

**4th Workshop/Meeting on Crown Condition,  
Helsingor, Denmark, February 3-4 and 5-6, 2003**

# **Mandatory and optional parameters assessed in Italy in the Level II plots**



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- *Fagus sylvatica*
- *Quercus cerris*
- *Quercus ilex*
- *Picea abies*
- Mixed broadleaves



**NT&IC : *National Training and Intecalibration Course***

(once at year on the main species, before the field assessment)

**FC : *Field Check***

(every year, on 15-25 % of the permanent plots)

**NRT : *National Reference Team***

(carries out the NT&IC and FC; participate to the International Training Courses both for Mediterranean and Central Europe Countries)

## **NM: *National Manual***

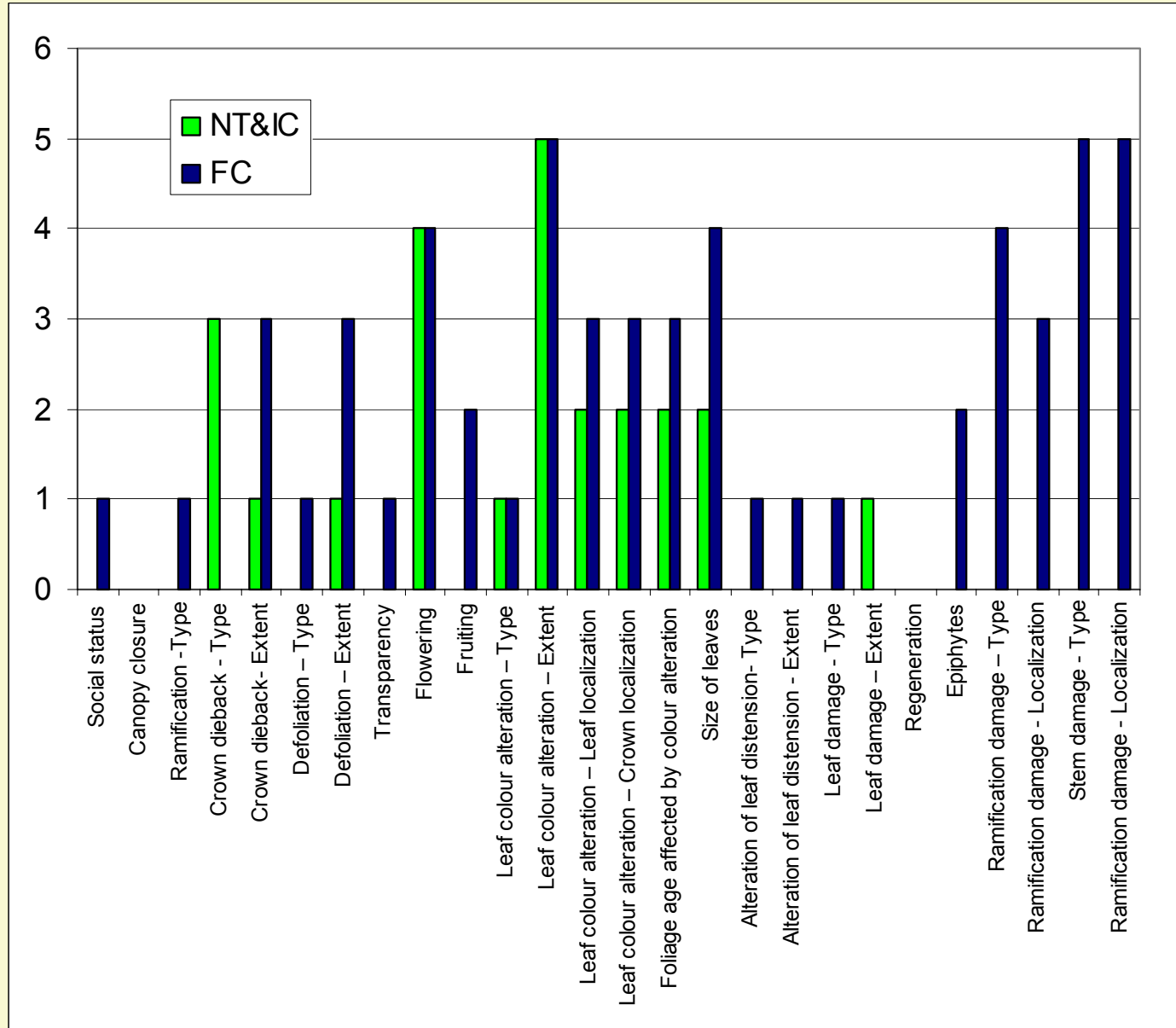
(updated once a year, according to the problems found in the field activities)

