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(Acts whose publication is obligatory)

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

(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.

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 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.

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

3. By 31 December 1996, Member States shall forward to the Commission in a standardized form the data collected from the diffferent surveillance undertaken between 1991 and 1996 for each permanent observation plot together with an interpretation of the results as specified in Annex VII.

4. Technical details pertaining to the provisions of this Article are set out in Annexes III to VI.

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, and

— to carry out the meteorological measurements,

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.

Done at Brussels, 29 April 1994.

For the Commission

René STEICHEN

Member of the Commission

ANNEX I

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

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

I. General remarks

The purpose of the scheme mentioned in Article 2 (1) to Regulation (EEC) No 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 component,

— 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 shall select by 30 June 1994 at its latest a sufficiently large number of permanent observation plots in their country. The maximum number of these plots should in principle not exceed 20 % of the number of national plots of the Community's 16 x 16 km gridnet (Regulation EEC No 1696/87). Member States with a limited number of plots of the Community's gridnet, are allowed to select a larger number of permanent plots under the condition that the number shall be limited up to 15 plots.

The selection of these plots are 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 minimize the effects from activities on surrounding areas the plot shall be surrounded by a buffer zone. The actual width of the zone is depending 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 restrictions 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. mangagement operations should be comparable and disturbances 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 surrounding of farms, very close to main roads or in the direct vicinity of polluting industries,

— a sufficient number of trees should be available for sampling in or nearby 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 during the last years within the framework of the Regulation (EEC) No 3528/86 or other programmes. When additional plots have to be selected it is recommended that plots are identical with or located nearby 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 shall install, preferably all, but at least over 50 % of the plots in a permanent way by 30 June 1994. In certain cases it could be acceptable that the actual installation of the last plots is delayed for one year. Each installed plot shall be described in detail. General data shall be determined and reported before 15 December 1994. The detailed description of the plot shall include: the exact location of the plot, a sketch map shall be prepared showing the permanent marking of the plot corners and/or boundaries, the number of trees in the plot and any other relevant permanent elements in or nearby the plot (e. g. access road, rivers). In the future, the exact location of sample sites (e.g. soil pits) shall be recorded on this map as well.

II.3. *Definition of a sub-plot*

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). In the case that the plot has many trees (i.e. dense stands), a sub-plot may be defined to be used for these surveys. The size of the sub-plot 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 sub-plot should be available in this period.

II.4. *General information on each plot*

The following general information on each permanent observation plot for the 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 Sub-plot (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)	
Other observation	History of the plot Nearby situated other monitoring station	

By 15 December 1994, 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 1a) and reports (see Annex VIIa, Form 1b). Important information obtained during the years of monitoring shall be submitted yearly using the Forms 1a and 1b (Annex VII). The other information shall be submitted right after the first relevant survey has been carried out and will be updated when necessary.

II.5. *Replacement of permanent observation plots*

Permanent observation plots have to be available for long duration monitoring. In case of unforeseen events (e.g. destruction of trees in the plot by fire, storm) a replacement of this plot might be necessary. Member States shall forward to the Commission the basic information for the new plot as specified in this Annex.

ANNEX II

APPLICATIONS 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 to 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. *Short 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 (+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 to be included in 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)

[1] OJ No L 53, 21. 2. 1987, p. 14.

3. Detailed description of the sampling procedures used at plot level (number of single 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)

(e) the measures 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)

5. *Cost of measures under 4a to 4g* (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 (4b to 4g)

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 (4b to 4g)

   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 form 2a and 2b*

.....

Date and signature

Form 2a

PROPOSED FINANCING (intensive monitoring)

Measure	Forest area concerned (km^2)	Number of intensive monitoring plots	Total cost (1)	Non-Community participation				Aid requested (1)
				State (1)	Region (1)	Other public funds (1)	Private (1)	
To establish or extend the network of observation plots for intensive and continuous surveillance								
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 content in the needles and leaves								
To establish and execute increment change measurements								
Total								

(1) In national currency.

Form 2b

FORWARD PLAN FOR THE EXECUTION OF THE PROJECT

to be completed for each Article 2 project proposal

Phases	Year																																			
	Months	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	J	F	M	A	M	J	J	A	S	O	N	D
1																																																
2																																															
3																																															
4																																															
5																																															

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.

II.3. *General background information*

The following general information shall be collected:

— plot number,

— tree number,

— tree species,

— date of assessment.

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.

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:

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.

II.5. **Data transfer**

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

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.

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:

(*) 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.

— 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	
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).

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;

— 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 of

pierced 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.

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).

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.

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).

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.

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

Each file name consists of the two letter country code (represented by the XX in the list of names), followed by the year of assessment (in the example 1995) or Gener when the information is given once. the 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 of the assessment Soil, Foliage and Increment. This three letter code for the data files consists of two (or one) letter(s) for FOliage SOil or Increment and one (or two) letter(s) to indicate Manadatory, Optional or the different parts of the increment assessment.

