameters to the Commission by applying the relevant details of the sub-manual.

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►M2 II.6. ◄ ►M1 *Data transfer*

The Member States shall forward to the Commission for each plot this information in standardized forms (see Annex VII, Form 3a and 3b). ◄

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ANNEX IV

COMMON METHODS FOR THE SOIL INVENTORY ON THE PERMANENT OBSERVATION PLOTS

I. General remarks

The inventory is to be carried out on all permanent observation plots in the period between 1994 and 1996. Soil condition data, which were collected and analysed before 1994, but after 1 January 1991 could also be used if the methods as described below have been applied. The inventory will be repeated on each individual sample plot every 10 years. This Annex is based on results of the soil expert panel of UN-ECE/ICP on assessment and monitoring of air pollution effects on forests (ICP forests). Reference is made to the manual (1992) prepared by this expert panel. After two sampling periods a review of the parameters to be analysed in future soil samples shall be made.

II. Inventory methodology

II.1. *Selection of sample location*

Soil samples will be statistically representative for the situation of the plot. The soil samples will be collected from a profile pit and/or taken from bores. Care should be taken to avoid any disturbance of roots belonging to sample trees.

II.2. *General background information*

The following general information shall be collected:

— plot number,

— date of sampling and analysis.

II.3. *Pedological and physical characterization of the sample plots*

A pedological characterization shall be made for each sample plot. It is advised to make the profile description according to the FAO-guidelines (*FAO guidelines for soil description*, third edition (revised), Rome 1990) in the buffer zone. Care should be taken that the profile description(s) is/are made on a location which is representative for the actual sampling area. It is recommended that the dry bulk density is determined from undisturbed soil to enable the calculation of the total nutrient contents. If the dry bulk density is not determined, a reasonable estimate of this parameter should be made. The determination of the soil granulometry is mandatory. The particle size fractions are: < 2 μm, 2-63 μm, 63-2000 μm (FAO). If 50 μm is used to separate silt and sand fractions, conversion to 63 μm limit has to be done.

II.4. *Method of sampling*

The soil samples shall be collected by depth or by horizon. For every sampled layer or horizon, at least one representative composite sample will be collected or several samples; the number of subsamples collected for the composite sample and the sampling date shall be reported.

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The organic layers (O- and H-)(*) are sampled separately. In case the sampling is done by fixed depth, the following layers are to be used:

— 0 — 10 cm (it is advised to sample 0 — 5 and 5 — 10 separately),

— 10 — 20 cm,

— 20 — 40 cm,

— 40 — 80 cm.

II.5. *Transport storage and preparation*

The samples shall be transported and stored in such a way that chemical changes are minimized. The procedures of this transport and storage (including waiting periods) shall be reported. Where applicable the problems and deviations of these procedures shall be reported in detail. It is advised to store part of the sample in a soil bank for comparative use with future sampling (e. g in 10 years). Before the samples are analysed the samples have to be prepared. Large items (> 2 mm) have to be removed, the samples have to be dried (at a maximum of 40 °C), and milled or sieved.

II.6. *Analysis methods*

In the 'Manual on methodologies of forest soil sampling and analysis' prepared by the soil expert panel of the ICP forests, the approved methods for the analysis of the various soil parameters are described. It is advised to use the approved methods. In case other (national) methods are applied, the comparability of the analysis results shall be reported in detail together with the presentation of the analysis results. The inventory of the forest soil condition will distinguish between mandatory and optional parameters (see list).

Mandatory and optional parameters and their respective approved method for analysis:

Parameter	Units	H/O	Min	Approved methods	Remarks
pH ($CaCl_2$)		Mandatory	Mandatory	Labex 8703-01-1-1 and ISO/TC190/SC3/GT8	
Carbon organic (C-org)	(g/kg)	Mandatory	Mandatory	Dry combustion	
Nitrogen (N)	(g/kg)	Mandatory	Mandatory	Dry combustion	
Phosphorus (P)	(mg/kg)	Mandatory	Optional	Extractant: aqua regia	
Potassium (K)	(mg/kg)	Mandatory	Optional	Extractant: aqua regia	
Calcium (Ca)	(mg/kg)	Mandatory	Optional	Extractant: aqua regia	
Magnesium (Mg)	(mg/kg)	Mandatory	Optional	Extractant: aqua regia	
Organic layer (OrgLay)	(kg/m^2)	Mandatory		Volume (cylindric)-dry-weight	
Calcium carbonate ($CaCO_3$)	(g/kg)	Optional	Mandatory	AFNOR X 31-105	if pH ($CaCl_2$) > 6
Exchangeable acidity (Ac-Exc)	($cmol^+/kg$)	Optional	Mandatory	Titration	

(*) The soil expert panel of the UN-ECE/ICP has agreed to use the definitions as given in the FAO-guidelines for soil description (1990), and the definitions of the organic layers (O- and H-) are as follows:

H-horizons or layers: layers dominated by organic material, formed from accumulations of undecomposed or partially decomposed organic material at the soil surface which may be underwater. All H-horizons are saturated with water for prolonged periods or were once saturated but are now artificially drained. An H-horizon may be on the top of mineral soils or at any depth beneath the surface if it is buried.

O-horizons or layers: layers dominated by organic material, consisting of undecomposed or partially decomposed litter, such as leaves, needles, twigs, moss and lichens, which has accumulated on the surface; they may be on top of either mineral or organic soils. O-horizons are not saturated with water for prolonged periods. The mineral fraction of such material is only a small percentage of the volume of the material and generally is much less than half of the weight. An O-layer may be at the surface of a soil or at any depth beneath the surface if it is buried. An horizon formed by illuviation of organic material into a mineral subsoil is not an O-horizon, though some horizons formed in this matter contain much organic matter.

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Parameter	Units	H/O	Min	Approved methods	Remarks
Base cations exchangeable (BCE)	($cmol^+/kg$))	Optional	Mandatory	Extractant: $BaCl_2$	
Acid cations exchangeable (ACE)	($cmol^+/kg$)	Optional	Mandatory	Extractant: $BaCl_2$	
Cation exchange capacity (CEC)	($cmol^+/kg$)	Optional	Mandatory	Bascomb	
Base saturation (BaseSat)	(%)	Optional	Mandatory	Labex L8703-26-1-1	
Sodium (Na)	(mg/kg)	Optional	Optional	Extractant: aqua regia	
Aluminium (Al)	(mg/kg)	Optional	Optional	Extractant: aqua regia	
Iron (Fe)	(mg/kg)	Optional	Optional	Extractant: aqua regia	
Chromium (Cr)	(mg/kg)	Optional		Extractant: aqua regia	
Nickel (Ni)	(mg/kg)	Optional		Extractant: aqua regia	
Manganese (Mn)	(mg/kg)	Optional	Optional	Extractant: aqua regia	
Zinc (Zn)	(mg/kg)	Optional	Optional	Extractant: aqua regia	
Copper (Cu)	(mg/kg)	Optional	Optional	Extractant: aqua regia	
Lead (Pb)	(mg/kg)	Optional	Optional	Extractant: aqua regia	
Cadmium (Cd)	(mg/kg)	Optional	Optional	Extractant: aqua regia	
Mercurium (Hg)	(mg/kg)	Optional		Extractant: aqua regia	
Sulphur (S)	(mg/kg)	Optional	Optional	Extractant: aqua regia	
pH (H_2O)		Optional	Optional	pH-electrode	
Electric conductivity (EC)	(mS/m)	Optional	Optional	EC-metre	

Member States are free to analyse more, all, or part of the optional parameters.

II.7. *Data transfer*

The Member States shall forward to the Commission for each plot this information in a standardized form (see Annex VII, Form 4a, 4b, and 4c).

▼B

ANNEX V

COMMON METHODS FOR THE FOLIAGE INVENTORY ON THE PERMANENT OBSERVATION PLOTS

I. General remarks

The inventory is to be carried out on all permanent observation plots. The first common inventory shall be completed before the summer of 1996. Although it is recommended to carry out the foliage inventory in the indicated periods of summer 1995 and winter 1995/96, it could be allowed that the inventory is split over two years. The inventory will be repeated on each individual plot in a two year interval. The following technical details are based on the results of the expert panel for foliar analysis of ICP forests. Reference is made to the manual (1993) prepared by this expert panel.

II. Inventory methodology

II.1. *Date of sampling*

Deciduous species (including larch): sampling must be done when the new leaves are fully developed, and before the very beginning of the autumnal yellowing and senescence. Evergreen species: sampling must be done during the dormancy period. Member States are requested to define for each region, and inside each region for plains and mountains, the most convenient period for the sampling and analysis of the various species, and to keep to this period.

II.2. *Selection of trees*

Every second year, at least five trees of each main species present in the plot are sampled.

The number of trees needed for the sampling are selected in such a way that:

— the trees are different from those used for the crown assessment, in order to avoid that successive samplings introduce loss of foliage,

— in case the vitality assessment is restricted to the trees in the sub-plot, the trees for the foliage sampling shall be selected from the remaining part of the total plot. If no sub-plot is used the trees for sampling shall be selected from the trees in the buffer zone. In this case the trees selected for sampling in the buffer zone shall be given a special number (see Annex VII),

— the trees belong to the predominant and dominant classes (forest with closed canopy) or to the trees with average height ± 20 % (forest with open canopy),

— the trees are in the vicinity of the locations where soil samples were taken for anaylsis; however care must be taken that the main roots of the sample trees have not been damaged by soil sampling,

— the trees are representative of the mean defoliation level of the plot (± 5 % of the mean foliage loss),

— the trees are representative of the sanitary status of the plot.

The same sample trees shall be sampled over the years; the trees must be numbered. For species with small crowns and too few needles (or leaves) per year, it is allowed (but not recommended) to alternate between two sets of five trees, when necessry to avoid damage to the sample trees. Each set mut respond to the above conditions.

Only trees of the main species of the Community are to be sampled (see Annex VII, item 15).

Trees which are used for the sampling of foliage, shall be assessed on crown condition (see Annex III), using the existing or the specially assigned numbers.

II.3. *General background information*

The following information shall be collected:

— plot number,

— data of sampling and analysis;

▼B

— tree species.

II.4. *Selection and quantity of leaves and needles*

The trees in the plot cannot be felled, which may influence the sampling method of leaves or needles. It is important that sampled leaves or needles have developed in full light. Generally speaking the current year needles or leaves of evergreen species are most convenient for judging the nutrition level but, for a number of elements, comparing element concentration in older needles with that in current year needles may be interesting.

The sampled leaves or needles must be taken from the upper third of crown, but not from the very first whorls in the conifers; in stands where the different whorls can be clearly identified, it is advisable to sample between the seventh and the 15th whorl.

For deciduous species, sampling is done on current year leaves or needles.

For evergreen species, sampling of both the current year needles or leaves and the second year needles or leaves (current + 1) is recommended.

For all species it is necessary to take care that leaves or needles which are sampled are mature ones, especially for species which have several flushes per year (e.g. *Pinus Halepensis, Pseudotsuga menziesii, Eucalyptus sp. Quercus sp.*, For *Larix sp.* and *Cedrus sp.* samples are taken of the short twigs of the previous year.

In general sampling must be carried out in such a way that all the orientations are represented in the set of sample trees. If necessary it is allowed to sample different orientations on each tree of the sample set. In special sites with evident influence of one orientation (e.g. steep slopes or strong dominant wind) only one orientation is sampled, which always has to be the same. In such cases, it is necessary to document the orientation.

For the analysis of major elements and Fe, Mn, Zn, Cu, the recommended quantity is 30 grams of fresh needles or leaves for each sampled age class.

Each country may decide to sample a larger quantity of leaf material, according to the need of its own analytical methods, or in order to conserve samples for the future.

II.5. *Means of sampling*

As trees cannot be felled, any convenient way of sampling, taking into consideration kind and size of stands etc., is acceptable, provided that it does not lead to contamination of the sample, to heavy tree damage, or to risks for the sampling team.

II.6. *Pretreatment before sending the samples to the laboratories for analysis*

At least five trees of each main species present in the plot are sampled; the five samples are individually preserved in bags; for analysis, a composite sample is made by mixing equal quantities of each of the five samples (in case the five trees are analysed individually, the mean value is calculated for each element).

For broadleaves, it may be advisable to detach the leaves from the twigs (and even, in certain species, the small leaves from the axis) bus this is not necessary for the conifer needles. The shoots of the current year and those of the second year are separated and preserved in separate bags. The use ofpierced high density polyethylene bags is recommended. If possible, samples are dried in a clean room and stored in a cool place in pierced polyethylene bags.

Great care must be taken to clearly mark each sample (forest, number of plot, species, age of needles, etc.) before sending it to the laboratory for analysis. These identifications must be given outside the bag (directly on the bag by indelible ink, or by clasping a label on the bag). It is recommended to repeat these identifications inside the bag on a paper label written with indelible ink. The label should be folded in order to avoid leaves or needle contamination by contact with ink.

II.7. *Treatment before analysis*

The determination of the mass of 100 leaves or 1 000 needles, as well as the shoot mass, are recommended for the intensive and continuous surveillance on the permanent observation plots and the current year shoot.

It is not necessary to cut the petioles of the leaves but in case of compound leaves it may be advisable to detach the small leaves from the axis if this has not been done in the forest. To avoid contamination, no powdered plastic gloves shall be used.

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It is not necessry to systematically wash the samples, but it may be advisable in regions with a high level of air pollution or near the sea. The samples shall be washed with water without any additions.

Oven drying must be done at no more than 80 °C for at least 24 hours. The needles shall be removed from the twigs with the same precautions as for detaching the small leaves from their axis.

Dry samples shall be ground in order to obtain a fine powder, as homogeneous as possible. There will always remain some fibres, depending on the tree species; this is not a major inconvenience if they are small and if the powder is mixed carefully before taking samples for analysis. For Mn, Fe, Cu, Cd, Al and Pb determination, it has to be assured that the grinder does not contaminate the samples. The grinder may be tested by grinding dried fibrous cellulose and analysing it for these elements before and after the grinding.

II.8. *Chemical analyses*

Only the total element concentration is determined.

In the 'Manual on methodologies for leaf and needle sampling and analyses' prepared by the foliar expert panel of the ICP forests, the indicative methods for the analysis of the various foliar parameters are described.

Each country is allowed to use its national methods. But is is necessary to compare the total element concentrations obtained by national methods with those certified on the reference standard samples. The foliage inventory will distinguish between mandatory and optional parameters (see list below).

Parameters

Mandatory parameters	Optional parameters
Nitrogen (N)	Sodium (Na)
Sulphur (S)	Zinc (Zn)
Phosphorus (P)	Manganese (Mn)
Calcium (Ca)	Iron (Fe)
Magnesium (Mg)	Copper (Cu)
Potassium (K)	Lead (Pb)
	Aluminium (Al)
	Borium (B)

Member States are free to analyse more, all, or part of the optional parameters.

II.9. *Data transfer*

The Member States shall forward to the Commission for each plot this information in a standardized form (see Annex VII, Form 5a, 5b, and 5c).

▼B

ANNEX VI

COMMON METHODS FOR INCREMENT CHANGE MEASUREMENTS ON THE PERMANENT OBSERVATION PLOTS

I. General remarks

The first measurement is to be carried out on all permanent observation plots in the period 1994 until 1996.

The measurement of the growth is divided into two parts:

— periodic measurements on tree parameters,

— tree ring analysis by means of increment cores and stem discs (optional).

The periodic measurements will be repeated on each individual plot in the dormancy period 1999 to 2000 and will then be repeated in a five year interval. The sampling and analysis of increment cores and stem discs could be carried out once preferably during the installation or soon after.

The following technical details are based on the results of the expert panel on increment of ICP forests. Reference is made to the manual prepared by this expert panel.

The methodologies described here are inappropriate for maquis and similar vegetation types.

II. Inventory methodology

II.1. *Date of measurements*

Measurements should be done during the dormancy period.

II.2. *Selection of sample trees*

In principle all trees in the total plot are to be monitored. In the case that the plot has many trees (e.g. dense stands), a sub-plot may have been defined to be used for the tree assessment (e.g. crown assessment and increment). In this case the trees in the sub-plot are to be monitored. The size of the sub-plot at the time of the inventory should be large enough to give reliable estimates for stand increment over the entire measurement period. The exact size of this sub-plot shall be determined and reported.

II.3. *Methods*

Periodic measurements

Every five years, all trees in the (sub-)plot are measured.

Tree ring analysis (increment cores and stem disc)

As the sampling of increment cores could influence other measurements these samples are taken from trees outside the plot. As trees for stem disc sampling have to be felled, the trees selected have to be so far away from the plot that no effects of this removal can affect the monitored trees in the plot. At the same time the sample trees shall be representative to the trees in the plot. Whenever possible, maximum use shall be made of trees felled during normal management operations.

II.4. *General background information*

The following information shall be collected:

— plot number,

— data of sampling and analysis,

— tree number.