The common manual was adopted in 1998 with both mandatory and optional parameters.

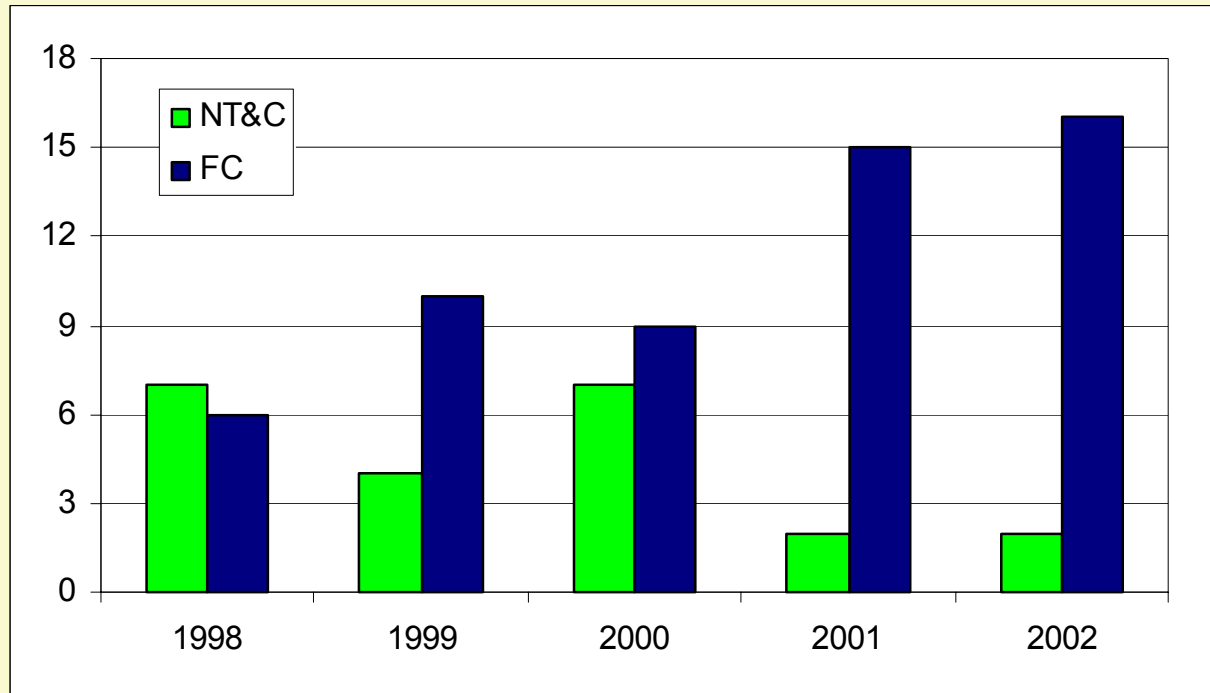
Before that year, data were collected according to a national fiche.