In case the data handling for the plots of the 16 × 16 km is done at the same place this could create confusion, as similar file names are used. In this case the year codes in the abovementioned file names could be increased with 1 000 (e.g.XX2995.SOM).

Form 1a

XXGENER.PLT

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

Sequence	Country	Observation plot number	Latitude coordinate (+DD MM SS)	Longitude coordinate (+DD MM SS)	Altitude	Orientation	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 / 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)

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

XX1993.PLT

Contents of file with the information on plot level to be used with the crown assessment (see Annex III)

Sequence	Country	Observation plot number	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	Mean age	Observations
1–4	6–7	9–12	14–19	21–27	29–35	37–38	40–41	43–53
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Column		See explanatory notes
1– 4	Sequence number of plots (1 to 9999)	
6– 7	Country code (France = 01, Belgium = 02, etc.)	(1)
9–12	Plot number (maximum 9999)	(2)
14–19	Date of assessment	(3)
21–27	Latitude in + DDMMSS (e. g. +50 58 52)	(4)
29–35	Longitude in (+ or –) DDMMSS (e. g. +03 55 31)	(4)
37–38	Altitude (in 50 metre classes form 1 to 51)	(7)
40–41	Mean age of dominant storey (in 20 year classes from 1 to 8)	(9)

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

43–53	Other observations (word)	(99)

Form 3b

XX1993.TRE

Contents of file with the information on tree level to be used with the crown assessment (see Annex III)

Sequence	Observation plot number	Assessment date (D D M M Y Y)	Tree #	Species	Defoliation	Dis-co-lour-ation	Easily identifiable causes of damage T1 T2 T3 T4 T5 T6 T7 T8	Identification of damage type	Other observations
1–5	7–10	12–17	19–22	24–26	28–30	32	34–48	50–55	57–67
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

Column		See explanatory notes
1– 5	Sequence number of trees (1 to 99 999)	
7–10	Plot number (maximum 9999)	(2)
12–17	Date of survey in DD MM YY (e.g. 220690)	(3)
19–22	Tree number (as marked during installation)	(14)
24–26	Species (001 to 199)	(15)
28–30	Defoliation (0, 5, 10, 15, 20, ..., 95, 100 %)	(16)
32	Discolouration (0, 1, 2, 3 or 4)	(17)
34 (*)	Damaged caused by: game and grazing (1 = Yes)	(18)
36 (*)	Damaged caused by: insects (1 = Yes)	(18)
38 (*)	Damaged caused by: fungi (1 = Yes)	(18)
40 (*)	Damaged caused by: abiotic agents (1 = Yes)	(18)
42 (*)	Damaged caused by: direct action of man (1 = Yes)	(18)
44 (*)	Damaged caused by: fire (1 = Yes)	(18)
46 (*)	Damaged caused by: known local/regional pollutant (1 = Yes)	(18)
48 (*)	Other damage (1 = Yes)	(18)
50–55 (*)	Identification of damage type (name)	(19)
57–67	Other observations (word)	(20)

(*) Leave blank if no damage has been observed.

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)

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 (g/kg)	N (g/kg)	P (mg/kg)	K (mg/kg)	Ca (mg/kg)	Mg (mg/kg)	OrgLay (kg/m^2)	$CaCO_3$ (g/kg)	Ac-Exc ($cmol^+/kg$)	BCE ($cmol^+/kg$)	ACE ($cmol^+/kg$)	CEC ($cmol^+/kg$)	BaseSat %	Observations
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			.		.								.	.	.		
99999	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.

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)	$CaCO_3$ (g/kg)	Na (mg/kg)	Al (mg/kg)	Fe (mg/kg)	Cr (mg/kg)	Ni (mg/kg)	Mn (mg/kg)	Zn (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Cd (mg/kg)	Hg (mg/kg)	S (mg/kg)	pH(H_2O)	EC (mS/m)	(cmol*/kg) Ac_Exc	BCE (cmol*/kg)	ACE (cmol*/kg)	CEC (cmol*/kg)	BaseSat %	P (mg/kg)	Ca (mg/kg)	Mg (mg/kg)	K (mg/kg)	Observations
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	999	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.

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)

Form 5b

XX1993.FOM

Contents of file with foliar analysis information (mandatory)