▼B

II.5. *Parameters to be measured*

	Mandatory parameters	Optional parameters
Periodic measurements	Tree species Diameter at breast height (DBH) Information on management operations	Bark Tree height Crown height Crown width Volume estimates
Tree ring analysis		Ring width History of the tree diameter under bark in five years intervals Basal area and volume estimates

Member States are free to analyse more, or part of the optional parameters.

Member States are allowed to use their own national system and methods. Suggested methods and details on measurements procedures are described in the 'Submanual on increment' prepared by the increment panel of the ICP forests.

II.6. *Data transfer*

The Member States shall forward to the Commission for each plot this information in a standardized form (see Annex VII, Forms 6a, 6b, 6c and 6d).

▼B

ANNEX VII

COMMON GUIDELINES FOR THE REPORTING OF THE RESULTS OF THE SURVEILLANCE ON THE PERMANENT OBSERVATION PLOTS AND THEIR INTERPRETATION

I. General remarks

The purpose of the network of permanent observation plots is to obtain detailed data on the evolution of forest ecosystems in the Community and to try to correlate the variation of environmental factors, especially atmospheric pollution, and the reaction of the forest ecosystems.

This purpose can only be reached by evaluating the results on the plot level. Comparison between the results of different permanent plots on regional or Community level will have to be done with great care. It is recommended that the validated data of each survey (or completed part) is submitted to the Commission as soon as the data become available, using the standardized forms in this Annex.

Member States shall forward to the Commission the data collected from the different inventories carried out between 1991 and 1996 for each permanent plot together with an interpretation of the results per plot. By 31 December 1996, all data and the national interpretation shall be available at the Commission in a standardized form for further evaluation.

The validated data from the inventories after 1996 will be forwarded to the Commission upon completion of the surveys, with new deadlines every five years (e.g. 31 December 2001, 2006, etc.).

In this Annex the detail on the submission of the inventory results and their interpretation are presented.

II. General technical information for the submission of data

II.1. *Hardware requirements*

As medium for the data submission, the 3,5″ floppy disk (DSDD or HD) has been selected. This floppy has become a worldwide standard and is cheap and durable. Diskettes of good quality are to be used.

II.2. *Software requirements*

The diskettes are to be formatted on the appropriate density (DSDD = low density and HD = high density), using DOS 2.1 or higher, and should be 100 % IBM compatible. All information on the diskette shall be in ASCII characters.

II.3. *Data files*

Each diskette (or set of diskettes) shall contain the plot and data files; the file with the summarized information of the plots (plot file), and file(s) with the inventoried results per survey (data files). Details on the names and the contents of these files are presented in Annex VIIa.

II.4. *Example on diskette*

On request a diskette with an example of the structure and contents of the files can be supplied.

▼B

ANNEX VIIa

SUBMISSION OF DATA PER PERMANENT PLOT IN A DIGITAL FORMAT

Review of file names per survey

In the Annexes before, the details have been desribed of the inventory methods. After assessment, sampling/analysis, validation and evaluation, the data are to be submitted to the Commission in a standardized form. In this Annex the standardized form for each assessment is defined.

For each assessment the validated data are to be presented in one or more files with a standard format.

Assessment	Annex	Frequency	File name(s)
Installation	I	Once	XXGENER.PLT
Crown assessment	III	Yearly	XX1995.PLT,XX1995.TRE
Soil inventory	IV	Five or 10 yearly	XX1995.PLS,XX1995.SOM,XX1995.SOO
Foliage inventory	V	Two yearly	XX1995.PLF,XX1995.FOM,XX1995.FOO
Increment	VI	Five yearly	XX1995.PLI,XX1995.IPM,XX1995.IRA,XX1995.IEV
▼M1			
Deposition	VIII	Continuous	XX1995.PLD, XX1995.DEM, XX1995.DEO, XX1995.DEA
Meteorology	IX	Continuous	XX1995.PLM, XX1995.MEM, XX1995.MEC, Form 8d, XX1995.MEO et XX1995.MED
▼M2			
Soil solution	X	Continuous	XX1996.PSS, XX1996.SSM, XX1996.SSO
▼M3			
Ground vegetation	XI	Five yearly	XX1996.PLV, XX1996.VEM

Each file name consists of a two-letter country code (represented by XX in the list of names), followed by the year of assessment (in the example 1996) or GENER when the information is given once, a dot (.) and in the extension a three-letter code. This three letter code for the plot files consists of the letters PL and the first letter(s) of the assessment soil, foliage increment, deposition, meteorology, soil solution and ground vegetation. The three-letter code for the datafiles consists of two (or one) letters) for soil, foliage, increment, deposition, meteorology, soil solution or ground vegetation and one (or two) letters) to indicate mandatory, optional or the different parts of the increment assessment (evaluation), deposition assessment (air).

▼B

Form 1a

XXGENER.PLT

Contents of file with the information on plot level to be completed during installation (See Annex I)

Sequence	Country	Obser-vation plot number	Latitude coordinate (+DD MM SS)	Longitude coordinate (+DD MM SS)	Altitude	Orien-tation	Installation date (DD MM YY)	Total plot size (ha)	Number of trees in plot	Size of sub-plot (ha)	Mean age	Main tree species	Yield absolute	Yield relative	Observations
1–4	6–7	9–12	14–20	22–28	30–31	33	35–40	42–47	49–52	54–59	61–62	64–66	68–70		72–82
1								.		.					
2								.		.					
3								.		.					
4								.		.					
5								.		.					
6								.		.					
7								.		.					
8								.		.					
9								.		.					
10								.		.					
								.		.					

Column		See explanatory notes
1– 4	Sequence number of plots (1 to 9 999)	
6– 7	Country code (France = 01, Belgium = 02, etc.)	(1)
9–12	Observation plot number (maximum 9 999)	(2)
14–20	Latitude in + DDMMSS (e.g. + 50 58 52)	(4)
22–28	Longitude in (+ or –) DDMMSS (e.g. + 03 55 31)	(4)
30–31	Altitude (in 50 metre classes from 1 to 51)	(7)
33	Orientation (N = 1, NE = 2, etc.)	(8)
35–40	Installation date in DDMMYY	(3)
42–47	Total plot size (in 0,0001 ha)	(11)
49–52	Number of trees in total plot	(12)
54–59	Size of sub-plot (in 0,0001 ha)	(11)
61–62	Mean age of dominant storey (in 20 year classes from 1 to 8)	(9)
64–66	Main tree species	(15)
68	Yield estimate — absolute	(13)
70	Yield estimate — relative	(13)

In the last column a remark on the plot can be included:

72–82	Other observations (word)	(99)

▼B

Form 1b

Other observations on the plots of the intensive monitoring of the forest ecosystems

Country: (*)

Plot number:

Main species: (*)

Latitude: D D M M S S (*)

Longitude: (*)

Alitude: (*)

Date of instalation: D D M M Y Y

Nearby meteorologic station and/or other monitoring or observation plots (history or active)

Name/number	Latitude (*)	Longitude (*)	Information type
.....			.....
.....			.....
.....			.....

Information obtained during installation

Description of forest during installation: (mixtures, storeys, game, regeneration, etc.)

.....

.....

.....

.....

.....

History of forest management before installation of plot (establishment, thinning, fertilization, etc.)

	year
.....	.....
.....	.....
.....	.....
.....	.....

Information obtained during years of monitoring

History of forest management after installation of plot (thinnings, fertilization, littter raking, etc.)

Year	Activity	Details (quantities, %)
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

(*) See for description and codes the explanatory part of Annex VIIa.

Form 3a

XX1996.PLT

Contents of file with the information on Plot level to be used with the crown assessment

1-4	6-7	9-12	14-19	21-27	29-35	37-38	40	42----52
Sequence	Country	Observation Plot No	Assessment date (D D M M Y Y)	Latitude Coordinate (+ D D M M S S)	Longitude Coordinate (+ D D M M S S)	Altitude	Exposure	Observations
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Column		See explanation item #
1 - 4	Sequence number of plots (1 to 9 999)	
6 - 7	Country Code (France = 01, Belgium = 02, etc.)	(1)
9 - 12	Plot number (max. 9 999)	(2)
14 - 19	Date of assessment (DD MM YY)	(3)
21 - 27	Latitude in + DD MM SS (e.g. + 50 58 52)	(4)
29 - 35	Longitude in (+ or −) DD MM SS (e.g. + 03 55 31)	(4)
37 - 38	Altitude (in 50 meter classes from 1 to 51)	(5)
40	Exposure (1, 2, 3)	(54)

In the last column a remark on the plot can be included:

42 - 52 Other observations (word)

Form 3b

XX1996.TRM

Contents of file with the information on Tree level (Mandatory) to be used with the tree condition assessment

1-5	7-10	12-17	19-22	24-25	27-29	31	33	35	37-39	41	43----53
Sequence	Observation plot # No	Assessment date (D D M M Y Y)	Tree #	Removal Mortal.	Species	Soc. clss	Corwn shad.	Visib.	Defoliation	Discol.	Other Observations
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

Column		See explanation item #
1 - 5	Sequence number of trees (1 to 99 999)	
7 - 10	Plot number (max. 9 999)	(2)
12 - 17	Date of survey in DD MM YY (e.g. 22 06 96)	(3)
19 - 22	Tree number (as marked during installation)	(14)
24 - 25	Removals & mortality (10 to 48)	(55)
27 - 29	Species (001 to 199)	(15)
31	Social class (1, 2, 3, 4)	(56)
33	Corwn shading (1, 2, 3, 4, 5, 6)	(57)
35	Visibility (1, 2, 3, 4)	(58)
37 - 39	Defoliation (0, 5, 10, 15, 20, . . ., 95, 99, 100 %)	(16)
41	Discolouration (0, 1, 2, 3 or 4)	(17)
43 - 53	Other Observations (word)	

▼B

Form 4a

XX1993.PLS

Contents of reduced plot file to be used in combination with the forest soil inventory (see Annex IV)

Sequence	Country	Observation plot number	Date (D D M M Y Y)	Latitude coordinate (+ D D M M S S)	Longitude coordinate (+ D D M M S S)	Altitude	Soil unit	Water	Humus	Observations
1–4	6–7	9–12	14–19	21–27	29–35	37–38	40–42	44	46	48–58
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										

Column		See explanatory notes
1– 4	Sequence number of plots (1 to 9 999)	
6– 7	Country code (France = 01, Belgium = 02, etc.)	(1)
9–12	Plot number (maximum 9 999)	(2)
14–19	Date of sampling in DD MM YY (e. g. 22 06 90)	(3)
21–27	Latitude in + DD MM SS (e.g. + 50 58 52)	(4)
29–35	Longitude in (+ or –) DD MM SS (e.g. + 03 55 31	(4)
37–38	Altitude (in 50 metre classes from 1 to 51)	(7)
40–42	Soil unit (101 to 253)	(10)
44	Water availability (insufficient = 1, sufficient = 2, excessive = 3)	(5)
46	Humus type (mull = 1, moder = 2, etc.)	(6)

In the last column a remark on the plot can be included:

48–58	Other observations (word)	(99)

▼B

Form 4b

XX1993.SOM

Contents of file with soil analysis information (mandatory)

Sequence number	Observation plot number	Horizon	Sample code (0,1,2)	Date of analysis (dd mm yy)	pH ($CaCl_2$)	C_Org	N	P	K	Ca	Mg	OrgLay	$CaCO_3$	Ac-Exc	BCE	ACE	CEC	BaseSat	Observations
						(g/kg)	(g/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(kg/m^2)	(g/kg)	($cmol^+/kg$)	($cmol^+/kg$)	($cmol^+/kg$)	($cmol^+/kg$)	%	
1–5	7–10	12–14	16	18–23	25–27	29–31	33–36	38–40	42–45	47–50	52–55	57–59	61–63	65–67	69–72	74–77	79–82	84/85	87–97
0	0	SAM																	
1		H	0		.		.								.	.	.		
2		O	0		.		.								.	.	.		
3		M05	1		.		.								.	.	.		
4		M51	1		.		.								.	.	.		
5		M01	9		.		.								.	.	.		
6		M12	0		.		.								.	.	.		
7		M24			.		.								.	.	.		
8		M48			.		.								.	.	.		
9999	9999	M48	2		9.9	999	99.9	999	9999	9999	9999	999	999	999	99.9	99.9	99.9	99	Maximum value (**)

The first line (line #0) is used to indicate what sampling analysis method (SAM) has been used.
Indicate for each parameter what analysis method has been used:
0 = No deviation from approved method
1 = Analysed according to alternative method (*)
9 = Recomputed data (*)

1–5	Sequence number (1 to 99 999)		
7–10	Observation plot number (maximum: 9 999)		(2)
12–14	Level	Code for depth level (H, O, M05, M51, M01, M12, M24, M48)	(21)
16	Sample code	Code for sampling analysis method (0 = approved method, 1 = as advised, 2–8 = any subsequent sub-samples, 9 = recalculated) (*)	(22)
18–23	Date	Date of analysis (ddmmyy)	(3)

Mandatory file

	Parameters	Units (***)	H/O	Min	Approved method	Remarks
25–27	$pH(CaCl_2)$		Mandatory	Mandatory	pH-electrode	
29–31	C_org	(g/kg)	Mandatory	Mandatory	Dry combustion	
33–36	N	(g/kg)	Mandatory	Mandatory	Dry combustion	
38–40	P	(mg/kg)	Mandatory		Extractant: aqua regia	
42–45	K	(mg/kg)	Mandatory		Extractant: aqua regia	
47–50	Ca	(mg/kg)	Mandatory		Extractant: aqua regia	
52–55	Mg	(mg/kg)	Mandatory		Extractant: aqua regia	
57–59	OrgLayer	(kg/m^2)	Mandatory		Volume dry-weight	
61–63	$CaCO_3$	(g/kg)		Mandatory	Calcimeter	(if pH $CaCl_2$ > 6)
65–67	Ac-Exc	($cmol^+/kg$)		Mandatory	Titration	Exchangeable acidity
69–72	BCE	($cmol^+/kg$)		Mandatory	Extractant: $BaCl_2$	Base cations exchangeable
74–77	ACE	($cmol^+/kg$)		Mandatory	Extractant: $BaCl_2$	Acid cations exchangeable
79–82	CEC	($cmol^+/kg$)		Mandatory	Bascomb	Cation exchange capacity
84–85	BaseSat	%		Mandatory	LabexL8703-26-1-1	
87–97	Observation	Words				

Blank = not required.

(*) Methods and recomputations that have been used shall be described in detail in an annex to the soil condition report.
(**) Maximum values are used when the actually registered value is equal or higher than the maximum value. When the actual registered value is below the minimum value that could be entered, the minimum value shall be used. If no quantity could be measured (i.e. below detection limits) a special code –1 (minus 1) will be used. When no analysis has been carried out for this parameter a zero or blank shall be used.
(***) Based on oven-dry weight.

▼B

Form 4c

XX1993.SOO

Contents of file with soil analysis information (optional)

Sequence number	Plot number	Horizon	Sample code (0,1,2)	Date of analysis (dd mm yy)	$CaCO_3$	Na	Al	Fe	Cr	Ni	Mn	Zn	Cu	Pb	Cd	Hg	S	pH(H_2O)	EC	(cmol+/kg) Ac_Exc	BCE	ACE	CEC	BaseSat	P	Ca	Mg	K	Observations
					(g/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)		(mS/m)		(cmol+/kg)	(cmol+/kg)	(cmol+/kg)	%	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	
1-5	7-10	12-14	16	18-23	25-27	29-32	34-38	40-44	46-48	50-52	54-57	59-61	63-65	67-69	71-73	75-78	80-83	85-87	89/90	92-94	96-99	101-104	106-109	111/12	114-116	118-121	123-126	128-131	133-143
0	0	SAM																											
1		H	0												.	.		.			.	.	.						
2		O	0												.	.		.			.	.	.						
3		M05	1												.	.		.			.	.	.						
4		M51	1												.	.		.			.	.	.						
5		M01	9												.	.		.			.	.	.						
6		M12	0												.	.		.			.	.	.						
7		M24													.	.		.			.	.	.						
8		M48													.	.		.			.	.	.						
9999	9999	M48	2		999	9999	99999	99999	999	999	9999	999	999	999	9.9	9.99	9999	9.9	99	999	99.9	99.9	99.9	99	9999	9999	9999	9999	Maximum value (**)

The first line (line # 0) is used to indicate what sampling analysis method (SAM) has been used.
Indicate for each parameter what analysis method has been used:
0 = No deviation from approved method
1 = Analysed according to alternative method (*)
9 = Recomputed data (*)

1–5	Sequence number (1 to 99 999)		
7–10	Observation plot number (maximum: 9 999)		(2)
12–14	Level	Code for depth level (H, O, M05, M51, M01, M12, M24, M48)	(21)
16	Sample code	Code for sampling analysis method (0 = approved method, 1 = as advised (*), 9 = recalculated) (*)	(22)
18–23	Date	Date of analysis (dd mm yy)	(3)

(continued on next page)

Optional file

Parameters		Units (***)	H/O	Min	Approved method	Remarks
25–27	$CaCO_3$	(g/kg)	Optional		AFNOR X 31–105	(if pH $CaCl_2$ > 6)
29–32	Na	(mg/kg)	Optional	Optional	Extractant: aqua regia	
34–38	Al	(mg/kg)	Optional	Optional	Extractant: aqua regia	
40–44	Fe	(mg/kg)	Optional	Optional	Extractant: aqua regia	
46–48	Cr	(mg/kg)	Optional		Extractant: aqua regia	
50–52	Ni	(mg/kg)	Optional		Extractant: aqua regia	
54–57	Mn	(mg/kg)	Optional	Optional	Extractant: aqua regia	
59–60	Zn	(mg/kg)	Optional	Optional	Extractant: aqua regia	
63–65	Cu	(mg/kg)	Optional	Optional	Extractant: aqua regia	
67–69	Pb	(mg/kg)	Optional	Optional	Extractant: aqua regia	
71–73	Cd	(mg/kg)	Optional	Optional	Extractant: aqua regia	
75–78	Hg	(mg/kg)	Optional			
80–83	S	(mg/kg)	Optional	Optional	Extractant: aqua regia	
85–87	pH(H_2O)		Optional	Optional	pH-electrode	
89–90	EC	(mS/m)	Optional	Optional	EC-meter	
92–94	Ac–Exc	(cmol+/kg)	Optional		Titration	Exchangeable acidity
96–99	BCE	(cmol+/kg)	Optional		Extractant: $BaCl_2$	Base cations exchangeable
101–104	ACE	(cmol+/kg)	Optional		Extractant: $BaCl_2$	Acid cations exchangeable
106–109	CEC	(cmol+/kg)	Optional			Cation exchange capacity
111–112	BaseSat	%	Optional			
114–116	P	(mg/kg)		Optional	Extractant: aqua regia	
118–121	Ca	(mg/kg)		Optional	Extractant: aqua regia	
123–126	Mg	(mg/kg)		Optional	Extractant: aqua regia	
128–131	K	(mg/kg)		Optional	Extractant: aqua regia	
133–143	Observation	Words				

Blank = not required.