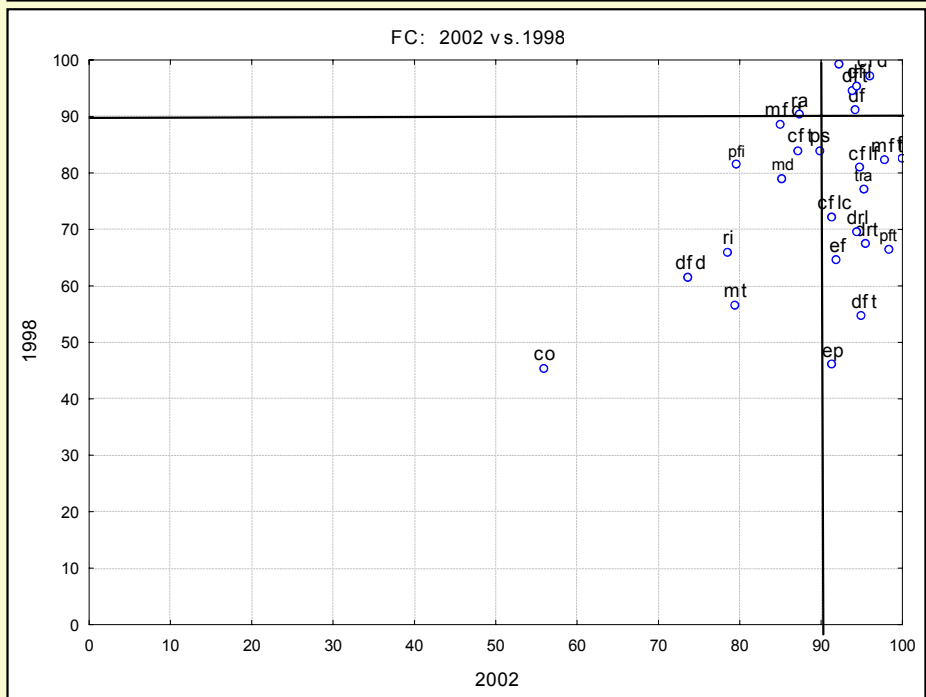
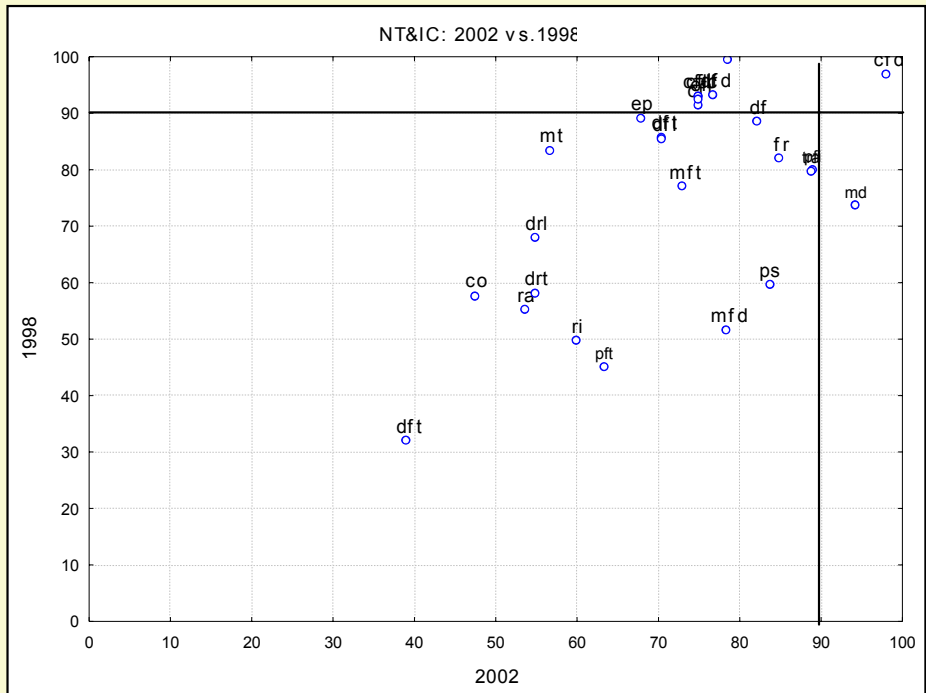
<b>Parameter</b>	<b>Acron.</b>	<b>Measur. Unit</b>	<b>DQLs</b>
Species	Sp	1 cod	99 % @
Social status	Ss	4 classes	85 % @
Canopy closure	Cc	6 classes	90 % @
Ramification -Type	RaT	Spruce: 4 classes Scots pine: 6 classes Beech: 5 classes	90 % @
Crown dieback - Type	CdT	6 classes	90 % @
Crown dieback- Extent	CdE	22 classes	90 % @ ± 10 %
Defoliation – Type	DeT	Spruce: 9 classes Pines and Broadleaves: 8 classes	90 % @
Defoliation – Extent	DeE	22 classes	90 % @ ± 10 %
Transparency	Tr	22 classes	90 % @ ± 10 %
Flowering	Fl	3 classes	90 % @
Fruiting	Fr	3 classes	90 % @
Leaf colour alteration – Type	LcaT	7 classes	90 % @
Leaf colour alteration – Extent	LcaE	22 classes	85 % @ ± 20 %
Leaf colour alteration – Leaf	LcaLL	10 classes	85 % @
Leaf colour alteration – Crown	LcaCL	7 classes	85 % @
Foliage age interested by colour	Fa	4 classes	85 % @
Size of leaves	Sl	4 classes	90 % @
Alteration of leaf distension- Type	AldT	7 classes	90 % @
Alteration of leaf distension -	AldE	22 classes	90 % @ ± 10 %
Leaf damage - Type	LdT	18 classes	90 % @
Leaf damage – Extent	LdE	22 classes	90 % @ ± 10 %
Regeneration	Re	3 classes	90 % @
Epiphytes	Ep	11 classes	90 % @
Ramification damage - Type	RadT	9 classes	90 % @
Ramification damage -	RadL	5 classes	90 % @
Stem damage – Type	SdT	16 classes	90 % @
Stem damage - Localization	SdL	7 classes	90 % @