Sequence number	Observation plot number	Sample number	Date of analysis (dd mm yy)	Number of sampled trees					Mass of 100 leaves (g)	Mass of 1000 needles (g)	Shoot mass (g)	N (mg/g)	S (mg/g)	P (mg/g)	Ca (mg/g)	Mg (mg/g)	K (mg/g)	Observations	
				# 1	# 2	# 3	# 4	# 5											
1–5	7–10	12–16	17–22	24–27	29–32	34–37	39–42	44–47	49–52	54–57	59–62	64–68	70–74	76–79	81–85	87–91	93–97	99–109	
		.										.	.	.	.	.	.		
		.										.	.	.	.	.	.		
		.										.	.	.	.	.	.		
		.										.	.	.	.	.	.		
		.										.	.	.	.	.	.		
		.										.	.	.	.	.	.		
		.										.	.	.	.	.	.		
		.										.	.	.	.	.	.		
		.										.	.	.	.	.	.		
9999	9999	199.1	311295	9999	9999	9999	9999	9999	9999	9999	9999	99.99	99.99	9.99	99.99	99.99	99.99		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)
17–22	Date of analysis	Date of analysis (DDMMYY)	(3)
24–27	Tree number #1	Number of first tree in sample	(24)
29–32	Tree number #2	Number of second tree in sample	(24)
34–37	Tree number #3	Number of third tree in sample	(24)
39–42	Tree number #4	Number of fourth tree in sample	(24)
44–47	Tree number #5	Number of fifth tree in sample	(24)
49–52	Mass of 100 leaves	Mass of 100 current year leaves	(25)
54–57	Mass of 1 000 needles	Mass of 1 000 current year or 1 000 current + 1 year needles	(25)
59–62	Shootmass	Mass of shootmass	(26)

Mandatory file

Parameters		Units (**)
64–68	N	mg/g
70–74	S	mg/g
76–79	P	mg/g
81–85	Ca	mg/g
87–91	Mg	mg/g
93–97	K	mg/g
99–109	Observation	Words

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 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.

Form 5c

XX1993.FOO

Contents of file with foliar analysis information (optional)

Sequence number	Observation 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		.						.	.			
		.						.	.			
9999	9999	199.1	311295	999999	99999	99999	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.

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)

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

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

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

(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
0 8	0 9	9 4

(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
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
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
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

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

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
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:

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*
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*
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.

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
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.

(26) *Shoot mass*

The mass of the shoot is determined (oven-dry) in grams.

to be used in the increment assessment

(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.

(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).

ANNEX VIIb

Details for the submission of background information and interpretation of the permanent plots

I. General remarks

As an annex to the submission of the inventoried results, Member States shall prepare a document with the background information and the interpretation of the results, either plot wise or for all national observation plots.

— In principle each submission of inventory data shall be accompanied by background information describing the actually applied methods of determination/sampling/measuring, etc., details on the methods of recording and validating, as described below under paragraph II.

— Together with the survey results, an interpretation as indicated below in paragraph III shall be included.

— When data from more surveys are submitted at the same time (or have been submitted before) an integrated interpretation (as indicated in paragraph IV) shall be submitted in addition to the interpretation mentioned under the second indent of this paragraph.

This annex presents information on the structure of these reports.

II. Background information

II.1. *General information*

The general part shall contain information on (country wise or when relevant province/region wise):

— forest area (in 1 000 ha),

— number of plots (total),

— number of plots (in the submitted survey),

— selection criteria (if submitted number of plots is less than total number of plots),

— history of these plots with regard to this survey,

— relations with other surveys.

II.2. *Inventory methods*

A summary of the inventory method shall be given, including details on used equipment, installation and recording. Especially where these details have not been laid down in a mandatory way, a clear review of the executed inventory method is essential for further interpretation, possible comparability, and the evaluation of the obtained results. In many surveys there is a large freedom in the selection of equipment, depths, timing and intensity of the survey. Details on the used equipment, recorded depths, timing and frequency of the survey/sampling shall be stated. Whenever samples have been taken, details on this sampling including the storage (cool, dark, etc.) shall be supplied.

Any applied control measurements shall be described in short.

II.3. *Methods for the analysis and calculation of results*

With regard to chemical analysis of samples, in most cases certain methods are recommended. Information on the actually used methods (including storage, evaluation and (re-)calculation of the obtained results) shall be supplied. Whenever applicable the results of the calibration tests shall be reported.

II.4. *Exceptions and disturbances*

Special attention shall be given to exceptional situations with regard to the inventory, sampling, storage, analysis, calculation and/or interpretation. When gaps exist in the data, due to whatever reasons, estimates based on results from other sources can be made in certain cases. These assumptions shall be carefully documented.

Regional differences shall be stated and explained in detail (e. g. different laboratory).

III. **Interpretation within one survey**

III.1. *Actual internal interpretation*

An interpretation shall be made of the collected and evaluated data for each survey separately. Whenever possible relations between the different parameters in this survey shall be indicated.

III.2. *Internal interpretation with former surveys*

The results of consecutive surveys shall be evaluated and whenever possible trends shall be indicated.

III.3. *Interpretation with external data*

The results of the survey shall 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 data from other sources which could explain certain relations in parameters shall be included here.

IV. **Integrated interpretation**

IV.1. *Actual interpretation*

In the national focal centre all survey results on a national level are collected. The relationship between parameters of different surveys shall be investigated. Also the various interpretations of the single survey results shall be taken into account and shall be reviewed in the light of the integration.

IV.2. *Interpretation with former years*

National level results from former surveys shall also be used in the integrated interpretation. Whenever possible trends shall be indicated and explained.

IV.3. *Interpretation with external data*

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