



FUTMON
forest monitoring for the future

Improvement of Data Quality*

Marco Ferretti, TerraData, Italy

*Work carried out under the contract with
AB 15(IT) Corpo Forestale dello Stato, Italy



a Life+ co-financed project for
the "Further Development and
Implementation of an EU-level
Forest Monitoring System".



The project coordination centre
is situated at the Institute for
World Forestry, Hamburg,
Germany.

- Importance of data quality
- QA/QC activity under Life+ FUTMON
- Data quality: before (during) and after the FUTMON project

- Importance of data quality
- QA/QC activity under Life+ FUTMON
- Data quality: before (during) and after the FUTMON project



FUTMON
forest monitoring for the future

Society

(Stiglitz,, Sen and Fitoussi, 2007)



- “What we measure affects what we do; and if our measurements are flawed, decision may be distorted”
- “We are almost blind when the metrics on which action is based are ill-designed or when they are not well understood.”





FUTMON
forest monitoring for the future

Credibility



- Failure to provide convincing evidence of the overall quality of environmental information can have serious consequences in environmental decision making.
- Particularly when “economic and litigious forces intersect with broader societal goals in a regulatory crucible” (Crumbling, 2002).





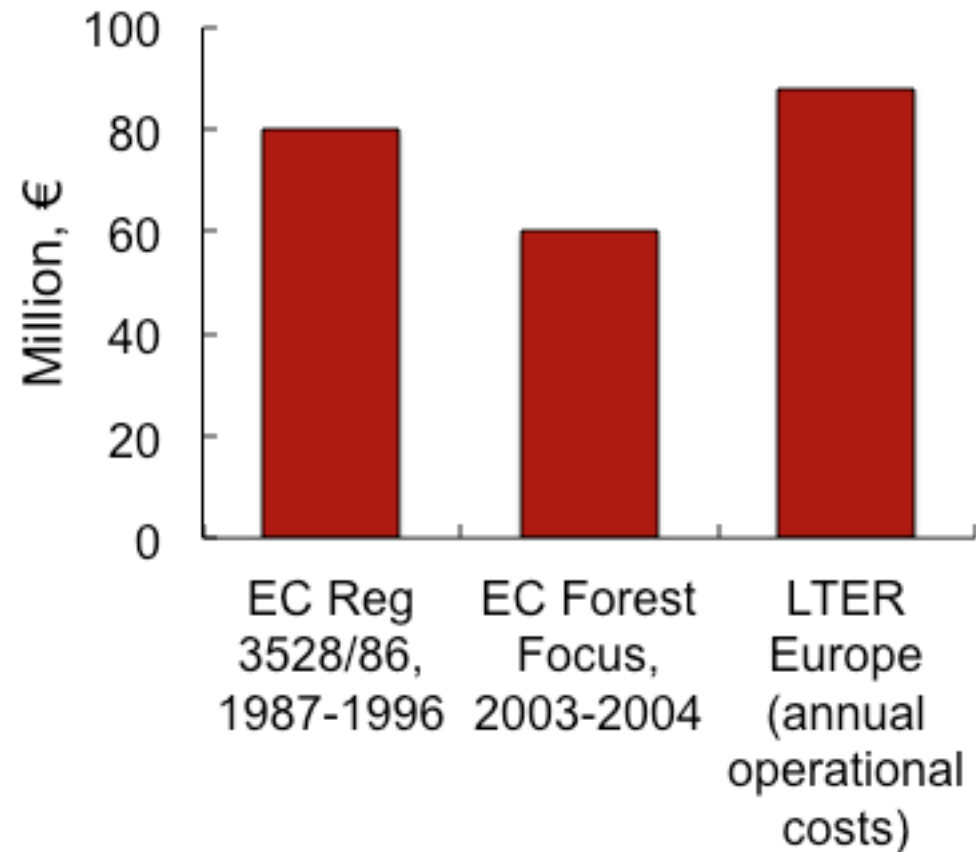
FUTMON
forest monitoring for the future

Costs

(after EC, 1997; Moffat et al., 2008; Mirtl et al., 2010)