# Five years (1998 – 2002) results of NT&ICs and FCs



## Number of parameters reaching the DQLs in NT&IC and FC, in the period 1998-2002





## CROWN CONDITION INDEX

- (i) beech, turkey oak, sessile oak

$$CCI_{tree} = I_{rel}Tr + I_{rel}RaT + I_{rel}LcaE + I_{rel}LdE + I_{rel}AldE$$

- (ii) Norway spruce:  $CCI_{tree} = I_{rel}Tr + I_{rel}LcaE + I_{rel}LdE$

- (iii) European hornbeam:  $CCI_{tree} = I_{rel}Tr + I_{rel}LcaE + I_{rel}LdE + I_{rel}AldE$

where

$CCI_{tree}$  = Crown Condition Index for individual trees

$I_{rel}$  = relativized index (a-dimensional) for the various original indices given by:

$$I_{rel} = (I_{actual} - I_{min}) / I_{max}, \text{ where}$$

$I_{actual}$  = actual score for the original index

$I_{min}$  = minimum possible score for the original index.

$I_{max}$  = maximum possible score for the original index

The score for the PMP was calculated by means of the  $CCI_{tree}$  values:

$$CCI_{PMP} = \frac{\sum^N CCI_{tree}}{N}, \text{ where}$$

$CCI_{PMP}$  = Crown Condition Index for the PMP

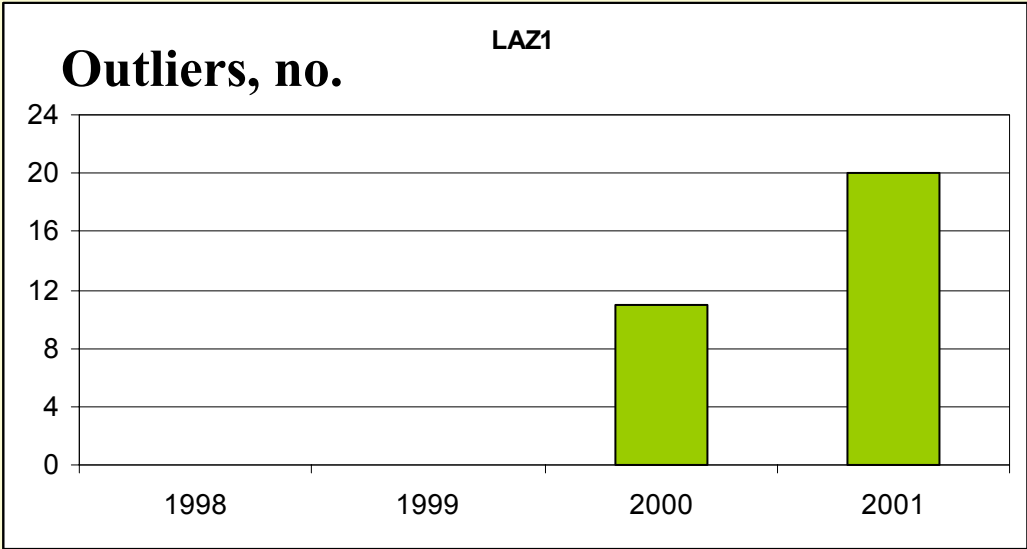
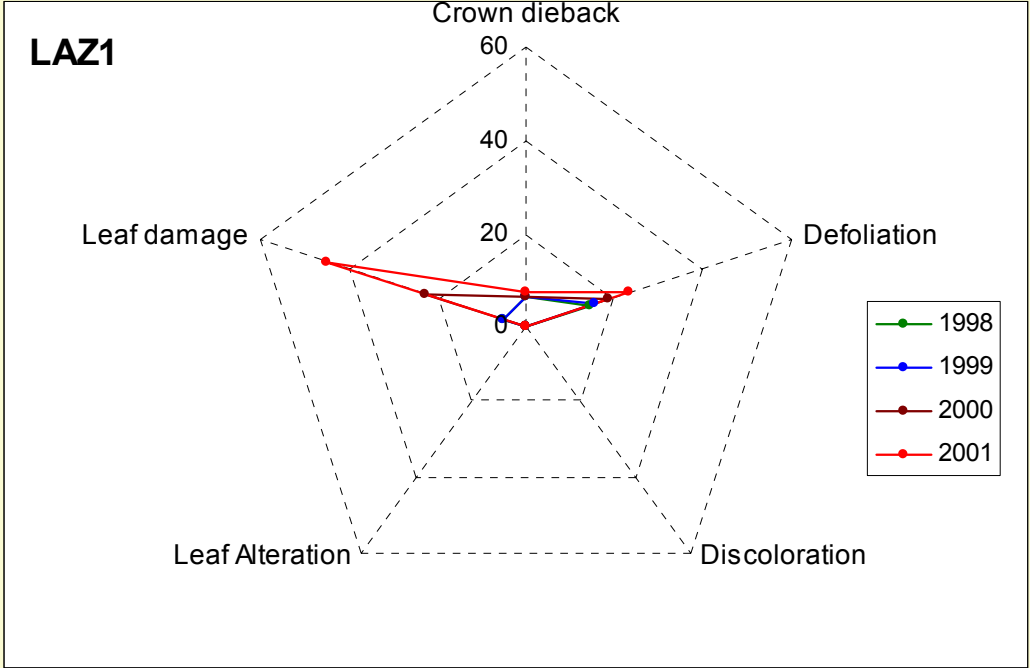
$N$  = number of trees assessed

The median CCI value of all the observations of each individual tree during the first 4 years of assessment is assumed as "background value" for a given Permanent Monitoring Plot.

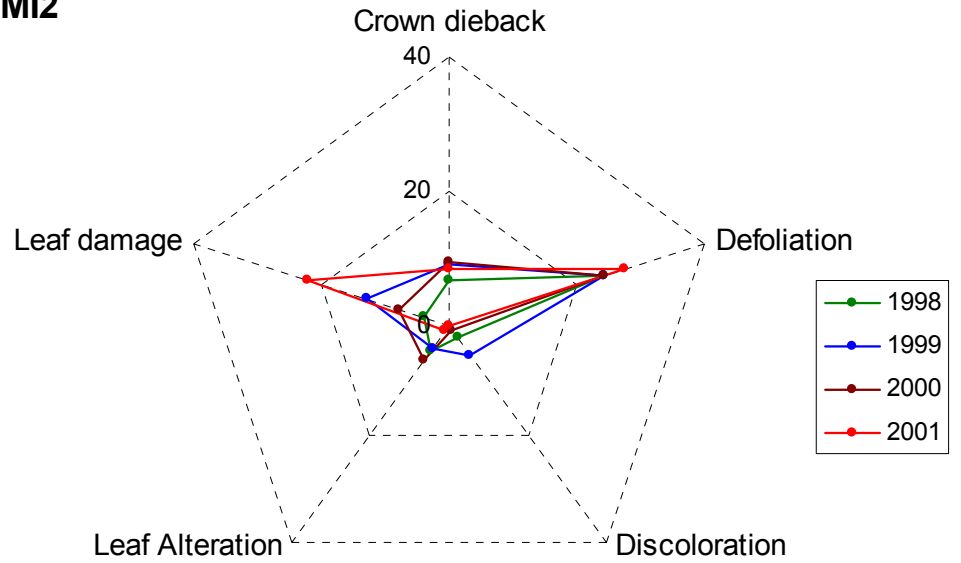
The threshold for outliers was calculated as that median value plus 2 times the range of the interquartile value.