(*) Methods and recomputations that have been used shall be described in detail in an annex to the soil condition report.

(**) Maximum values are used when the actually registered value is equal or higher than the maximum value. When the actual registered value is below the minimum value that could be entered, the minimum value shall be used. If no quantity could be measured (i.e. below detection limits) a special code –1 (minus 1) will be used. When no analysis has been carried out for this parameter a zero or blank shall be used.

(***) Based on oven–dry weight.

▼B

Form 5a

XX1993.PLF

Contents of reduced plot file to be used in combination with the survey of chemical content of needles and leaves (see Annex V)

Sequence	Country	Observation plot number	Date (D D M M Y Y)	Latitude coordinate (+ D D M M S S)	Longitude coordinate (+ D D M M S S)	Altitude	Observations
1–4	6–7	9–12	14–19	21–27	29–35	37–38	40–50
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							

Column		See explanatory notes
1– 4	Sequence number of plots (1 to 9 999)	
6– 7	Country code (France = 01, Belgium = 02, etc.)	(1)
9–12	Plot number (maximum 9 999)	(2)
14–19	Date of sampling in DD MM YY (e. g. 220690)	(3)
21–27	Latitude in + DD MM SS (e. g. +505852)	(4)
29–35	Longitude in (+ or –) DD MM SS (e. g. +035531)	(4)
37–38	Altitude (in 50 metre classes from 1 to 51)	(7)

In the last column a remark on the plot can be included:

40–50	Other observations (word)	(99)

▼M3

Form 5b

XX1996.FOM

Contents of file with foliar analysis information (mandatory)

1 - - - 5	7 - - 10	12 - - - 16	18 - - - - 23	25 - - 28	30 - - 33	35 - - 38	40 - - 43	45 - - 48	50 - - 53	55 - - 58	60 - - - 64	66 - - - 70	72 - - - 75	77 - - - 81	83 - - - 87	89 - - - 93	95 - - - 105
Sequence No	Observation No	Sample No	Date of analysis (ddmmyy)	Number of sampled trees: No 1	No 2	No 3	No 4	No 5	Mass of 100 leaves (g)	Mass of 1000 needles (g)	N (mg/g)	S (mg/g)	P (mg/g)	Ca (mg/g)	Mg (mg/g)	K (mg/g)	Observations
		.									,	,	,	,	,	,	
		,									,	,	,	,	,	,	
		,									,	,	,	,	,	,	
		,									,	,	,	,	,	,	
		,									,	,	,	,	,	,	
		,									,	,	,	,	,	,	
		,									,	,	,	,	,	,	
		,									,	,	,	,	,	,	
		,									,	,	,	,	,	,	
		,									,	,	,	,	,	,	
9 9 9 9	9 9 9 9	1 9 9 , 3	1 1 2 9 5	9 9 9 9	9 9 9 9	9 9 9 9	9 9 9 9	9 9 9 9	9 9 9 9	9 9 9 9	9 9 , 9 9	9 9 , 9 9	9 , 9 9	9 9 , 9 9	9 9 , 9 9	9 9 , 9 9	
											Maximum value (*)						

1 - 5	Sequence No (1 to 99 999)					
7 - 10	Observation Plot No (max. 9999)		(2)			
12 - 16	Sample No	Tree species (Code from 1 to 199) and leaves type (0 = current, 1 = current + 1	(23)		Parameters	(Mandatory file) Units (**)
18 - 23	Date of analysis	Date of analysis (ddmmyy)	(3)	60 - 64	N	(mg/g)
25 - 28	Tree No 1	Number of first tree in sample	(24)	66 - 70	S	(mg/g)
30 - 33	Tree No 2	Number of second tree in sample	(24)	72 - 75	P	(mg/g)
35 - 38	Tree No 3	Number of third tree in sample	(24)	77 - 81	Ca	(mg/g)
40 - 43	Tree No 4	Number of fourth tree in sample	(24)	83 - 87	Mg	(mg/g)
45 - 48	Tree No 5	Number of fifth tree in sample	(24)	89 - 93	K	(mg/g)
50 - 53	Mass of 100 leaves	Mass of 100 current year leaves	(25)	95 - 105	Observation	Words
55 - 58	Mass of 1000 needles	Mass of 1000 current year or 1000 current+1 year needles	(25)		Those parameters have to be filled in once for the current needles and leaves and once for the current+1 needles. For *Larix* sp. and *Cedrus* sp., samples are taken of the short twigs of the previous year	

(*) Maximum values are used when the actually registered value is equal or higher than the maximum value. When the actual registered values is below the minimum value that could be entered, the minimum values shall be used. If no quantity could be measures (i.e. below detection limits) a special code-1 (minus 1) will be used. When no analysis has been carried out for this parameter a zero or blank shall be used.

(**) By reference at 105 °C dried material.

▼B

Form 5c

XX1993.FOO

Contents of file with foliar analysis information (optional)

Sequence number	Obser-vation plot number	Sample number	Date of analysis (dd mm yy)	Na (µg/g)	Zn (µg/g)	Mn (µg/g)	Fe (µg/g)	Cu (µg/g)	Pb (µg/g)	Al (µg/g)	B (µg/g)	Observations
1–5	7–10	12–16	18–23	25–30	32–36	38–43	45–49	51–55	57–60	62–66	68–72	74–84
1		.						.	.			
2		.						.	.			
3		.						.	.			
4		.						.	.			
5		.						.	.			
6		.						.	.			
7		.						.	.			
8		.						.	.			
		.						.	.			
99999	9999	199.1	311295	999999	99999	999999	999 9	99.99	99.9	99999	99999	Maximum value (*)

See explanatory notes

1–5	Sequence number (1 to 99 999)		
7–10	Observation plot number (maximum 9 999)		(2)
12–16	Sample number	Tree species (code from 1 to 199) and leaves type (0 = current, 1 = current + 1)	(23)
18–23	Date	Date of analysis (DDMMYY)	(3)

(Optional file)

Parameters		Units (**)
25–30	Na	µg/g
32–36	Zn	µg/g
38–43	Mn	µg/g
45–49	Fe	µg/g
51–55	Cu	µg/g
57–60	Pb	µg/g
62–66	Al	µg/g
68–72	B	µg/g
74–84	Observation	Words

For *Larix* sp. and *Cedrus sp.* samples are taken of the twigs of the previous year.

(*) Maximum values are used when the actually registered value is equal or higher than the maximum value. When the actual registered value is below the minimum value that could be entered, the minimum value shall be used. If no quantity could be measured (i. e. below detection limits) a special code – 1 (minus 1) will be used. When no analysis has been carried out for this parameter a zero or blank shall be used.

(**) By reference at 105 °C dried material.

▼B

Form 6a

XX1993.PLI

Contents of reduced plot file to be used for increment (see Annex VI)

Sequence	Country	Observation plot number	Assessment date	Latitude coordinate	Longitude coordinate	Total plot size	Number of trees in total plot	Sample plot size	Observations
			(DD MM YY)	(+ DD MM SS)	(± DD MM SS)	(ha)		(ha)	
1–4	6–7	9–12	14–19	21–27	29–35	37–42	44–48	50–55	57–67
1						.		.	
2						.		.	
3						.		.	
4						.		.	
5						.		.	
6						.		.	
7						.		.	
8						.		.	
9						.		.	
10						.		.	
						.		.	

Column		See explanatory notes
1– 4	Sequence number of plots (1 to 9 999)	
6– 7	Country code (France = 01, Belgium = 02, etc.)	(1)
9–12	Plot number (maximum 9 999)	(2)
14–19	Date of observation in DD MM YY (e.g. 22 06 94)	(3)
21–27	Latitude in + DD MM SS (e.g. + 50 10 27)	(4)
29–35	Longitude in + or – DD MM SS (e.g. – 01 15 32)	(4)
37–42	Total plot size in hectares (maximum 9,9999 hectares)	(11)
44–48	Number of trees in total plot	(12)
50–55	Sample plot size in hectares (maximum 9,9999 hectares)	(11)
57–67	Other observations (word)	(99)

▼B

Form 6b

XX1993.IPM

Contents of file with increment information — periodic measurements

	Mandatory					Optional					
Sequence	Plot number	Tree number	Species	Diameter (cm)	Diameter 2 (cm)	Bark (cm)	Height (m)	Tree volume (m^3)	Crown length (m)	Crown width (m)	Observations
1–4	6–9	11–14	16–18	20–24	26–30	32–34	36–39	41–46	48–51	53–56	58–68
1				.	.	.	.	.	.	.	
2				.	.	.	.	.	.	.	
3				.	.	.	.	.	.	.	
4				.	.	.	.	.	.	.	
5				.	.	.	.	.	.	.	
6				.	.	.	.	.	.	.	
7				.	.	.	.	.	.	.	
8				.	.	.	.	.	.	.	
9				.	.	.	.	.	.	.	
10				.	.	.	.	.	.	.	
				.	.	.	.	.	.	.	

Column		See explanatory notes
1– 4	Sequence number records (1 to 99 999)	
6– 9	Plot number (maximum 9 999)	(2)
11– 4	Tree number	(14)
16–18	Species (001 to 199)	(15)
20–24	Diameter (maximum 999,9 cm)	(27)
26–30	Diameter (maximum 999,9 cm)*	(27)
32–34	Bark (maximum 9,9 cm)	(28)
36–39	Height rounded off to nearest 0,5 metres (maximum 99,5 m)	(29)
41–46	Tree volume (maximum 99 999 m^3)	(30)
48–51	Crown length rounded off to neares 0,5 metres (maximum 99,5 m)	(31)
53–56	Crown width rounded off to nearest 0,5 metres (maximum 99,5 m)	(32)
58–68	Other observations (word)	

Mandatory	Optional	Remarks
Mandatory		
Mandatory		
Mandatory		
Mandatory		
Mandatory (*)		
	Optional	
	Optional	
	Optional	
	Optional	
	Optional	
	Optional	

(*) Mandatory when calipers are used

▼B

Form 6c

XX1993.IRA

Contents of file of increment information — ring analysis and stem disc analysis (optional)

Sequence	Plot number	Tree	Species	DBH_t (o.b.)	$Diameter^*_t$	$Diameter^*_{t-5}$	$Diameter^*_{t-10}$	$Diameter^*_{t-15}$	$Diameter^*_{t-20}$	$Diameter^*_{t-25}$	$Diameter^*_{t-30}$	$Diameter^*_{t-35}$	$Diameter^*_{t-40}$	$Diameter^*_{t-45}$	$Diameter^*_{t-50}$	Observations
		(R/D ###)		(cm)	(cm)	(cm)										
1–4	6–9	11–14	16–18	20–24	26–30	32–36	38–42	44–48	50–54	56–60	62–66	68–72	74–78	80–84	86–90	92–102
1					.	.	.	.	.	.	.	.	.	.	.	
2					.	.	.	.	.	.	.	.	.	.	.	
3					.	.	.	.	.	.	.	.	.	.	.	
4					.	.	.	.	.	.	.	.	.	.	.	
5					.	.	.	.	.	.	.	.	.	.	.	
6					.	.	.	.	.	.	.	.	.	.	.	
7					.	.	.	.	.	.	.	.	.	.	.	
8					.	.	.	.	.	.	.	.	.	.	.	
9					.	.	.	.	.	.	.	.	.	.	.	
10					.	.	.	.	.	.	.	.	.	.	.	
					.	.	.	.	.	.	.	.	.	.	.	

DBH_t (o.b.) Diameter breast height over bark in year of assessment (=t)
$Diameter^*_t$ Diameter breast height under bark in year of assessment (=t)

Column		See explanatory notes
1 to 4	Sequence number (1 to 99 999)	
6 to 9	Plot number (maximum 9 999)	(2)
11 to 14	Tree number with initial R for ring analysis and D for disk sampling	(24)
16 to 18	Species (001 to 199)	(15)
20 to 24	Actual DBH over bark (maximum 999,9 cm)	(27)
26 to 30	Actual diameter under bark (maximum 999,9 cm)	(33)
32 to 36	Diameter under bark five years ago (maximum 999,9 cm)	(33)
38 to 42	Diameter under bark 10 years ago (maximum 999,9 cm)	(33)
44 to 48	Diameter under bark 15 years ago (maximum 999,9 cm)	(33)
50 to 54	Diameter under bark 20 years ago (maximum 999,9 cm)	(33)
56 to 60	Diameter under bark 25 years ago (maximum 999,9 cm)	(33)
62 to 66	Diameter under bark 30 years ago (maximum 999,9 cm)	(33)
68 to 72	Diameter under bark 35 years ago (maximum 999,9 cm)	(33)
74 to 78	Diameter under bark 40 years ago (maximum 999,9 cm)	(33)
80 to 84	Diameter under bark 45 years ago (maximum 999,9 cm)	(33)
86 to 90	Diameter under bark 50 years ago (maximum 999,9 cm)	(33)
92 to 102	Other observations (word)	

Form 6d

XX1993.IEV

Contents of evaluated data on increment (optional)

		Periodic measurements			Ring analysis and stem disc analysis																		
Sequence	Plot number	Trees/ plot	Basal area/ plot	Volume/ plot	Basal area/ plot	Volume/ $plot_t$	Thinning	Basal area/ $plot_{t-5}$	Volume/ $plot_{t-5}$	Thinning	Basal area/ $plot_{t-10}$	Volume/ $plot_{t-10}$	Thinning	Basal area/ $plot_{t-15}$	Volume/ $plot_{t-15}$	Thinning	Basal area/ $plot_{t-20}$	Volume/ $plot_{t-20}$	Thinning	Basal area/ $plot_{t-25}$	Volume/ $plot_{t-25}$	Observations
			(m^2/plot)	(m^3/plot)	(m^2/plot)	(m^3/plot)	(Y/N)	(m^2/plot)	(m^3/plot)	(Y/N)	(m^2/plot)	(m^3/plot)	(Y/N)	(m^2/plot)	(m^3/plot)	(Y/N)	(m^2/plot)	(m^3/plot)	(Y/N)	(m^2/plot)	(m^3/plot)	
1–4	6–9	11–14	16–20	22–26	28–32	34–38	40	42–46	48–52	54	56–60	62–66	68	70–74	76–80	82	84–88	90–94	96	98–102	104–108	110–120
	1																					
	2																					
	3																					
	4																					
	5																					
	6																					
	7																					
	8																					
	9																					
	10																					