Questions remain about the ability of monitoring systems to provide reliable... data and information about the condition of natural resources
(McGlade, 2010)



- Importance of data quality
- QA/QC activity under Life+ FUTMON
- Data quality: before (during) and after the FUTMON project

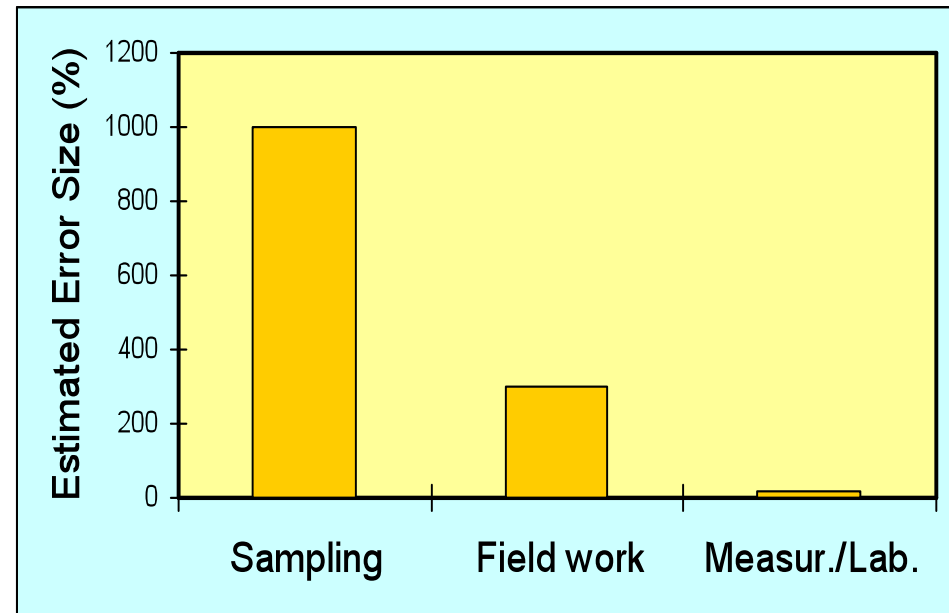


FUTMON
forest monitoring for the future

QA/QC activity



- Improvement of methods
 - Integration and harmonization of monitoring methods
 - Definition of Data Quality Requirements
- Controlling and testing the actual quality of monitoring data
 - Intercalibration exercises
 - Training and assistance