***All individual cases exceeding this value are considered outliers.***

PMP	Anni riferimento per calcolo soglia outliers	N validi	Media	Mediana	Min	Max	Quartile	Quartile	Quartile	Dev.Std.	Soglia							totale
							Infer.	Super.	Interv.		Outliers	2001	2000	1999	1998	1997	1996	
ABR1	1996-1999	108	0.53	0.40	0.20	1.68	0.30	0.70	0.40	0.32	<b>1.200</b>	3	0	0	6	0	0	<b>9</b>
BAS1	1998-2001	112	0.34	0.31	0.10	0.68	0.25	0.43	0.18	0.13	<b>0.663</b>	1	1	0	0	-----		<b>2</b>
CAL1	1996-1999	120	0.67	0.58	0.33	1.50	0.49	0.80	0.31	0.25	<b>1.200</b>	4	2	1	6	0	0	<b>13</b>
CAM1	1996-1999	120	0.48	0.45	0.15	1.23	0.35	0.58	0.23	0.20	<b>0.900</b>	8	0	0	2	1	2	<b>13</b>
EMI1	1996-1999	80	0.60	0.50	0.10	2.53	0.30	0.64	0.34	0.47	<b>1.175</b>	3	1	1	1	2	2	<b>10</b>
EMI2	1996-1999	116	0.42	0.30	0.15	2.55	0.25	0.48	0.23	0.35	<b>0.750</b>	15	3	2	1	8	0	<b>29</b>
FRI1	1997-2000	86	0.29	0.25	0.05	1.10	0.15	0.30	0.15	0.21	<b>0.550</b>	1	3	2	3	2	-----	<b>11</b>
FRI2	1996-1999	120	0.23	0.20	0.05	0.75	0.15	0.30	0.15	0.15	<b>0.500</b>	0	0	1	5	1	2	<b>9</b>
LAZ1	1996-1999	120	0.30	0.30	0.10	0.83	0.20	0.34	0.14	0.12	<b>0.575</b>	20	11	0	0	2	1	<b>34</b>
LOM1	1996-1999	72	0.22	0.20	0.05	0.50	0.10	0.30	0.20	0.13	<b>0.600</b>	0	0	0	0	0	0	<b>0</b>
MAR1	1996-1999	96	0.48	0.48	0.10	1.18	0.38	0.55	0.18	0.17	<b>0.825</b>	2	3	0	3	0	0	<b>8</b>
PIE1	1996-1999	80	0.54	0.40	0.15	3.03	0.30	0.54	0.24	0.43	<b>0.875</b>	2	2	1	1	6	2	<b>14</b>
PUG1	1997-2000	91	0.38	0.30	0.10	1.52	0.23	0.48	0.25	0.25	<b>0.800</b>	1	1	1	1	2	0	<b>6</b>
SAR1	1996-1997-1999-2000	119	0.26	0.25	0.10	0.88	0.15	0.35	0.20	0.13	<b>0.650</b>	1	0	0	-----	0	1	<b>2</b>
SIC1	1996-1999*	120	0.35	0.29	0.28	0.63	0.28	0.40	0.13	0.10	<b>0.538</b>	0	0	0	0	3	3	<b>6</b>
TOS1	1996-1999	118	1.05	1.03	0.10	2.03	0.78	1.33	0.55	0.39	<b>2.125</b>	0	2	0	0	0	0	<b>2</b>
TRE1	1996-1999	120	0.19	0.15	0.05	0.70	0.10	0.25	0.15	0.11	<b>0.450</b>	2	1	1	1	3	0	<b>8</b>
UMB1	1996-1999	112	0.43	0.40	0.10	1.43	0.25	0.55	0.30	0.22	<b>1.000</b>	2		2	1	0	0	<b>5</b>
VAL1	1996-1999*	120	0.19	0.20	0.00	0.60	0.06	0.30	0.25	0.15	<b>0.690</b>	0	0	0	0	0	0	<b>0</b>
VEN1	1996-1999*	120	0.25	0.18	0.05	0.75	0.10	0.40	0.30	0.17	<b>0.775</b>	0	0	0	0	0	0	<b>0</b>
<b>TOTALE</b>												<b>65</b>	<b>30</b>	<b>12</b>	<b>31</b>	<b>30</b>	<b>13</b>	<b>181</b>