Column		See explanatory notes
1 to 4	Sequence number	
6 to 9	Plot number (maximum 9 999)	(2)
11 to 4	Number of trees per plot (maximum 9 999 trees/per plot)	(12)
16 to 20	Basal area per plot (maximum 999,9 m^2/plot)	(34)
22 to 26	Volume per plot (maximum 999,9 m^3/plot)	(35)
28 to 32	Basal area per plot (maximum 999,9 m^2/plot)	(34)
34 to 38	Volume per plot (999,9 m^3/plot)	(35)
40	Thinning between now and five years ago (Yes = 1, no = 0)	(36)
42 to 46	Basal area per plot five years ago (maximum 999,9 m^2/plot)	(34)
48 to 52	Volume per plot five years ago (maximum 999,9 m^3/plot)	(35)
54	Thinning between five and 10 years ago (Yes = 1, no = 0)	(36)
56 to 60	Basal area per plot 10 years ago (maximum 999,9 m^2/plot)	(34)
62 to 66	Volume per plot 10 years ago (maximum 999,9 m^3/plot)	(35)
68	Thinning between 10 and 15 years ago (Yes = 1, no = 0)	(36)
70 to 74	Basal area per plot 15 years ago (maximum 999,9 m^2/plot)	(34)
76 to 80	Volume per plot 15 years ago (maximum 999,9 m^3/plot)	(35)
82	Thinning between 15 and 20 years ago (Yes = 1, no = 0)	(36)
84 to 88	Basal area per plot 20 years ago (maximum 999,9 m^2/plot)	(34)
90 to 94	Volume per plot 20 years ago (maximum 999,9 m^3/plot)	(35)
96	Thinning between 20 and 25 years ago (Yes = 1, no = 0)	(36)
98 to 102	Basal area per plot 25 years ago (maximum 999,9 m^2/plot)	(34)
104 to 108	Volume per plot 25 years ago (maximum 999,9 m3/plot)	(35)
110 to 120	Other observations (word)	

Evalution of periodic measurements	Evaluation of ring and stem disc samples
Optional	Optional
Optional	
Optional	
Optional	
	Optional
	Optional
	Optional
	Optional
	Optional
	Optional
	Optional
	Optional
	Optional
	Optional
	Optional
	Optional
	Optional
	Optional
	Optional
	Optional
	Optional
	Optional
	Optional

▼M1

Form 7a

XX1995.PLD

Contents of reduced plot file to be used in combination with the deposition measurements

1 – – – 4	6 – – 7	9 – – – 12	14	16 – – – – – 22	24 – – – – – 30	32 – 33	35 – – – – 40	42 – – – – 47	49 – 50	52 – – – 62
Sequence	Country	Observation Plot #	Sampler code	Latitude coordinate (+ D D M M S S)	Longitude coordinate (± D D M M S S)	Altitude	1st period Start date (D D M M Y Y)	Last period Final date (D D M M Y Y)	Number of periods	Observation
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										

Column		See explanation item #
1 – 4	Sequence number of plots (1 to 9999)	
6 – 7	Country Code (France = 01, Belgium = 02, etc.)	(1)
9 – 12	Observation plot number	(2)
14	Sampler code	(37)
16 – 22	Latitude in +DDMMSS (e.g. + 505852)	(4)
24 – 30	Longitude in (+ or −) DDMMSS (e.g. + 035531)	(4)
32 – 33	Altitude (in 50 meter classes from 1 to 51)	(7)
35 – 40	First date of monitoring period	(38)
42 – 47	Final date of monitoring period	(38)
49 – 50	Number of (equal) measuring periods	(39)
52 – 62	Other observations (word)	(12)

▼M1

Form 7b

XX1995.DEM

Contents of datafile with deposition measurements (mandatory parameters)

Sequence Number	Obser-vation Plot #	Period	Samp Code	Quantity	pH	Conduc-tivity	K	Ca	Mg	Na	$N\text{-}NH_4$	Cl	$N\text{-}NO_3$	$S\text{-}SO_4$	Alkalinity	N_{total}	Observation
				(mm)		(µS/cm)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(µeq/l)	(mg/l)	
1–5	7–10	12–13	15	17–20	22–24	26–29	31–34	36–40	42–45	47–51	53–57	59–63	65–69	71–75	77–80	82–86	88–98
1					.		.	.	.	.	.	.	.	.		.	
2					.		.	.	.	.	.	.	.	.		.	
3					.		.	.	.	.	.	.	.	.		.	
4					.		.	.	.	.	.	.	.	.		.	
5					.		.	.	.	.	.	.	.	.		.	
6					.		.	.	.	.	.	.	.	.		.	
7					.		.	.	.	.	.	.	.	.		.	
8					.		.	.	.	.	.	.	.	.		.	
9 9 9 9 9	9 9 9 9	9 9	2		9 . 9	9 9 9 9	9 9 . 9	9 9 9 . 9	9 9 . 9	9 9 9 . 9	9 9 9 . 9	9 9 9 . 9	9 9 9 . 9	9 9 9 . 9	9 9 9 9	9 9 9 . 9	Maximum value (")

1 – 5	Sequence Number	Sequence number of samples (1 to 99999)	
7 – 10	Observation Plot number	Corresponding plotnumber (max. 9999)	(2)
12 – 13	Period	Period number (max. 99)	(40)
15	Sampler code	Sampler code (1 = Throughfall, 2 = Bulk, 3 = Wet-only, 4 = Stemflow, 5 = Fog, 6 = Fog_{frozen}, 7 = Air concentration, 9 = other)	(37)
17 – 20	Sample quantity	Quantity of total collected sample expressed in mm (max. 9999)	(37a)

▼M1

	Parameters (*)	Units	Throughfall	Bulk or Wet-only	Stemflow		Fog Fog_{frozen}	Air Conc.	Remarks
					Beech	Other			
22-24	pH		Man.	Man.	Man.	Opt.	Opt.		
26-29	Conductivity	(µS/cm)	Man.	Man.	Man.	Opt.	Opt.		
31-34	K^+	(mg/l)	Man.	Man.	Man.	Opt.	Opt.	Opt.	
36-40	Ca^{2+}	(mg/l)	Man.	Man.	Man.	Opt.	Opt.	Opt.	
42-45	Mg^{2+}	(mg/l)	Man.	Man.	Man.	Opt.	Opt.	Opt.	
47-51	Na^+	(mg/l)	Man.	Man.	Man.	Opt.	Opt.	Opt.	
53-57	$N\text{-}NH_4$	(mg/l)	Man.	Man.	Man.	Opt.	Opt.	Opt.	
59-63	Cl^-	(mg/l)	Man.	Man.	Man.	Opt.	Opt.		
65-69	$N\text{-}NO_3$	(mg/l)	Man.	Man.	Man.	Opt.	Opt.	Opt.	
71-75	$S\text{-}SO_4$	(mg/l)	Man.	Man.	Man.	Opt.	Opt.	Opt.	
77-80	Alkalinity	(µeq/l)	Man.	Man.	Man.	Opt.	Opt.		(if annual median pH > 5)
82-86	N_{total}	(mg/l)	Man.	Opt.	Man.	Opt.	Opt.		
88-98	Observation	Words							

(*) Methods and recomputations that have been used shall be described in detail in an annex to the deposition report.

(**) Maximum values as mentioned in the bottom line of the table are to be used whenever the actually registered value is equal or higher than the maximum possible values in these columns.
When the actually registered value is below the minimum value that could be entered, the minimum value shall be used.
If no quantity could be measured (i.e. below detection limits) a special code −1 (minus 1) will be used. When no analysis has been carried out for this parameter a zero or blank shall be used.

▼M1

Form 7c

XX1995.DEO

Contents of datafile with deposition measurements (Optional)

Sequence number	Observation Plot #	Period	Samp Code	Al^{3+}	Mn^{2+}	Fe^{3+}	PO_4^{2-}	Cu	Zn	Hg	Pb	Co	Mo	Cd	S_{total}	N_{org}	C_{TOC}	C_{DOC}	P_{ink}	Observation
				(µg/l)	(µg/l)	(µg/l)	(mg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	
1–5	7–10	12–13	15	17–20	22–26	28–32	34–37	39–42	43–46	48–51	53–56	58–61	63–66	68–71	73–77	79–82	84–87	89–92	94–97	99–109
9 9 9 9 9	9 9 9 9	9 9	9	9 9 9 9	9 9 9 . 9	9 9 9 . 9	9 9 . 9	9 9 . 9	9 9 . 9	9 9 . 9	9 9 . 9	9 9 . 9	9 9 . 9	9 9 . 9	9 9 9 . 9	9 9 . 9	9 9 . 9	9 9 . 9	9 9 . 9	Maximum value (*)

Column		See explanation item #
1 – 5	Sequence number of samples (1 to 99999)	(1)
7 – 10	Corresponding plot number (max. 9999)	(2)
12 – 13	Period number	(40)
15	Sampler code (1 = Throughfall, 2 = Bulk, 3 = Wet-only, 4 = Stemflow, 5 = Fog, 6 = Fog_{frozen}, 7 = Air concentration, 9 = other)	(37)

▼M1

	Parameters (*)	Units	Throughfall	Bulk or Wet-only	Stemflow	Fog	Air Conc.	Remarks
17-20	Al^{3+}	(µg/l)	Opt.	Opt.	Opt.	Opt.		
22-26	Mn^{2+}	(µg/l)	Opt.	Opt.	Opt.	Opt.		
28-32	Fe^{3+}	(µg/l)	Opt.	Opt.	Opt.	Opt.		
34-37	PO_4^{3-}	(mg/l)	Opt.	Opt.	Opt.	Opt.		
39-42	Cu	(µg/l)	Opt.	Opt.	Opt.	Opt.		
43-46	Zn	(µg/l)	Opt.	Opt.	Opt.	Opt.		
48-51	Hg	(µg/l)	Opt.	Opt.	Opt.	Opt.		
53-56	Pb	(µg/l)	Opt.	Opt.	Opt.	Opt.		
58-61	Co	(µg/l)	Opt.	Opt.	Opt.	Opt.		
63-66	Mo	(µg/l)	Opt.	Opt.	Opt.	Opt.		
68-71	Cd	(µg/l)	Opt.	Opt.	Opt.	Opt.		
73-77	S_{total}	(mg/l)	Opt.	Opt.	Opt.			
79-82	N_{012}	(mg/l)	Opt.	Opt.	Opt.			
84-87	C_{TOC}	(mg/l)	Opt.		Opt.			
89-92	C_{DOC}	(mg/l)	Opt.		Opt.			
94-97	P_{total}	(mg/l)	Opt.	Opt.	Opt.	Opt.		
99-109	Observation	Words	Opt.		Opt.			

Opt. = optional blank = not required

(*) Methods and recomputations that have been used shall be described in detail in an annex to the deposition report.

(**) Maximum values as mentioned in the bottom line of the table are to be used whenever the actually registered value is equal or higher than the maximum possible values in these columns.
When the actually registered value is below the minimum value that could be entered, the minimum value shall be used. If no quantity could be measured (i.e. below detection limits) a special code −1 (minus 1) will be used. When no analysis has been carried out for this parameter a zero or blank shall be used.

▼M1

Form 7d

XX1995.DEA

Contents of datafile with air concentration measurements (Optional)

Sequence Number	Obser-vation Plot #	Period	Samp Code	O_3	SO_2	SO_4	NO_2	NO	HNO_2	HNO_3	NH_4NO_3	NH_3	V.O.C.	Observation
				(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	
1–5	7–10	12–13	15	17–19	21–23	25–27	29–33	35–39	41–44	46–49	51–54	56–58	60–64	66–76
9 9 9 9 9	9 9 9 9	9 9	9	9 9 9	9 9 9	9 9 9	9 9 . 9 9	9 9 . 9	9 9 . 9	9 9 . 9	9 9 . 9	9 9 9	9 9 . 9 9	maximum value (*)

Column		See explanation item #
1–5	Sequence number of samples (1 to 99 999)	(1)
7–10	Corresponding plot number (max. 9 999)	(2)
12–13	Period number	(40)
15	Sampler code (1 = Throughfall, 2 = Bulk, 3 = Wet-only, 4 = Stemflow, 5 = Fog, 6 = Fog_{frozen}, 7 = Air concentration, 9 = other)	(37)

	Parameters (*)	Units	Air Conc.	Remarks
17–19	O_3	(µg/m³)	Opt.	
21–23	SO_2	(µg/m³)	Opt.	
25–27	SO_4	(µg/m³)	Opt.	
29–33	NO_2	(µg/m³)	Opt.	
35–39	NO	(µg/m³)	Opt.	
41–44	HNO_2	(µg/m³)	Opt.	
46–49	HNO_3	(µg/m³)	Opt.	
51–54	NH_4NO_3	(µg/m³)	Opt.	
56–58	NH_3	(µg/m³)	Opt.	
60–64	Volatile Organic Compounds (V.O.C.)	(µg/m³)	Opt.	Non-methane
66–76	Observations	Words		

(*) Methods and measurements shall be in conformity with the existing Community directives and decisions in the field of air quality measurements.
Methods and recomputations that have been used shall be described in detail in an annex to the deposition report.

(**) Maximum values as mentioned in the bottom line of the table are to be used whenever the actually registered value is equal or higher than the maximum possible values in these columns.
When the actually registered value is below the minimum value that could be entered, the minimum value shall be used. If no quantity could be measured (i.e. below detection limits) a special code −1 (minus 1) will be used. When no analysis has been carried out for this parameter a zero or blank shall be used.

Form 8a

XX1996.PLM

Contents of reduced plot file
to be used in combination with the meteorologie measurements

1 - - 4	6 - 7	9 - - - - - 15	17	19 - - - - - 25	27 - - - - 33	35 - 36	38 - 39	25 - - 28	48 - 49	51 - 53	55 - 57	59 - - - - 64	66 - - - - 71	73 - 75	77 - - - 87	89 - - - 100
Sequence	Country	Observation plot/instrument	Location	Latitude Coordinate (+ D D M M S S)	Longitude coordinate (+ D D M M S S)	Altitude	Variable	Instrument Information: vertica position	instr. code	scanning interval	storing interval	Start date of monitoring period (D D M M Y Y)	Final date of monitoring period (D D M M Y Y)	Number of days	Description	Remarks
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16	9 9	9 9 9 9 , 9 9	9	+ 0 1 5 9 5 9 3	3 5 1 5 9 5 9	5 1	X X	± 9 9 9 , 9	9 9	9 9 9	9 9 9	3 1 1 2 9 9	3 1 1 2 9 9	9 9 9	XXXXXX	XXXXXX

Column		See explanatory notes
1 - 4	Sequence number of plots (1 to 9 999)	
6 - 7	Country code (France = 01, Belgium = 02, etc.)	(1)
9-15	Observation plot/instrument code (the code consists of the plot nunmber and instrument sequence number)	(41)
17-17	Location (S = stand, F = open filed in forest area, W = weather station, O = other)	(42)
19-25	Latitude in +DD MM SS (e.g. +50 58 52)	(4)
27-33	Longitude in (+or –) DD MM SS (e.g. +03 55 31)	(4)
35-36	Altitude (in 50 metre classes from 1 to 51)	(7)
38-39	Variable (AT = air temp. ST = soil temp. PR = precipitation, etc.)	(43)
	Instrument information	
41-46	Vertical position (in metre above (+) or below (–) the ground)	(44)
48-49	Instrument code (10 = manual reading, 20 = mechanical recording, 30 = paper recording, etc.)	(44)

Column		See explanatory notes
51-53	Scanning interval in seconds (for automatic stations only)	(44)
55-57	Storing interval in minutes (for automiatic stations only)	(44)
	Monitoring information	
59-64	First date of monitoring period	(38)
66-71	Final date of monitoring period	(38)
73-75	Number of (measuring) days	(39)
	In the last column the following can be included:	
77-87	Description of instrument	(99)
89-100	Remarks on monitoring	(99)

▼M3

Form 8b

XX1996.MEM

Contents of data file with meteorologic measurements

1 - - 6	8 - - - - - 14	16 - 17	19 - - - - - 24	26 - 31	33 - 38	40 - 45	47 - 49	51 - 62
Sequence No	Observation plot/ instrument	Variable code	Date D D M M Y Y	Mean/ Sum	Minimum	Maximum	Completeness (%)	Observation
1	,			,	,	,		
2	,			,	,	,		
3	,			,	,	,		
4	,			,	,	,		
5	,			,	,	,		
6	,			,	,	,		
7	,			,	,	,		
8	,			,	,	,		
	,							
9 9 9 9 9	9 9 9 9 , 9 9	X X	9 9 9 9 9 9	9 9 9 , 9	9 9 9 9 , 9	9 9 9 9 , 9	1 0 0	
						Maximum value (*)		

1 - 6	Sequence No	Sequence number of samples (1 to 99999)	
8 - 14	Observation plot/instrument code	Corresponding plot/instrument number (max. 99990.99)	(41)
16 - 17	Variable code	The code of a parameter (PR, AT, RH, WS, WD or SR)	(43)
19 - 24	Date	Date (in DDMMYY)	(40)
26 - 31	Daily mean (e.g. temperature) or sum (precipitation) values		(45)
33 - 38	Daily minimum value		(45)
40 - 45	Daily maximum value		(45)
47 - 49	Completeness of measurements over the day (in % of measurements that should have been recorded)		(46)
51 - 62	Observations (words)		

Parameters (*)		Units	Mean	Sum	Minimum	Maximum	Remarks
PR	Precipitation	(mm)		X			Total precipitation (including snow, etc.)
AT	Air temperature	(°C)	X		X	X	Air temperature
RH	Relative humidity	(%)	X		X	X	Relative humidity
WS	Windspeed	(m/s)	X			X	Windspeed
WD	Wind direction	(°)	X				Prevailing wind direction (0° = North, 45° = Northeast)
SR	Solar radiation	(W/m²	X				Solar radiation

(*) Methods and recomputations that have been used shall be described in detail in an annex to the data accompanying report on meteorology.