FUTMON
forest monitoring for the future

Monitoring Methods

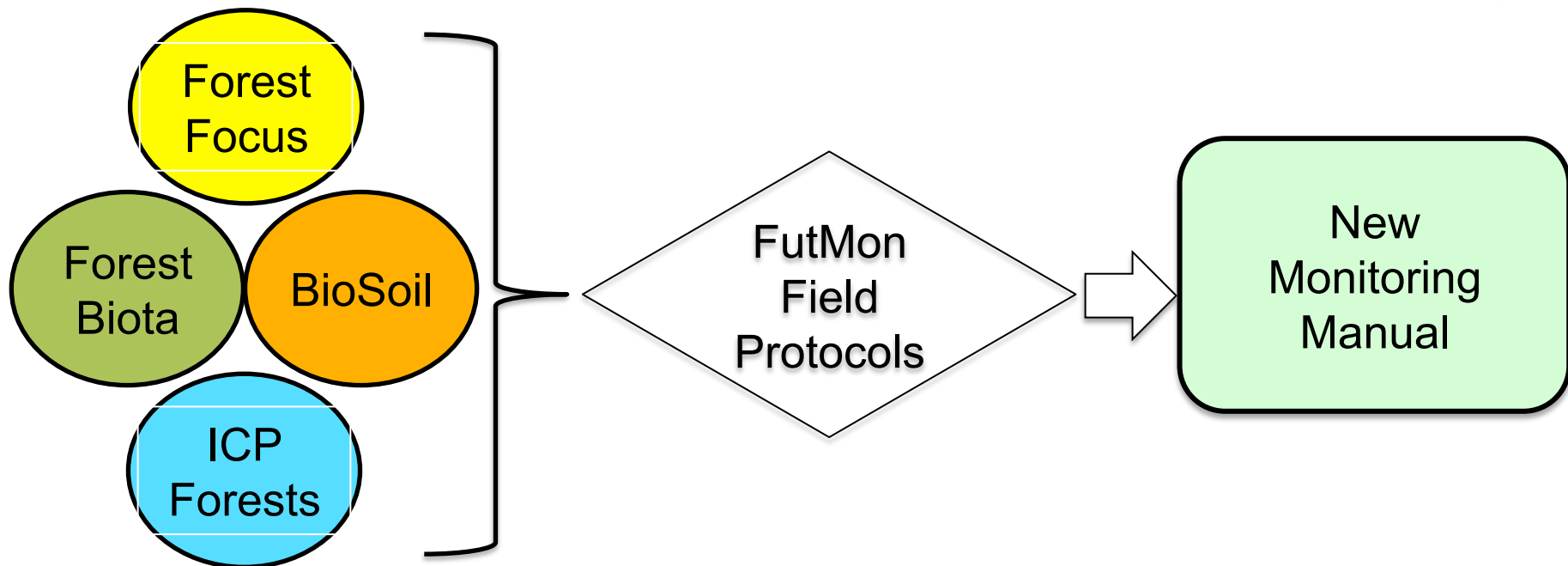
Revision, integration, harmonization



Before FutMon

During

After FutMon

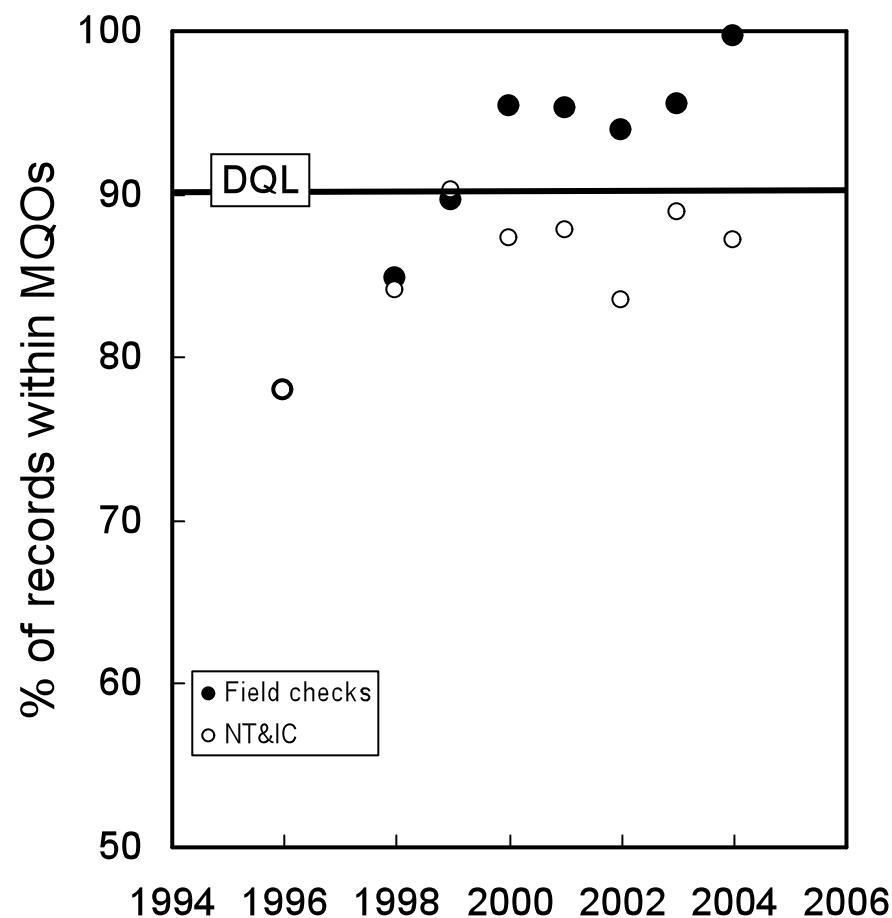


In relation to:

- Acceptable measurement errors;
- Acceptable frequency of wrong measurements;

Necessary for:

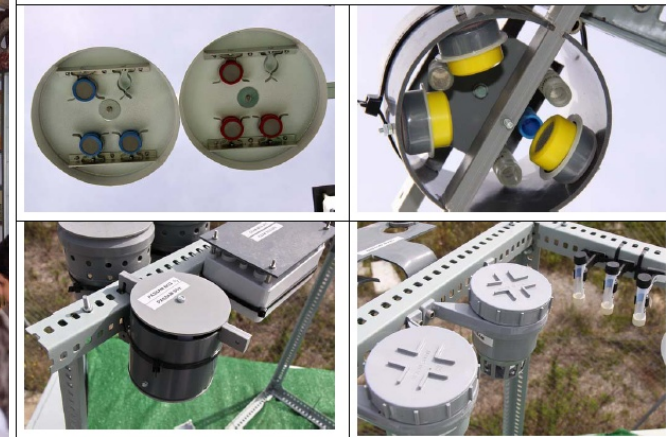
- Documentation and monitoring of data quality





FUTMON
forest monitoring for the future

Quality Control



(CEAM and WSL, 2009, 2010)