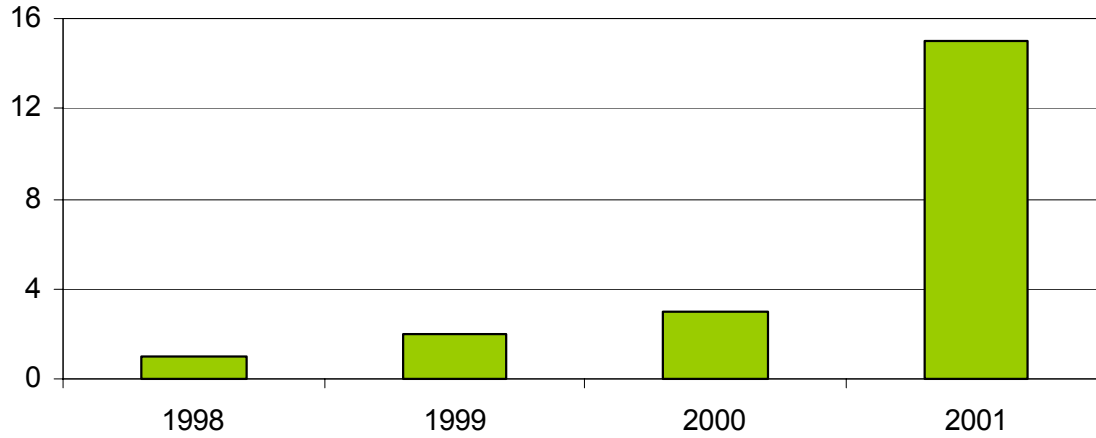


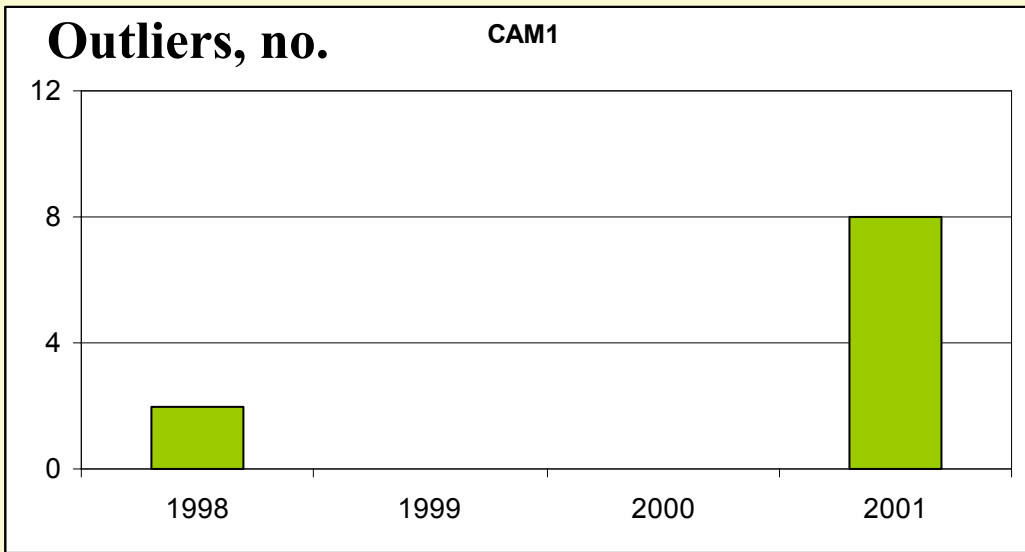
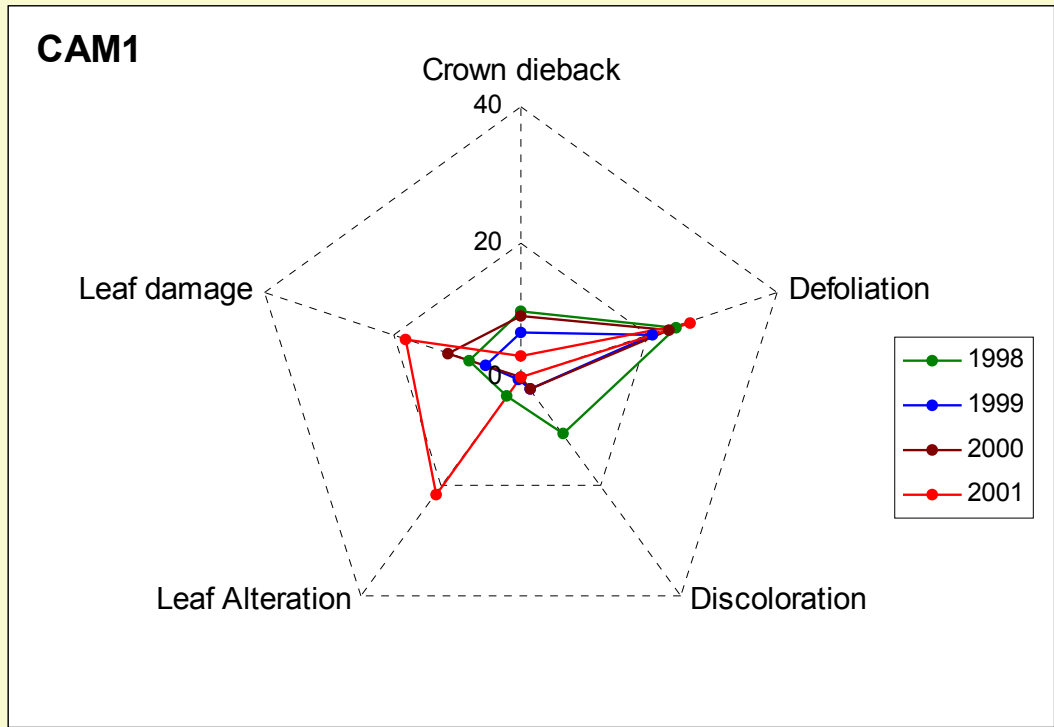
## EMI2



## Outliers, no.

EMI2





# CONCLUSIONS /1

1. The results of the application of a QA program in the period 1998-2002 clearly demonstrate that the quality of the data collected in the field surveys on crown conditions can be drastically improved thanks to a suitable programme of Quality Assurance;
2. The results of NT&IC were always worse than those of FC;
3. In case of composite indices (i.e. when more than one parameter is used to describe the same symptom, for. ex. *Type* and *Extent of Leaf colour alteration*), the quantitative index (*Extent*) usually achieved better results than the qualitative one (*Type*);
4. The worst results were obtained for some mandatory indices, such as *Canopy closure*;

## CONCLUSIONS /2

5. Crown dieback, Defoliation and Transparency, the key indices for crown condition description, rarely reached the DQLs both in the NT&IC and in the FC;
6. The best results were obtained for those index with a large amount of values in classes zero or absent;
7. The composite index and radar plots are suitable and informative means to express the data;
8. Short term (year – by – year) variations in crown conditions are attributed to biotic and/or abiotic damage to leaves and ecologic conditions. More specific informations on the causes of these damage need.