(*) Maximum values are used when the actually registered values is equal or higher than the maximum value. When the actual registered value is below the minimum value that could be entered, the minimum value shall be used (e.g. - 999.9).
When no analysis has been carried out for this parameter a blank shall be used.

▼M3

Form 8c

XX1996.MEO

Contents of datafile with meteorological measurements

1--6	8-----14	16-17	19-----24	26-31	33-38	40-45	47-49	51-62
Sequence No	Observation plot/ instrument	Variable code	Date D D M M Y Y	Mean/ sum	Minimum	Maximum	Completeness (%)	Observation
1	,			,	,	,		
2	,			,	,	,		
3	,			,	,	,		
4	,			,	,	,		
5	,			,	,	,		
6	,			,	,	,		
7	,			,	,	,		
8	,			,	,	,		
	,			,	,	,		
9 9 9 9 9	9 9 9 9 , 9 9	X X	9 9 9 9 9 9	9 9 9 9 , 9	9 9 9 9 . 9	9 9 9 9 , 9	1 0 0	

Maximum value (*)

1 - 6	Sequence No	Sequence No of samples (1 to 999 999)	
8 - 14	Observation plot/instrument code	Corresponding plot/instrument number (maximum 9 999,99)	(2)
16 - 17	Variable code	The code of a parameter (UR, TF, SF, ST, MP or WC)	(43)
19 - 24	Date	Date (in DDMMYY)	(40)
26 - 31	Daily mean (e.g. temperature) or sum (precipitation) values		
33 - 38	Daily minimum value		
40 - 45	Daily maximum value		
47 - 49	Completeness of measurements over the day (in %)		
51 - 62	Observation (words)		

Parameters (*)		Units	Mean	Sum	Minimum	Maximum	Remarks	(45)
UR	UV-b Radiation	(W/M^2)	X					
TF	Throughfall	(mm)		X			sum of daily values	
SF	Stemflow	(mm)		X			to be recalculated from litres into mm	
ST	Soil Temperature	(°C)	X		X	X		
MP	Matric potential in Soil	(hPa)	X		X	X		
WC	Water content in Soil	(Vol%)	X		X	X		
XX	Others						to be specified in data accompanying report	

x = to be submitted.
(*) Methods and recomputations that have been used shall be described in detail in an Annex to the data Accompanying report on meteorology.

(*) Maximum values are used when the actually registered values is equal or higher than the maximum value. When the actual registered values is below the minimum value that could be entered, the minimum value shall be used (- 999.9).
When no analysis has been carried out for this parameter a blank shall be used.

Form 9a

XX1996.PSS

Contents of reduced plot file to be used in combination with the soil solution measurements

1-4	6-7	9-12	14-20	22-28	30-31	33-35	37-38	40	42	44-48	50-55	57-62	64-65	67----77
Sequence	Coun-try	Observation Plot #	Latitude Coordinate (+ D D M M S S)	Longitude Coordinate (+ D D M M S S)	Altitude	Soil Unit	Sampler Number	Type	Layer	depth (m)	1st period Start date (D D M M Y Y)	last period final date (D D M M Y Y)	number of periods	Observations
1										- -				
2										- -				
3										- -				
4										- -				
5										- -				
6										- -				
7										- -				
8										- -				
9										- -				
10										- -				
11										- -				
12										- -				
13										- -				

Column		See explanation item #
1 - 4	Sequence number of plots (1 to 9 999)	
6 - 7	Country Code (France = 01, Belgium = 02, etc.)	(1)
9 - 12	Observation Plot number	(2)
14 - 20	Latitude in + DD MM SS (e.g. + 50 58 52)	(4)
22 - 28	Longitude in (+ or −) DD MM SS (e.g. + 03 55 31)	(4)
30 - 31	Altitude (in 50 meter classes from 1 to 51)	(7)
33 - 35	Soil unit code (101 - 253)	(10)
37 - 38	Sampler Number (1 - 99)	(51)
40	Sampler type (1 = Tension lysimeter, 2 = Zero tension lysimeter, 3= Centrifugation, 4 = Saturation extraction)	(52)
42	Layer (H, O = Organic, M = Mineral)	(21)
44 - 48	Sampling depth (in meters below surface)	(53)
50 - 55	1st period start date (DD MM YY)	(38)
57 - 62	last period final date (DD MM YY)	(38)
64 - 65	Number of (equal) monitoring periods	(39)
In the last column a remark on the plot can be included:		
67 - 77	Other observations (word)	(12)

Form 9b

XX1996.SSM

Contents of datafile with soil solution measurements (mandatory)

Seq. Num.	Observation Plot #	Period	Samp. Num.	pH	K (mg/l)	Ca (mg/l)	Mg (mg/l)	$N\text{-}NO_3$ (mg/l)	$S\text{-}SO_4$ (mg/l)	Al (mg/l)	DOC (mg/l)	Observations
1 - 5	7 - 10	12 - 13	15 - 16	18 - 20	22 - 26	28 - 32	34 - 38	40 - 44	46 - 50	52 - 56	58 - 62	64 - - - - 74
1				.	.	.	.	.	.	.	.	
2				,	,	,	,	,	,	,	,	
3				,	,	,	,	,	,	,	,	
4				,	,	,	,	,	,	,	,	
5				,	,	,	,	,	,	,	,	
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7				,	,	,	,	,	,	,	,	
8				,	,	,	,	,	,	,	,	
9 9 9 9 9	9 9 9 9	9 9	9 9	9 , 9	9 9 9 , 9	9 9 9 , 9	9 9 9 , 9	9 9 9 , 9	9 9 9 , 9	9 9 9 , 9	9 9 9 , 9	Maximum value (***)

1 - 5	Sequence Number	Sequence number of samples (1 to 99 999)	
7 - 10	Observation Plot number	Corresponding plot number (max. 9 999)	(2)
12 - 13	Period	Period number (max. 99)	(40)
15 - 16	Sampler number (*)	Sampler number (see plot file)	(51)

Parameters (**)

		Units
18 - 20	pH	
22 - 26	K	(mg/l)
28 - 32	Ca	(mg/l)
34 - 38	Mg	(mg/l)
40 - 44	$N\text{-}NO_3$	(mg/l)
46 - 50	$S\text{-}SO_4$	(mg/l)
52 - 56	Al (****)	(mg/l)
58 - 62	DOC	(mg/l)
64 - 74	Observation	Words

(*) The sampler number is defined in the plot file (PSS).

(**) Methods and recomputations that have been used shall be described in detail in an annex to the Data Accompanying Report on soil solution.

(***) Maximum values as mentioned in the bottom line of the table are to be used whenever the actually registered value is equal or higher than the maximum possible values in these columns. When the actual registered value is below the minimum value that could be entered, the minimum value shall be used. In both cases, the exact value should be reported either in the column 'observation' or in written form in the Data Accompanying Report. If no quantity could be measured (i.e. below detection limits) a special code − 1 (minus 1) will be used. When no analysis has been carried out for this parameter a zero or blank shall be used.

(****) Mandatory if pH < 5.

Form 9 c

XX1996.SSO

Contents of datafile with soil solution measurements (Optional)

Seq.Num	Observation Plot #	Period	Samp. Num.	Conditivity (µS/cm)	Water content (cm^3/cm^3)	(Na) (mg/l)	(Al-Labile) (mg/l)	Fe (mg/l)	Mn (mg/l)	P (mg/l)	$N\text{-}NH_4$ (mg/l)	Cl (mg/l)	Cr (µg/l)	Ni (µg/l)	Zn (µg/l)	Cu (µg/l)	Pb (µg/l)	Cd (µg/l)	Si (mg/l)	Alkalinity (µmolc/l)	Observations
1-5	7-10	12-13	15-16	18-21	23-26	28-32	34-38	40-44	46-50	52-56	58-62	64-68	70-74	76-79	81-84	86-89	91-95	97-101	103-107	109-113	115-125
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					,		,		,		,		,					,		,	
					,		,		,		,		,					,		,	
9 9 9 9 9	9 9 9 9	9 9	9 9	9 9 9 9	9 9 , 9 9	9 9 9 , 9	9 9 9 , 9	9 9 9 , 9	9 9 9 , 9	9 9 9 , 9	9 9 9 , 9	9 9 9 , 9	9 9 9 , 9	9 9 9 , 9	9 9 9 9	9 9 9 9	9 9 9 9	9 9 9 , 9	9 9 9 , 9	9 9 9 , 9	maximum value (*)

Column			See explanation item #
1-5	Sequence Number	Sequence number of samples (1 to 99 999)	(1)
7-10	Observation Plot number	Corresponding plotnumber (max. 9 999)	(2)
12-13	Period	Period number (max. 99)	(40)
15-16	Sampler number	Sampler number (see plot file)	(37)

	Parameters (**)	Units
18-21	Conductivity	(µS/cm)
23-26	Water content (extraction only)	(cm^3/cm^3)
28-32	Na	(mg/l)
34-38	Al-labile	(mg/l)
40-44	Fe	(mg/l)
46-50	Mn	(mg/l)
52-56	P	(mg/l)
58-62	$N\text{-}NH_4$	(mg/l)
64-68	Cl	(mg/l)

	Parameters (**)	Units
70-74	Cr	(µg/l)
76-79	Ni	(µg/l)
81-84	Zn	(µg/l)
86-89	Cu	(µg/l)
91-95	Pb	(µg/l)
97-101	Cd	(µg/l)
103-107	Si	(mg/l)
109-113	Alkalinity	(µmolc/l)
115-125	Observations	Words

(*) Methods and recomputations that have been used shall be described in detail in an annex to the Data Accompanying Report on soil solution.

(**) Maximum values as mentioned in the bottom line of the table are to be used whenever the actually registered value is equal or higher than the maximum possible values in these columns. When the actual registered value is below the minimum value that could be entered, the minimum value shall be used. In both cases, the exact value should be reported either in the column 'observation' or in written form in the Data Accompanying Report. If no quantity could be measured (i.e. below detection limits) a special code – 1 (minus 1) will be used. When no analysis has been carried out for this parameter a zero or blank shall be used.

Form 10a

XX1996.PLV

Contents of reduced plot file
to be used in combination with the survey of ground vegetation (see Annex XI)

1-4	6-7	9-12	14-15	17-22	24-30	32-38	40-41	43	45-48	50-52	54-57	59-61	63-66	68-70	72-74	76-86
Sequence	Country	Observation plot No	Survey No	Date (D D M M Y Y)	Latitude Coordinate (+ D D M M S S)	Longitude coordinate (± D D M M S S)	Attitude	Fence	Total area (m^2)	Ground. vegetation	Shrub layer: height	Shrub layer: cover	Herb layer: height	Herb layer: cover	Mosses cover	Observations
1											,		,			
2											,		,			
3											,		,			
4											,		,			
5											,		,			
6											,		,			
7											,		,			
8											,		,			
9											,		,			
10											,		,			
11											,		,			
12											,		,			
13											,		,			
14											,		,			
15											,		,			
16											,		,			

See explanatory notes

Column

1 - 4 Sequence No of plots (1 to 9999) (1)
6 - 7 Country code (France = 01, Belgium = 02, etc.) (2)
9-12 Plot No (maximum 9 999) (61)
14-15 Survey No (maximum 99) (3)
17-22 Date of sampling in DDMMYY (e.g. 220690) (4)
24-30 Latitude in + DDMMSS (e.g. + 505852) (4)
32-38 Longitude in (+ or –) DDMMSS (e.g. + 03 55 31) (5)
40-41 Altitude (in 50 meter classes from 1 to 51) (62)
43 Fence (Yes = 1, No = 2) (63)
45-48 Total sampled area (in m^2) (64)
50-52 Ground vegetation cover (in % of total area) (64)

Column

54-57 Shrub layer height (in m) (64)
59-61 Shrub layer cover (in % of total area) (64)
63-66 Herb layer height (in m) (64)
68-70 Herb layer cover (in % of total area) (64)
72-74 Mossess cover (in % of total area)

In the last column a remark on the plot can be included: (99)
76-86 Other observations (word)

▼M3

For 8b

XX1996.VEM

Contents of datafile with ground vegetation assessments

1-5	7-10	12-13	15-32	34	36-41	43-53
Sequence	Observation plot	Survey number	Species code	Layer	Cover (%)	Observations
1			, ,		,	
2			, ,		,	
3			, ,		,	
4			, ,		,	
5			, ,		,	
6			, ,		,	
7			, ,		,	
8			, ,		,	
9			, ,		,	
10			, ,		,	
11			, ,		,	
12			, ,		,	
13			, ,		,	
14			, ,		,	
15			, ,		,	
16			, ,		,	
17			, ,		,	
18			, ,		,	
19			, ,		,	
20			, ,		,	
21			, ,		,	
22			, ,		,	
23			, ,		,	
24			, ,		,	

See explanatory notes

Column		
1 - 5	Sequence No of plots (1 to 99 999)	
7-10	Plot No (maximum 90 999)	(2)
12-13	Survey No	(61)
15-32	Species code (see list in *Flora europaea*) The species code exists of the code for the family (999), the code for the genus (999) or (999 *bis*), the code for the species (999) or (999a) and possibly a code for the country (AA)	(66)
34	Layer (1 = tree, 2 = shrubs, 3 = herbs, 4 = mosses)	(65)
36-41	Cover (in percentage)	(67)
	In the last colum a remark on the plot can be included:	
43-53	Other observations (word)	(99)

▼B

CODE LISTS FOR THE SURVEY DATA OF THE PERMANENT OBSERVATION PLOTS TO BE FORWARDED TO THE COMMISSION

The following instructions and codes are to be adopted by the Member States to complete the common observation

Information on plot level

(1) *Country*

01 : France
02 : België — Belgique
03 : Nederland
04 : Deutschland
05 : Italia
06 : United Kingdom
07 : Ireland
08 : Danmark
09 : Ellas
10 : Portugal
11 : España
12 : Luxembourg

▼M2

13 : Sverige
14 : Österreich
15 : Suomi-Finland

▼B

(2) *Observation plot number*

The observation plot number corresponds to a unique number given to the permanent plot during the selection or installation.

(3) *Date of observation, date of assessment, date of analysis*

Dates shall be completed in the following order day, month and year:

Day	Month	Year
08	09	94

(4) *Latitude-/ longitude coordinates*

Fill in the full six figure latitude and longitude coordinates of the centre of the observation plot.

e.g.

	+/−	Degrees		Minutes		Seconds	
— latitude	+	5	0	1	0	2	7
— longitude	−	0	1	1	5	3	2

the first box is used to indicate a + or − coordinate

(5) *Availability of water to principal species (estimate)*

1 : Insufficient
2 : Sufficient

▼B

3 : Excessive

(6) *Humus type*

1 : Mull
2 : Moder
3 : Mor
4 : Anmor
5 : Peat
6 : Other
7 : Raw (Roh)

(7) *Altitude*

1 : ⩽ 50 m
2 : 51— 100 m
3 : 101— 150 m
4 : 151— 200 m
5 : 201— 250 m
6 : 251— 300 m
7 : 301— 350 m
8 : 351— 400 m
9 : 401— 450 m
10 : 451— 500 m
11 : 501— 550 m
12 : 551— 600 m
13 : 601— 650 m
14 : 651— 700 m
15 : 701— 750 m
16 : 751— 800 m
17 : 801— 850 m
18 : 851— 900 m
19 : 901— 950 m
20 : 951—1 000 m
21 : 1 001—1 050 m
22 : 1 051—1 100 m
23 : 1 101—1 150 m
24 : 1 151—1 200 m
25 : 1 201—1 250 m
26 : 1 251—1 300 m
27 : 1 301—1 350 m
28 : 1 351—1 400 m
29 : 1 401—1 450 m
30 : 1 451—1 500 m
31 : 1 501—1 550 m
32 : 1 551—1 600 m
33 : 1 601—1 650 m
34 : 1 651—1 700 m
35 : 1 701—1 750 m
36 : 1 751—1 800 m
37 : 1 801—1 850 m
38 : 1 851—1 900 m
39 : 1 901—1 950 m
40 : 1 951—2 000 m

▼B

41 : 2 001—2 050 m
42 : 2 051—2 100 m
43 : 2 101—2 150 m
44 : 2 151—2 200 m
45 : 2 201—2 250 m
46 : 2 251—2 300 m
47 : 2 301—2 350 m
48 : 2 351—2 400 m
49 : 2 401—2 450 m
50 : 2 451—2 500 m
51 : >2 500 m

(8) *Orientation*

1 : N
2 : NE
3 : E
4 : SE
5 : S
6 : SW
7 : W
8 : NW
9 : flat

(9) *Mean age of dominant storey (years)*

1 : ⩽ 20
2 : 21— 40
3 : 41— 60
4 : 61— 80
5 : 81—100
6 : 101—120
7 : > 20
8 : Irregular stands

(10) *Soil unit*

Fluvisols

101 Eutric Fluvisols
102 Calcaric Fluvisols
103 Dystric Fluvisols
104 Mollic Fluvisols
105 Umbric Fluvisols
106 Thionic Fluvisols
107 Salic Fluvisols

Gleysols

108 Eutric Gleysols
109 Calcic Gleysols
110 Dystric Gleysols
111 Andic Gleysols
112 Mollic Gleysols
113 Umbric Gleysols
114 Thionic Gleysols

▼B

115 Gelic Gleysols

Regosols

116 Eutric Regosols
117 Calcaric Regosols
118 Gypsic Regosols
119 Dystric Regosols
120 Umbric Regosols
121 Gelic Regosols

Leptosols

122 Eutric Leptosols
123 Dystric Leptosols
124 Rendzic Leptosols
125 Mollic Leptosols
126 Umbric Leptosols
127 Lithic Leptosols
128 Gelic Leptosols

Arenosols

129 Haplic Arenosols
130 Cambic Arenosols
131 Luvic Arenosols
132 Ferralic Arenosols
133 Albic Arenosols
134 Calcaric Arenosols
135 Gleyic Arenosols

Andosols

136 Haplic Andosols
137 Mollic Andosols
138 Umbric Andosols
139 Vitric Andosols
140 Gleyic Andosols
141 Gelic Andosols

Vertisols

142 Eutric Vertisols
143 Dystric Vertisols
144 Calcic Vertisols
145 Gypsic Vertisols

Cambisols

146 Eutric Cambisols
147 Dystric Cambisols
148 Humic Cambisols
149 Calcaric Cambisols
150 Chromic Cambisols
151 Vertic Cambisols
152 Ferralic Cambisols
153 Gleyic Cambisols
154 Gelic Cambisols

▼B

Calcisols

155 Haplic Calcisols
156 Luvic Calcisols
157 Petric Calcisols

Gypsisols

158 Haplic Gypsisols
159 Calcic Gypsisols
160 Luvic Gypsisols
161 Petric Gypsisols

Solonetz

162 Haplic Solonetz
163 Mollic Solonetz
164 Calcic Solonetz
165 Gypsic Solonetz
166 Stagnic Solonetz
167 Gleyic Solonetz

Solonchaks

168 Haplic Solonchaks
169 Mollic Solonchaks
170 Calcic Solonchaks
171 Gypsic Solonchaks
172 Sodic Solonchaks
173 Gleyic Solonchaks
174 Gelic Solonchaks

Kastanozems

175 Haplic Kastanozems
176 Luvic Kastanozems
177 Calcic Kastanozems
178 Gypsic Kastanozems

Chernozems

179 Haplic Chernozems
180 Calcic Chernozems
181 Luvic Chernozems
182 Glossic Chernozems
183 Gleyic Chernozems

Phaeozems

184 Haplic Phaeozems
185 Calcaric Phaeozems
186 Luvic Phaeozems
187 Stagnic Phaeozems
188 Gleyic Phaeozems

Greyzems

189 Haplic Greyzems
190 Gleyic Greyzems

▼B

Luvisols

191 Haplic Luvisols
192 Ferric Luvisols
193 Chromic Luvisols
194 Calcic Luvisols
195 Vertic Luvisols
196 Albic Luvisols
197 Stagnic Luvisols
198 Gleyic Luvisols

Lixisols

199 Haplic Lixisols
200 Ferric Lixisols
201 Plinthic Lixisols
202 Albic Lixisols
203 Stagnic Lixisols
204 Gleyic Lixisols

Planosols

205 Eutric Planosols
206 Dystric Planosols
207 Mollic Planosols
208 Umbric Planosols
209 Gelic Planosols

Podzoluvisols

210 Eutric Podzoluvisols
211 Dystric Podzoluvisols
212 Stagnic Podzoluvisols
213 Gleyic Podzoluvisols
214 Gelic Podzoluvisols

Podzols

215 Haplic Podzols
216 Cambic Podzols
217 Ferric Podzols
218 Carbic Podzols
219 Gleyic Podzols
220 Gelic Podzols

Acrisols

221 Haplic Acrisols
222 Ferric Acrisols
223 Humic Acrisols
224 Plinthic Acrisols
225 Gleyic Acrisols

Alisols

226 Haplic Alisols
227 Ferric Alisols
228 Humic Alisols
229 Plinthic Alisols

▼B

230 Stagnic Alisols
231 Gleyic Alisols

Nitisols

232 Haplic Nitisols
233 Rhodic Nitisols
234 Humic Nitisols

Ferralsols

235 Haplic Ferralsols
236 Xanthic Ferralsols
237 Rhodic Ferralsols
238 Humic Ferralsols
239 Geric Ferralsols
240 Plinthic Ferralsols

Plinthosols

241 Eutric Plinthosols
242 Dystric Plinthosols
243 Humic Plinthosols
244 Albic Plinthosols

Histosols

245 Folic Histosols
246 Terric Histosols
247 Fibric Histosols
248 Thionic Histosols
249 Gelic Histosols

Anthrosols

250 Aric Anthrosols
251 Fimic Anthrosols
252 Cumulic Anthrosols
253 Urbic Anthrosols

(11) *Size of total plot, size of sub-plot*

The size of the total plot, or sub-plot shall be stated in 0,0001 ha.

(12) *Number of trees in total plot*

The total number of trees in the total plot. All trees from 5 cm (DBH) and more are counted.

(13) *Yield estimates*

The yield estimates consist of an absolute and a relative yield estimate. The absolute estimate will be the estimated average yield over the total life period of the stand. The relative yield will indicate whether the absolute yield estimate is considered to be low, normal or high for the stand. The following codes will be used:

▼B

Absolute yield code	Relative yield code
0 = 0,0— 2,5 m^3 per hectare per year	1 = Low
1 = 2,5— 7,5 m^3 per hectare per year	2 = Normal
2 = 7,5—12,5 m^3 per hectare per year	3 = High
3 = 12,5—17,5 m^3 per hectare per year	
4 = 17,5—22,5 m^3 per hectare per year	
5 = > 22,5 m^3 per hectare per year	

(99) *Other Observations*

Relevant information concerning the plot shall be stated here.

Information on tree level

to be used in the crown assessment

(14) *Sample tree number*

The tree number is the number which has been assigned to the tree during the installation of the plot.

(15) *Species (Reference* Flora Europaea*)*

Broadleaves (* = species to be used for the foliage inventory)

001 : *Acer campestre* *
002 : *Acer monspessulanum* *
003 : *Acer opalus*
004 : *Acer platanoides*
005 : *Acer pseudoplatanus* *
006 : *Alnus cordata* *
007 : *Alnus glutinosa* *
008 : *Alnus incana*
009 : *Alnus viridis*
010 : *Betula pendula* *
011 : *Betula pubescens* *
012 : *Buxus sempervirens*
013 : *Carpinus betulus* *
014 : *Carpinus orientalis*
015 : *Castanea sativa (C. vesca)* *
016 : *Corylus avellana* *
017 : *Eucalyptus sp.* *
018 : *Fagus moesiaca* *
019 : *Fagus orientalis*
020 : *Fagus sylvatica* *
021 : *Fraxinus angustifolia*
spp. *oxycarpa (F. oxyphylla)* *
022 : *Fraxinus excelsior* *
023 : *Fraxius ornus* *
024 : *Ilex aquifolium*
025 : *Juglans nigra*
026 : *Juglans regia*
027 : *Malus domestica*
028 : *Olea europaea* *
029 : *Ostrya carpinifolia* *
030 : *Platanus orientalis*

▼B

031 : *Populus alba*
032 : *Populus canescens*
033 : *Populus hybrides* *
034 : *Populus nigra* *
035 : *Populus tremula* *
036 : *Prunus avium* *
037 : *Prunus dulcis (Amygdalus communis)*
038 : *Prunus padus*
039 : *Prunus serotina*
040 : *Pyrus communis*
041 : *Quercus cerris* *
042 : *Quercus coccifera (Q. calliprinos)* *
043 : *Quercus faginea* *
044 : *Quercus frainetto (Q. conferta)* *
045 : *Quercus fruticosa (Q. lusitanica)*
046 : *Quercus ilex* *
047 : *Quercus macrolepis (Q. aegilops)*
048 : *Quercus petraea* *
049 : *Quercus pubescens* *
050 : *Quercus pyrenaica (Q. toza)* *
051 : *Quercus robur (Q. peduculata)* *
052 : *Quercus rotundifolia* *
053 : *Quercus rubra* *
054 : *Quercus suber* *
055 : *Quercus trojana*
056 : *Robinia pseudoacacia* *
057 : *Salix alba*
058 : *Salix caprea*
059 : *Salix cinerea*
060 : *Salix eleagnos*
061 : *Salix fragilis*
062 : *Salix sp.*
063 : *Sorbus aria*
064 : *Sorbus aucuparia*
065 : *Sorbus domestica*
066 : *Sorbus torminalis*
067 : *Tamarix africana*
068 : *Tilia cordata*
069 : *Tilia platyphyllos*
070 : *Ulmus glabra (U. scabra, U. montana)*
071 : *Ulmus laevis (U. effusa)*
072 : *Ulmus minor (U. campestris, U. carpinifolia)*
073 : *Arbutus unedo*
074 : *Arbutus andrachne*
075 : *Ceratonia siliqua*
076 : *Cercis siliquastrum*
077 : *Erica arborea*
078 : *Erica scoparia*
079 : *Erica manipuliflora*
080 : *Laurus nobilis*
081 : *Myrtus communis*
082 : *Phillyrea latifolia*
083 : *Phillyrea angustifolia*

▼B

084 : *Pistacia lentiscus*

085 : *Pistacia terebinthus*

086 : *Rhamnus oleoides*

087 : *Rhamnus alaternus*

099 : *Other broadleaves*

Conifers (* = species to be used for the foliage inventory)

100 : *Abies alba* *

101 : *Abies borisii-regis* *

102 : *Abies cephalonica* *

103 : *Abies grandis*

104 : *Abies nordmanniana*

105 : *Abies pinsapo*

106 : *Abies procera*

107 : *Cedrus atlantica*

108 : *Cedrus deodara*

109 : *Cupressus lusitanica*

110 : *Cupressus sempervirens*

111 : *Juniperus communis*

112 : *Juniperus oxycedrus* *

113 : *Juniperus phoenicea*

114 : *Juniperus sabina*

115 : *Juniperus thurifera* *

116 : *Larix decidua* *

117 : *Larix kaempferi (L. leptolepis)*

118 : *Picea abies (P. excelsa)* *

119 : *Picea omorika*

120 : *Picea sitchensis* *

121 : *Pinus brutia* *

122 : *Pinus canariensis*

123 : *Pinus cembra*

124 : *Pinus contorta* *

125 : *Pinus halepensis* *

126 : *Pinus heldreichii*

127 : *Pinus leucodermis*

128 : *Pinus mugo (P. montana)*

129 : *Pinus nigra* *

130 : *Pinus pinaster* *

131 : *Pinus pinea* *

132 : *Pinus radiata (P. insignis)* *

133 : *Pinus strobus*

134 : *Pinus sylvestris* *

135 : *Pinus uncinata* *

136 : *Pseudotsuga menziesii* *

137 : *Taxus baccata*

138 : *Thuya sp.*

139 : *Tsuga sp.*

199 : *Other conifers*

(16) *Defoliation*

Defoliation figure for each sample tree expressed as a percentage (in steps of 5 %) compared with a tree with complete foliage. The actual percentage is used.

▼B

0 = 0 %

5 = 1- 5 %

10 = 6-10 %

15 = 11-15 %

etc.

(17) *Discolouration codes*

0 : no discolouration (0-10 %)

1 : slight discolouration (11-25 %)

2 : moderate discolouration (26-60 %)

3 : severe discolouration (> 60 %)

4 : dead

(18) *Easily identifiable causes of damage*

Add a mark (1) in the corresponding column(s).

T1 = game and grazing

T2 = presence or traces of an excessive number of insects

T3 = fungi

T4 = abiotic agents (wind, snow, frost, drought, …)

T5 = direct action of man

T6 = fire

T7 = known local/regional pollutant

T8 = other

(19) *Identification of damage type*

Where possible, further identification of the damage type should be added, e.g. for insects: the species or group (e.g. 'bark beetles').

(20) *Other observations on tree level*

Any additional observations which may be of interest shall be clearly noted on the form, (e.g. possible influencing factors (recent drought, temperature extremes); other damage/stress symtoms).

to be used in the soil condition inventory

(21) *Code for depth level*

O = Organic layer (see footnote in paragraph II.4 for definition)

H = Organic layer (see footnote in paragraph II.4 for definition)

M05 = Mineral soil between 0 and 5 cm (optional)

M51 = Mineral soil between 5 and 10 cm (optional)

M01 = Mineral soil between 0 and 10 cm (mandatory)

M12 = Mineral soil between 10 and 20 cm (mandatory)

M24 = Mineral soil between 20 and 40 cm (mandatory)

M48 = Mineral soil between 40 and 80 cm (mandatory)

(22) *Code of sampling analysis method (SAM)*

For each parameter that has been determined in one or more soil samples, one of the following codes is included in the first dataline, and used to indicate the sample type under sample code:

0 = no deviation from approved method

1 = parameters have been determined through an alternative method (details to be included in an annex to the soil condition report), or first (sub)sample

▼B

2-8 = codes to be used for any subsequent subsamples

9 = parameters have been determined through recomputation of data determined through a different method (details to be included in the annex to the soil condition report)

to be used in the foliage inventory

(23) *Sample code*

The sample code for the foliage inventory consists of the tree species code (see explanation item 15) followed by the code for leaves/needles of the current year (=0) or of the current + 1 leaves/needles (1). e.g. the sample of the needles of last year (1) of the *Picea abies* (118) is thus: 118.1

(24) *Tree numbers of the sample*

As in some samplings (foliage, increment) trees outside the normal plot (or sub-plot) have to be used, special numbers have to be applied. The numbers of these trees will start with a letter (F = foliage, R = ring analysis by increment borings, D = discs analysis) followed with a sequence number (e.g. F001). The numbers are to be reported.

(25) *Mass of 100 leaves or 1 000 needles*

The mass is determined of 100 leaves or 1 000 needles (oven-dry) in grams.

▼M3

▼B

(27) *Diameter at breast height (DBH)*

The diameter at breast height (1,30 m) over bark in 0,1 centimetres.

When a diameter tape is used a single value will be needed. When calipers are used the maximum and the minimum diameter (over bark) shall be determined and reported (diameter 1 and diameter 2).

(28) *Bark*

The thickness of the bark at 1,30 m, expressed in centimetres with one decimal.

(29) *Height of the tree*

The height of the tree expressed in metres and rounded off to the nearest 0,5 metres.

(30) *Tree volume*

Based on the measured diameter(s) and height, the tree volume can be estimated using locally known form factors or through the use of valid volume tables. The tree volume shall be expressed in cubic metres (m^3) with three decimals.

(31) *Crown length*

The length of the crown rounded off to the nearest 0,5 metres is determined from the tip of the stem to the lowest live branch excluding water shoots.

(32) *Crown width*

The average crown width is determined by the average of at least four crown radii, multiplied by two, and rounded off to the nearest 0,5 metres.

▼B

(33) *Diameter under bark*

The actual diameter under bark is calculated as the diameter over bark deducted with the width of the bark at the two sides. The diameter under bark of five years ago is calculated as the actual diameter under bark less the increment of the last five years of the tree at both sides. The diameter under bark is expressed in 0,1 centimeters.

(34) *Basal area per plot*

The actual basal area per plot is calculated as the total basal areas of all the trees in the plot. The basal area per plot of five years ago is calculated on the basis of the estimated diameter under bark of five years ago of all the trees in the plot. Basal area per plot is expressed in 0,1 m^2.

(35) *Volume per plot*

The actual volume per plot is calculated as the total volume of all the trees in the plot. The volume per plot of five years ago is calculated on the basis of the estimated diameter under bark of five years ago of all the trees in the plot. Volume per plot is expressed in 0,1 m^3.

(36) *Thinnings*

If a thinning has taken place in the five-year period between the two years of determination of diameter, basal area per plot and volume per plot, this will be indicated (Yes = 1, No = 0). In an additional part the details of this thinning will be described as detailed as possible (including: thinning method, exact year of thinning, thinning intensity expressed as number of trees, basal area/ha, volume/ha).

(99) *Other observations*

Relevant information shall be stated here and explained in the corresponding evaluation report (see Annex VIIb).

▼M1

Information with regard to the deposition monitoring

(37) *Sampler code*

The following codes shall be used for the samplers for deposition.

1 : throughfall

2 : bulk deposition

3 : wet-only deposition

4 : stemflow

5 : fog

6 : frozen fog (rime)

7 : air concentration

9 : others

Details on the equipment used shall be stated in an Annex to the document with the background information.

(37a) *Sample quantity*

The total collected quantity of the sample(s) shall be divided by the catchment area of the collectors) and shall be reported in mm.

(38) *First and final dates of the monitoring period*

The first and final dates of each monitoring period shall be stated on the forms, using the same format as the date of observation, assessment and analysis (see item 3).

A monitoring period shall consist of one or more measuring periods. The measuring periods within one monitoring period should have the same length. The minimum length of a measuring period is one week, the maximum one month.

▼M1

When it is necessary to use different measuring periods during the year (e.g. weekly in summer and monthly in winter), two separate monitoring periods shall be identified and the results shall be reported separately on the forms.

(39) *Number of measuring periods*

The number of measuring periods in each monitoring period shall be indicated in the forms.

(40) *Period*

The measuring period number in which the sample has been collected shall be stated. Each year (on or around 1 January) a new set of measuring periods will be started. When samples from several measuring periods are combined before analysis, the exact details of the mixing shall be stated in the annex to the document with background information. The number of the first measuring period shall be used to indicate the period for analysis (e.g. when the samples from period 9, 10, 11 and 12 are combined into a single sample for the analysis, this sample will be given the period number 9).

▼M3

(41) *Plot/instrument code*

All instruments that are installed in or near the plot are given an observation plot/instrument code. This code consists of the plot number (up to four digits) and a sequential number for all instruments (up to 99). When instruments are replaced or added, new codes are applied. (e.g. the fifth instrument in plot 1234 will thus receive code 1234.05).

(42) *Location*

The location of the instrument is indicated:

S : instrument is located on site, i.e. in (the buffer zone) of the plot. This could be under the canopy, above the canopy or in the forest soil

F : instrument is located in a (nearby) open field in the forest area

W : instrument is located at a weather station (in general outside the forest area)

O : instrument is located elsewhere.

(43) *Variable*

Indication of the variable that is measured with the instrument

AT = air temperature

PR = precipitation

RH = relative humidity

WS = windspeed

WD = wind direction

SR = solar radiation

UR = UVb radiation

TF = throughfall

SF = stemflow

ST = soil temperature

MP = matric potential in the soil

WC = water content in the soil

XX = other codes for additional parameters may be used, but should be specified in the DAR.

▼M3

(44) *Instrument information*

Vertical position

The vertical position (height or depth) of the instruments shall be indicated in metres with a plus (= height above the ground) or a minus sign (depth below the ground) using the format of two digits and two decimals.

Instrument code

The following codes shall be used for the samplers and recording method of data:

10 : manual reading and recording on paper

20 : mechanical recording (manual reading and recording on paper)

30 : direct paper recording

40 : digital recording (in stand alone situation)

50 : digital recording (integrated datalogger)

Details of the equipment shall be given in the data accompanying report (DAR).

Scanning interval (automatic instruments only)

The interval between two consecutive assessments shall be given stated in seconds.

Storing interval (automatic instruments only)

The interval between two consecutive data storage moments shall be given in minutes

(45) *Parameters to be assessed in the meteorological monitoring*

Precipitation and throughfall

The precipitation will be given as the daily sum, using the format of up to four digits and one decimal.

Temperature (air and soil)

The temperature will given in °C, using the format of a plus/minus and two digits plus one decimal. The daily mean, daily minimum and daily maximum are to be submitted.

Relative Humidity

The relative humidity will be given as the daily mean, the minimum and the maximum value reached per day, using the format of two digits and one decimal.

Windspeed

The windspeed will be given as the daily mean and the maximum value reached per day, using the format of two digits and one decimal.

Wind direction

The wind direction will be given as the prevailing wind per day. The wind rose will be split into eight sections of 45° starting form 22,5° onwards (NE (=45°), E (=90°), SE (=135°)… N (=0°). The most frequent wind direction is reported by its middle value.

Solur radiation and UVb radiation

The solar radiation and the UVb radiation will be given as the daily mean value, using the format of up to four digits and one decimal.

Stem flow

The stem flow will be calculated to mm precipitation and will be given as the daily sum, using the format of up to four digits and one decimal.

▼M3

Matric potential in the soil

The matric potential in the soil will be given in hPa, as the daily mean, the minimum and the maximum value reached per day, using the format of up to four digits and one decimal.

Water content in the soil

The water content in the soil will be given in Vol. % as the daily mean, the minimum and the maximum value reached per day, using the format of up to four digits and one decimal.

(46) *Completeness*

The completeness is an indicator of the coverage of the scanning and storing procedures and is given in percentages using the format of up to three digits (l00 % = complete).

▼M2

Information with regard to the soil solution monitoring

(51) *Sampler number*

The samplers in the plot shall be numbered in a permanent way (1 — 99).

(52) *Sampler code*

The following codes shall be used for the samplers for soil solution:

1 : Tension lysimeter

2 : Zero tension lysimeter

3 : Centrifugation

4 : Saturation extraction

(53) *Sampling depth*

The sampling depth in metres below the surface (e.g. −0.40)

Information with regard to the tree condition assessment

(54) *Exposure*

1 No special exposure (plot located within a larger forest area with no or gentle relief)

2 Limited exposure (plots near forest edge, on slopes, etc.)

3 Severely exposed plots (on mountain tops, etc.)

(55) *Removals & Mortality*

The tree has been cut and removed, only its stump has been left

11 planned utilization, e.g. thinning

12 utilization for biotic reasons, e.g. insect damage

13 utilization for abiotic reasons, e.g. windthrow

18 reason for disappearance unknown

Tree is still standing and alive, but condition parameters are no longer assessed

21 lop-sided or hanging tree

22 heavy crown break (over 50 % of the crown) or broken stem

▼M2

23 tree is no longer in Kraft class 1, 2 or 3 (not applicable to the first inventory in a plot)

29 other reason (specify)

Standing dead tree

31 biotic reason, e.g. bark beetle attack

32 abiotic reason, e.g. drought, lightning

38 unknown cause of death

Trees that have fallen (living or dead)

41 abiotic reason, e.g. storm

42 biotic reason, e.g. beavers

48 unknown cause

Notes:

— class 22 is only applicable in those countries that do not record trees with more than 50 % crown damage

— class 23 is only applicable in those countries who restrict sampling to Kraft classes 1, 2 and 3

(56) *Social Class*

1 pre-dominant (including free standing trees) trees with upper crown standing above the general level of the canopy

2 dominant — trees with crowns forming the general level of the canopy

3 co-dominant — trees extending into the canopy and receiving some light from above but shorter than 1 or 2

4 suppressed — trees with crowns below the general level of the canopy, receiving no direct light from above

(57) *Crown shading*

1 crown significantly affected (shaded or physical interactions) on one side

2 crown significantly affected (shaded or physical interactions) on two sides

3 crown significantly affected (shaded or physical interactions) on three sides

4 crown significantly affected (shaded or physical interactions) on four sides

5 crown open-grown or with no evidence of shading effects

6 suppressed trees

(58) *Visibility*

1 whole crown is visible

2 crown only partially visible

3 crown only visible with backlighting (i.e. in outline)

4 crown not visible

▼M3

Information with regard to the ground vegetation assessment

(61) *Plot/survey number*

Each time (day), or situation (inside outside fence), that an assessment of the ground vegetation is made on a given plot, a survey number is given. By combining the plot number with the survey number a unique plot/survey number is created.

▼M3

(62) *Fencing*

As the vegetation can be very different inside and outside a fence, it was decided that in principle the ground vegetation is always surveyed outside the fence. When a survey inside the fence is carried out this should be reported as a separate survey and the fencing code indicated:

1 = Yes, survey within the fence,

2 = No, survey was outside fenced area.

(63) *Total sampled area*

The total sample area shall be given in m^2 in up to four digits. In the data accompanying report (or DAR-Q) the exact details of the number of repetitions, the location/orientation of the ground vegetation plots and the sizes) of these plots shall be given.

(64) *Height and cover of layers*

The average height and estimated cover of the total ground vegetation layer, the shrub layer, the herb layer and the moss layer shall be submitted as follows:

	Height (in m)	Cover (in %)
Total ground vegetation layer		*
Shurb layer	*	*
Herb layer	*	*
Moss layer		*

* = to be submitted.

The average height of the layers shall be given in metres in one digit and two decimals. The estimated cover shall be given as a % of the total sampled area.

(65) *Layers*

The following layers are defined.

1 = free layer
2 = shrub layer
3 = herb layer
4 = moss layer

} to be defined in DAR-Q

(66) *Species code*

A species code is to be applied, which consists of three groups of number codes for the family, genus and species separated by dots (.). Most codes consist of a three-digit number. Unfortunately one genus consists of a three-digit code plus the letters 'bis'. The species code can be extended with l letter to indicate a variety. The total list consists of over 11 000 species. This list will be made available in digital format by the Commission for use by the NFC's.

In cases where the Flora Europaea is not complete enough, a special list of nationally important species could be prepared by the NFC. These national species codes will consist of a new code number (family, genus and species), plus the country code (2 letters) separated by dots (.). The NFC will maintain a complete list with all codes, including relevant details of the species (full name, aliases, etc.) and shall include this fist in the DAR.

(67) *Cover of plant species*

Countries are free in the assessment of the abundance/cover of the plant species. The submission of this cover is in % using up to five digits and two decimals (999.99). In the DAR the complete assessment methods, as well as the conversion to % shall be specified.

▼M2

ANNEX VIIb

DETAILS FOR THE SUBMISSION OF BACKGROUND INFORMATION ON THE MONITORING METHODS APPLIED AND THE RESULTS OF EVALUATION/INTERPRETATION OBTAINED ON NATIONAL LEVEL

I. **General remarks**

In addition to the submission of the data from the intensive monitoring of forest ecosystems, Member States shall prepare and submit to the Commission a document with the background information on the monitoring methods applied (Data Accompanying Report, DAR) and an annual report on the progress made in the interpretation/evaluation of results on national level (annual progress report).

The DAR consists of two parts: the part describing the actually applied methods of the sampling lay-out, the equipment used, the assessment, the analysis, etc. (for details see paragraph II.1) and the part on exceptions and disturbances encountered (for details see paragraph II.2).

Member States shall submit to the Commission every year a report on progress made in the interpretation/evaluation of results on national level, starting from 1997 onwards. This report shall comprise

— information on the achievements of the National Focal Centre (NFC) itself,

— an (up-dated) description of the national evaluation strategy,

— a summary of the results achieved on national level, and

— information on publications made in this field on national or international level by the NFC or other institutions involved.

Recommendations for interpretation and evaluation of results on national level are given below in paragraph III.

II. **Data Accompanying Report**

II.1 Part of the DAR describing the methods actually applied, etc.

This part of the DAR describes the sampling lay-out methods actually applied, the equipment used, the assessment, the analysis, etc. The following details are given:

Inventory/Sampling methods

In many surveys of the intensive monitoring of forest ecosystems there is a large freedom in the selection of equipment, sampling depths, timing, intensity of the survey, etc. The details of the equipment actually applied, the actual depth, timing and frequency of the survey/sampling shall be stated. Whenever samples have been taken, details on this sampling including the storage and transport, shall be stated.

Any applied control measurements shall be described in short.

Methods for analysis and calculation of results

With regard to the analysis of samples, details of the preparation of the samples and methods applied in the analysis shall be given. In most surveys, certain methods for preparation and analysis are recommended. Whenever methods different from the recommended methods have been applied, exact details of these methods shall be given including possibilities for (re-) calculation of the obtained data. Any applied control measurements (participation in ring tests, etc.) shall be described in short.

As a basis for the description of the methods, the DAR questionnaires that have been developed by Forest Intensive Monitoring Coordination Institute of the European Commission, in close collaboration with the chairmen of the expert panels of ICP Forests (UN/ECE), can be used for the general description of the data assessment. The information submitted with the help of the DAR questionnaires will remain valid over the years until the applied methods are changed.

Special attention shall be given to observe and document changes in the applied methods of the inventory, transport and analysis. Regional differences shall be stated and explained in full detail (e.g. different laboratories used for analysis).

▼M2

II.2 Part of the DAR dealing with exceptions and disturbances encountered (annual DAR)

In addition to the general information on the methods described by using the DAR questionnaire, the specific problems, exceptions, disturbances and validation problems of the data submitted each year, are to be described.

Exceptions and disturbances

Exceptional situations and important disturbances from the routine shall be reported. Besides the description of the applied methods for the sampling, analysis, etc., as presented in the DAR questionnaires, good documentation of the exceptions, exceptional situations and disturbances is needed. This will be documented in an annual DAR report and submitted to the Commission together with the submitted data.

Data validation and data management

The procedures applied for data quality control shall be given, including limits of data rejection (plausibility checks) as well as the procedures that have been applied to check the consistency of the national data sets.

When gaps exist in the data, estimates based on results from other sources can be made in certain cases. These estimated data shall be indicated and the used assumptions shall be carefully documented.

III. **Annual report on progress made in the interpretation/evaluation of results on national level**

This report provides information on progress made in the interpretation/evaluation of results on national level. For the interpretation/evaluation of results on national level the following details are given:

General information

Member States shall execute an evaluation and interpretation of the monitoring data on national level.

Member States are free to decide which evaluation and interpretation is carried out on national level and reported to the Commission. However, the following suggestions are given for this evaluation:

Single survey evaluation and interpretation

Whenever results from earlier surveys are available an attempt should be made to determine trends. The results of the single survey should be reviewed and compared to results from other (similar) surveys carried out in the (same) region/country. Differences and similarities are to be indicated and when applicable the differences should be evaluated. Also relevant data from other sources, which could explain certain relations in parameters should be included in the evaluation here.

Integrated evaluation and interpretation

With the completion of the different surveys, possibilities arise for integrated evaluation. In the NFC, all survey results and evaluation reports are collected. The NFC shall coordinate the integrated evaluation and the interpretation of the different survey results on national level.

Evaluation and interpretation with external data

The results of the integrated evaluation and interpretation found should be reviewed and compared to results from other sources. Differences and similarities should be noted and explained whenever possible.

IV. **Timing for the submission of the DAR and the report on progress made in the interpretation/evaluation of results on national level**

IV.1 Timing for the DAR

The DAR questionnaire shall be completed and submitted to the Commission with the first data submission. If the methods are changed the information on the changes shall be submitted. The part of the DAR dealing with descriptions of noted disturbances and exceptions shall be submitted to the Commission together with the annually submitted data.

▼**M2**

IV.2 Timing for the report on progress made in the interpretation/evaluation of results on national level

Progress reports on evaluations and interpretations carried out on national level shall be forwarded to the Commission before 31 December each year.

▼M1

ANNEX VIII

COMMON METHODS FOR DEPOSITION MEASUREMENTS ON THE PERMANENT OBSERVATION PLOTS

I. Generals remarks

The measurements are to be carried out on a selection of the permanent observation plots in a continous way. At least 10 % of the permanent observation plot shall be selected for the monitoring of deposition by the Member States. Measurements on throughfall (under canopy), stem flow (under canopy, in beech) and wet-only or bulk deposition (in an open area in the forest) will be mandatory. The installation of the equipment for the mandatory items shall be completed by December 1995. All other measurements such as: stemflow (in other species than beech), fog and air-concentrations are optional.

The depositions monitoring will be done on a fixed period basis (for example monthly or weekly). To reduce analysis costs samples may be combined from a number of consecutive periods.

The following technical details are based on the results of the Expert Panel on Deposition of ICP Forests. Reference is made to the manual prepared by this Expert Panel especially regarding specific details of sampling equipment, sampling techniques, quality assurance and data handling.

II. Monitoring methodology

II.1. *Monitoring under the forest canopy*

Whenever possible the measuring equipment for throughfall shall be installed in the actual plot. To avoid damage to root systems, the parts that have to be installed in pits (collectors, recorders, etc.) could be installed outside the actual plot in the bufferzone. In beech forest equipment shall also be installed for the collection of stemflow. As these collectors should also be stored in a (or the same) pit, it is recommended to select trees outside the actual plot, in for example the bufferzone.

The measurements of throughfall and stemflow should be made in such a way that the results are representative for the plot area. This means that a sufficient number of samples should be used.

II.2. *Monitoring in an open area in the forest*

At a location near the actual plot (within a distance of 2 km), wet-only and/or bulk deposition collectors shall be installed. The location should be selected in such a way that the surrounding objects are not closer than two times their height.

II.3. *Measurement period*

The measuring will be made monthly, weekly or at a time interval between the two, e. g. every two or three weeks, depending mainly on the general weather conditions at the specific plot (evaporation and growth of algae in the sample containers should be avoided).

When it is necessary to use different measuring periods during the year (e. g. weekly in summer and monthly in winter), two separate monitoring periods shall be identified and the results shall be reported separately on the forms. Within one monitoring period the lenght of the measuring period shall be constant. The same measuring period shall be used for the monitoring under the forest canopy and the open area monitoring.

II.4. *Sampling, sample handling*

Clean collection gauges and containers are to be used for the collection of samples. Deionized water shall be used to rinse the equipment. It is important that the containers are kept away from light and kept cool during the sampling and transport. In sunny and warm conditions preservatives may be added to prevent the growth of algae. In this case only such preservatives should be used that do not interfere with the analysis of any ion of interest.

▼M1

II.5. *Pretreatment of samples, transport and storage*

The volume of each collected sample form each individual throughfall, stemflow or open air collector shall be determined. The samples may be analyzed separately or mixed with samples from parallelly installed equipment of the same type. Throughfall, stemflow or open air samples shall be analyzed separately. Samples from stemflow measurements can only be pooled for trees of the same species and similar size and dominance.

Samples from short periods may be analyzed as they are, or can be mixed to monthly samples before analysis. If samples are mixed they should be mixed in proportion to the total sample volume.

The samples shall be transported to the laboratory as soon as possible (preferably in cold boxes) and kept in a cold (4 °C) and dark store until analyzed.

II.6. *General background information*

The following information shall be collected:

— plot number,

— sampler code,

— first date of monitoring period,

— last date of monitoring period,

— number of (equal) measuring periods in monitoring period.

Additional optional information can be collected, which is useful for the interpretation of the results, such as canopy roughness, leaf area index etc.

II.7. *Chemical Analysis*

In each sample the following parameters shall be determined mandatory (Man) or optional (Opt.):

Parameter	Throughfall	Bulk/Wet-only	Stemflow		Fog	Air
			beech	other spec.		
pH	Man	Man	Man	Opt.	Opt.	
Conductivity	Man	Man	Man	Opt.	Opt.	
K	Man	Man	Man	Opt.	Opt.	Opt.
Ca	Man	Man	Man	Opt.	Opt.	Opt.
Mg	Man	Man	Man	Opt.	Opt.	Opt.
Na	Man	Man	Man	Opt.	Opt.	Opt.
$N\text{-}NH_4$	Man	Man	Man	Opt.	Opt.	
Cl	Man	Man	Man	Opt.	Opt.	
$N\text{-}NO_3$	Man	Man	Man	Opt.	Opt.	
$S\text{-}SO_4$	Man	Man	Man	Opt.	Opt.	Opt.
Alkalinity	Man	Man	Man	Opt.	Opt.	
N_{total}	Man	Opt.	Man	Opt.	Opt.	
Al^{3+}	Opt.	Opt.	Opt.	Opt.	Opt.	
Mn^{2+}	Opt.	Opt.	Opt.	Opt.	Opt.	
Fe^{3+}	Opt.	Opt.	Opt.	Opt.	Opt.	
PO_4^{3-}	Opt.	Opt.	Opt.	Opt.	Opt.	
Cu	Opt.	Opt.	Opt.	Opt.		
Zn	Opt.	Opt.	Opt.	Opt.	Opt.	
Hg	Opt.	Opt.	Opt.	Opt.		
Pb	Opt.	Opt.	Opt.	Opt.	Opt.	
Co	Opt.	Opt.	Opt.	Opt.		
Mo	Opt.	Opt.	Opt.	Opt.		

▼**M1**

Parameter	Throughfall	Bulk/Wet-only	Stemflow		Fog	Air
			beech	other spec.		
Cd	Opt.	Opt.	Opt.	Opt.		
S_{total}	Opt.	Opt.	Opt.	Opt.		
N_{org}	Opt.	Opt.	Opt.	Opt.		
C_{TOC}	Opt.		Opt.	Opt.		
C_{DOC}	Opt.		Opt.	Opt.		
P_{total}	Opt.	Opt.	Opt.	Opt.		
O_3						Opt.
SO_2						Opt.
SO_4						Opt.
NO_2						Opt.
NO						Opt.
HNO_2						Opt.
HNO_3						Opt.
NH_4NO_3						Opt.
NH_3						Opt.
V.O.C.						Opt.

II.8. *Data transfer*

The Member States shall forward this information in a standardized form to the Commission for each plot where deposition has been monitored (see Annex VII, Forms 7a, 7b, 7c and 7d).

▼M3

ANNEX IX

COMMON METHODS FOR MEASUREMENTS OF METEOROLOGY ON THE PERMANENT OBSERVATION PLOTS

I. General remarks

The measurement of meteorology is to be carried out on at least 10 % of permanent observation plots. It is recommended to monitor meteorology on plots where deposition is also monitored. The installation of the equipment for the meteorologic measurements shall be completed by 30 June 1999.

This Annex is based on technical recommendations of the *ad hoc* expert group on meteorology (EU/ICP Forests). Reference is made to the submanual (1996/1997) prepared by this expert group.

II. Inventory methodology

II.1. *Location of sampling equipment*

To represent the specific climatic conditions of woodlands the measurements should be carried out inside the forest area concerned. In general the measurements (with the exception of soil temperatures, soil moisture and stand precipitation) may be taken either above the forest stand canopy at the plot or at an open field station within the forest area in close proximity (in general not more than 2 km distance) to the stand of the plot. The distance from the measuring point at open field stations to the surrounding stands or other obstacles shall be at least two times the height of a mature tree/obstacle. Soil temperature, soil moisture and stand precipitation are to be measured inside the stand of the permanent observation plot

Whenever possible a combination with the equipment for deposition should be made. To avoid disturbances to the roots and soil situation, the equipment should be placed so that it can be reached and maintained without actually passing through the plot.

II.2. *Methods to measure the actual meteorologic situation in or close to the plot*

By installation of a meteorological station in an open area close to the plot or the installation of a tower in the stand near the plot, the weather situation should be monitored continuously. The technical equipment, sensors and their placement are to be in accordance with the international World Meteorological Organisation standard and should also be compatible with national weather service networks. The following variables are to be obtained.

Mandatory	Optional
Precipitation	UVb radiation
Air temperature	Soil temperatures
Air humidity	Soil moisture
Wind speed [1]	(matric potential, water content)
Wind direction [1]	Stand precipitation
Solar radiation [1]	(quantity of throughfall and stemflow)

[1] If there are local technical problems at the permanent observation plots wind speed, wind direction and solar radiation may be omitted at these plots.

Automatic stations with quasi-continuous ($\approx$ 1 s) sensing variables and electronic storage of aggregated values for periods of one hour or parts of it are recommended.

II.3. *Collection, aggregation, storage and submission of information*

Data are to be aggregated to daily values (sum or average/mean, minimum and maximum respectively) before submission.

The following plot information shall be collected and submitted:

— plot No,

▼M3

— exact details of the used equipment,

— location of the plots (longitude, latitude, altitude) and of equipment (relative to the plot),

— start and end dates of the measurements,

— frequency (number of periods).

The information on the variables is submitted on a daily basis.

LIST OF PARAMETERS

Parameter	Units	Mean	Sum	Minimum	Maximum	Remarks
Precipitation	(mm)		*			Total precipitation including snow, etc.)
Air temperature	(°C)	*		*	*	
Relative humidity	(%)	*		*	*	
Wind speed	(m/s)	*			*	
Wind direction	(°)	*				Prevailing wind direction
Solar radiation	(W/m^2)	*				
UVb radiation	(W/m^2)	*				
Soil temperature	(°C)	*		*	*	
Soil moisture (matric pot. Water content)	(hPa)	*		*	*	
Stand precipitation	(mm)		*			
Others						To be specified in the data accompanying Report

* = to be submitted.

For each plot where the measurements are executed a summary of the collected measurements shall be compiled and submitted to the Commission on a yearly basis, using the forms XX1996.PLM, XX1996.MEM and XX1996.MEO (forms 8a, 8b, 8c)

▼M2

ANNEX X

COMMON METHODS FOR SOIL SOLUTION MONITORING ON THE PERMANENT OBSERVATION PLOTS

I. General remarks

Monitoring of soil solution is to be carried out on at least 10 % of permanent observation plots. It is recommended that soil solution be monitored on plots where deposition is also monitored. Installation of the soil solution equipment shall be completed by 30 June 1998.

This Annex is based on technical recommendations of the Soil Expert Panel of the UN/ECE International Cooperative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests). Reference is made to the sub-manual (1996) prepared by this expert panel.

II. Inventory methodology

II.1 *Selection of sample location*

Soil solution samplers should be installed close to where crown condition assessment is conducted. It is recommended that the lysimeters be randomly or systematically distributed over the whole plot although this may be limited by the presence of stones or stems (distance from a tree is not specified). Because of disturbances to the soil, zero-tension lysimeters should not be installed in the central part of the plot where tree parameters are monitored. For practical reasons, a representative subplot can be used. Lysimeters that have already been installed can be maintained, but new installations should be made as proposed above.

II.2 *Sampling depths*

It is recommended that the lysimeters be installed at fixed depths but installation by horizons is also acceptable.

— Soil solution collectors

It is strongly advised that lysimeters be placed at at least two depths, i.e one within the rooting zone (suggested depth is 10 to 20 cm) to gain insight into concentrations of nutrients and toxic elements near the fine roots (aim 1) and one below the rooting zone (suggested depth is 40-80 cm), to estimate the element output (aim 2). It is also advised that a third lysimeter be placed immediately below the humus layer.

— Soil samples

If centrifugation or saturation extract methods are used, the soil layers to be sampled are those mentioned in the soil manual: humus layer, 0 — 10, 10 — 20, 20 — 40 and 40 — 80 cm. A selection or aggregation of some layers can be made.

II.3 *Sampling frequency*

On plots where other intensive monitoring programmes are carried out, e.g. deposition and meteorological measurements, the sampling of the soil solution should be done monthly or bi-weekly. In case of soil sampling followed by extraction of the soil solution, four times per year is a maximum because of the destructive sampling procedure. Sampling should be done at the same month of the year.

II.4 *Transport, storage and preparation*

The samples shall be transported and stored in such a way that chemical changes are minimized.

Cool (4 °C) and dark storage of the soil solution within the lysimeter system will diminish biological activity. In many cases, and especially during colder season, keeping the bottle dark is sufficient. Organic or inorganic preservatives may be used, but they may interfere with the analysis. To diminish possible changes in the samples, the soil solution should be collected as soon as possible after the suction has been applied.

Transport and storage procedures (including waiting periods) shall be reported. Where applicable the problems and deviations of these procedures shall be reported in detail.

▼M2

For determination of trace metals, aliquots of the sample should be transported to the laboratory in acid washed bottles.

If soil samples are collected, they should be kept cool in plastic or polyethylene bags and stored at 4 °C until centrifugation or the preparation of the saturation extract. Centrifugation or extraction should take place within one day (18 - 30 hours) after collection of the soil samples.

II.5 *General background Information*

The following information shall be collected:

— plot number,

— information on sampler (type, depth),

— first date of monitoring period,

— last date of monitoring period,

— number of (equal) measuring periods in monitoring period.

II.6 *Analysis methods*

In the 'Sub-manual on soil solution collection and analysis' prepared by the Soil Expert Panel of the ICP-Forests, the approved methods for the analysis of the various soil solution parameters are described.

It is advised that the approved methods be used. If other (national) methods are applied, comparability of the analysis results shall be reported in detail together with the presentation of the analysis results. The inventory of the forest soil solution monitoring will distinguish between mandatory and optional parameters (See list below).

List of parameters

Parameter	unit	Mandatory/Optional
Conductivity	µS/cm	Opt.
pH		Man.
Alkalinity	µmolc/l	Opt. (if pH > 5)
DOC	mg/l	Man.
Sodium (Na)	mg/l	Opt ([1])
Potassium (K)	mg/l	Man.
Calcium (Ca)	mg/l	Man.
Magnesium (Mg)	mg/l	Man.
Aluminium (total)	mg/l	Man. (if pH < 5)
Aluminium (labile)	mg/l	Opt.
Iron (Fe)	mg/l	Opt.
Manganese (Mn)	mg/l	Opt.
Total Phosphorus (P)	mg/l	Opt.
NO_3-N	mg/l	Man.
SO_4-S	mg/l	Man.
NH_4-N	mg/l	Opt. ([2])
Chlorine (Cl)	mg/l	Opt. ([1])
Chromium (Cr)	µg/l	Opt.
Nickel (Ni)	µg/l	Opt.
Zinc (Zn)	µg/l	Opt. ([3])
Copper (Cu)	µg/l	Opt. ([3])
Lead (Pb)	µg/l	Opt.
Cadmium (Cd)	µg/l	Opt.

▼M2

Parameter	unit	Mandatory/Optional
Silicon (Si)	mg/l	Opt.

(1) Measurement is advisable when acid base budgets are calculated.

(2) Measurement of NH_4 is advised in areas with high NH_x deposition (above 20 kg NH_x per ha per year).

(3) Advised since these are minor nutrients.

Man. = Mandatory Opt. = Optional

Member States are free to analyse more, all, or part of the optional parameters.

II.7 *Data transfer*

The Member States shall forward to the Commission for each plot this information in a standardized form (see Annex VIIa, Form 9a, 9b, and 9c).

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ANNEX XI

COMMON METHODS FOR GROUND VEGETATION ASSESSMENT IN PERMANENT OBSERVATION PLOTS

I. General remarks

The ground vegetation assessment is to be carried out on at least 10 % of the permanent observation plots. The first common assessment shall be completed before the autumn of 1999. The objectives of the ground vegetation assessment are two fold:

— characterisation of the current state of the forest ecosystems on the basis of their composition,

— monitoring of vegetation changes due to natural and anthropogenic environmental factors.

Ground vegetation data, which were collected and analysed before 1997 can also be used if the methods as described below have been applied.

This Annex is based on technical recommendations of the *ad-hoc* expert group on ground vegetation assessment (EU/ICP Forests). Reference is made to the submanual (1997) prepared by this group.

II. Inventory methodology

II.1. *Selection of sample location*

The ground vegetation assessment will be carried out on the permanent observation plots. The area selected for the ground vegetation assessment must be representative of the plot. Several sampling units can be used in order to obtain statistical replication. Member States are free to select the number and shape of the sampling units. If the plot has been fenced, the sampling units are to be located outside the fence. In addition sampling units inside the fence can also be assessed. Disturbed areas are to be avoided (e.g. soil pits, soil solution monitoring areas, tracks). The location of the sampling units has to be marked in a permanent way. The precise method of marking is left to the Member States, but the material used should be inert to avoid contamination.

II.2. *General background information*

The following general information shall be collected:

— plot number

— date of sampling and analysis

— fencing

— total area sampled

— information on the total ground vegetation layer (cover), the shrub and herbs layer (cover and average height) and the moss layer (cover).

II.3. *Measurement of species abundance or cover*

Member States are free to apply in the assessment their own scaling system as long as it can be directly converted into percentage cover ranking from 0,01 % (very rare) to 100 % (complete cover).

II.4. *Species*

All phanerograms, vascular cryptograms and the major species of terricolous mosses (bryophytes) are to be included in the assessment. It is recommended to include terricolous lichens. Non-terricolous species and fungi may be noted on an optional basis. The nomenclature shall follow the *Flora Europaea.* In situations where the *Flora Europaea* is not valid, where more accurate taxonomic identification is available, an extension of this standard species list may be elaborated by the NFC involved. The Commission shall be kept informed of these extended species lists.

II.5. *Frequency and assessment time*

Every five years, vegetation studies must be undertaken on all plots. It is recommended to do the ground vegetation assessment on an annual basis

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on a limited number of plots (e.g. 10 %). In the case of a seasonally complex vegetation composition, a second assessment during the year may be needed to assess the full vegetation cover. The subsequent ground vegetation assessments shall be carried out around the same date of the year.

II.6. *Analysis and submission*

The assessed information on sampling units shall be aggregated to plot level. Where sampling units have been assessed inside and outside the fences two aggregations shall be made. The results of the ground vegetation assessment shall be submitted on a yearly basis to the Commission in a standardised format, as indicated in forms 10a and 10b. (file specification XX1996.PLV and XX1996.VEM).

The submission of the ground vegetation assessment results shall include on plot level: the plot/survey number, the coordinates of the plot, fencing, and the information on the main layers. Information on assessment level shall include; the plot/survey number, the standard code of the species, using the eight-letter abbreviation as given in attached list, or as extended list for additional species, as well as the cover indicator expressed in a percentage on plot level.

III. **Data accompanying information**

III.1. *Data accompanying information on applied methods (DAR-Q)*

In a separate document details shall be given of:

— sampling lay-out of the sampling units (number and area of the subplots)

— definition of layers applied (moss, herbs, shrubs, tree)

— scales applied and conversion of these scales to percentages

— information on deviations from the standard species list and their codes

— aggregation methods applied to arrive at plot level information.

It is recommended to submit this information to the Commission by using the DAR-questionnaires referred to in Annex C.

III.2. *Data accompanying report on deviations from standard methods (DAR)*

Any important deviation from the standards which may have influenced the assessment and any relevant disturbances, which may have occurred shall be recorded and reported separately.

III.3. *Data accompanying information on evaluation and interpretation (annual progress report)*

Information on evaluations and interpretation of ground vegetation data (whether or not in combination with other data) shall be reported to the Commission in the annual progress report.