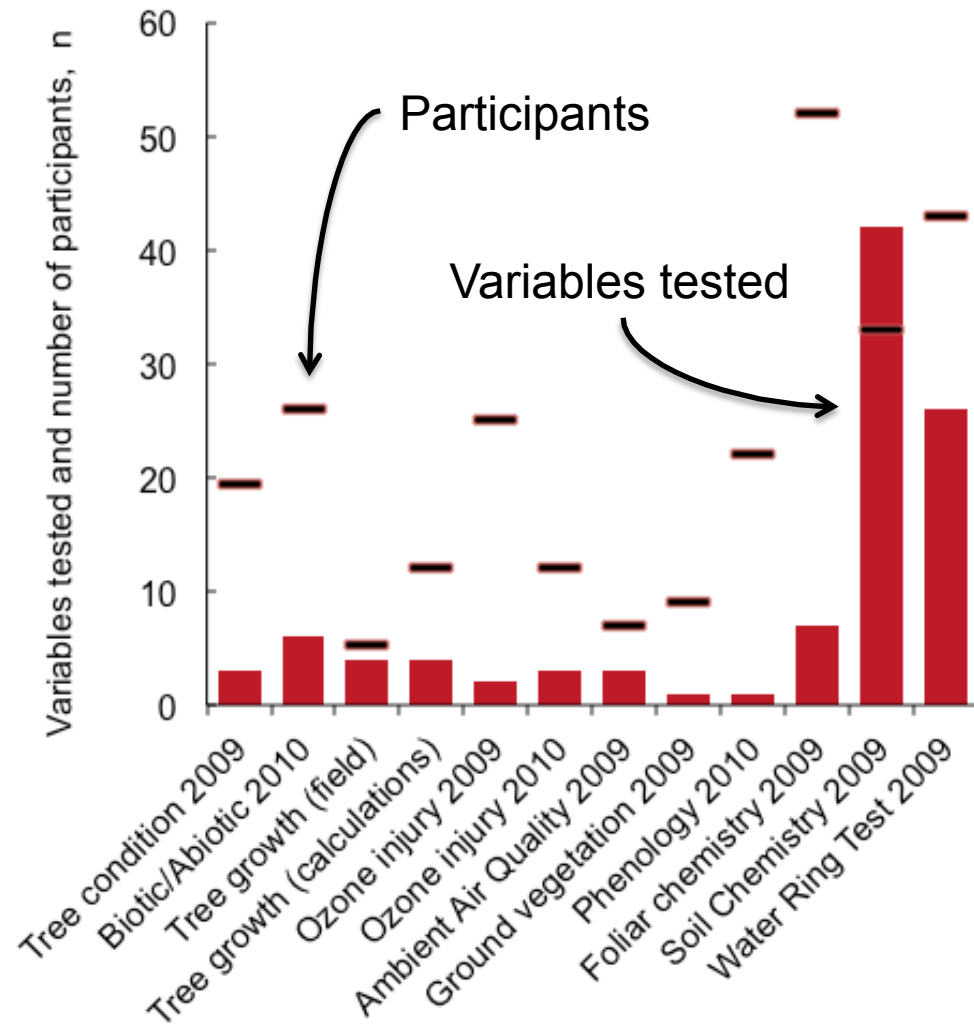


FUTMON
forest monitoring for the future

Quality Control in FUTMON



- 13 field-lab QC exercises undertaken
- 102 variables tested
- 265 field/crews and labs involved



- Importance of data quality
- QA/QC activity under Life+ FUTMON
- Data quality: before (during) and after the FUTMON project



FUTMON
forest monitoring for the future

Monitoring design

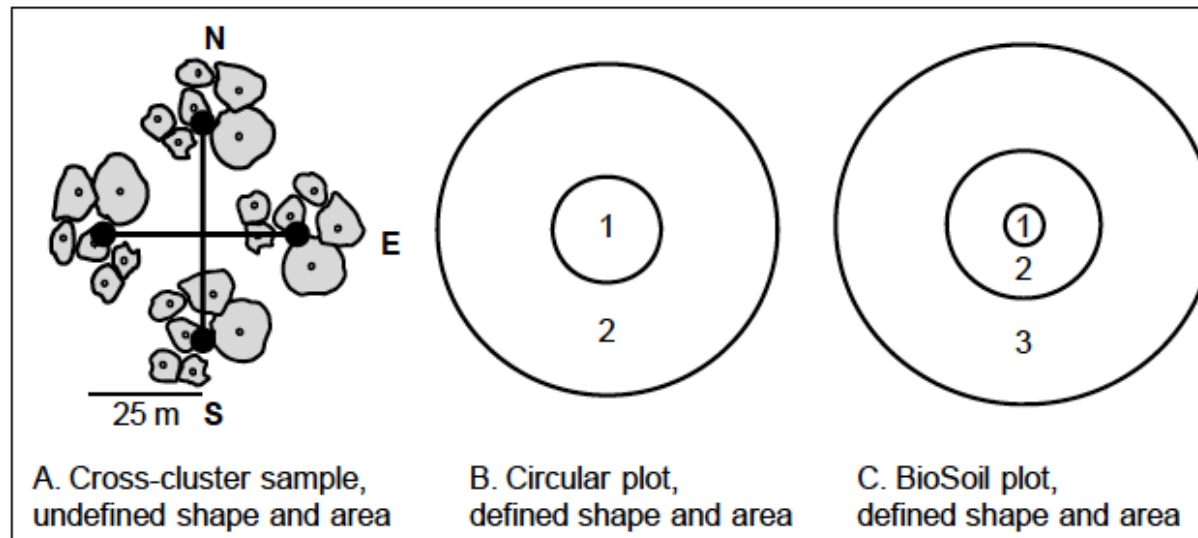


- **Before FUTMON**

- Scarce attention paid to statistical monitoring design

- No attention paid to formal definition of objectives

- **FUTMON**



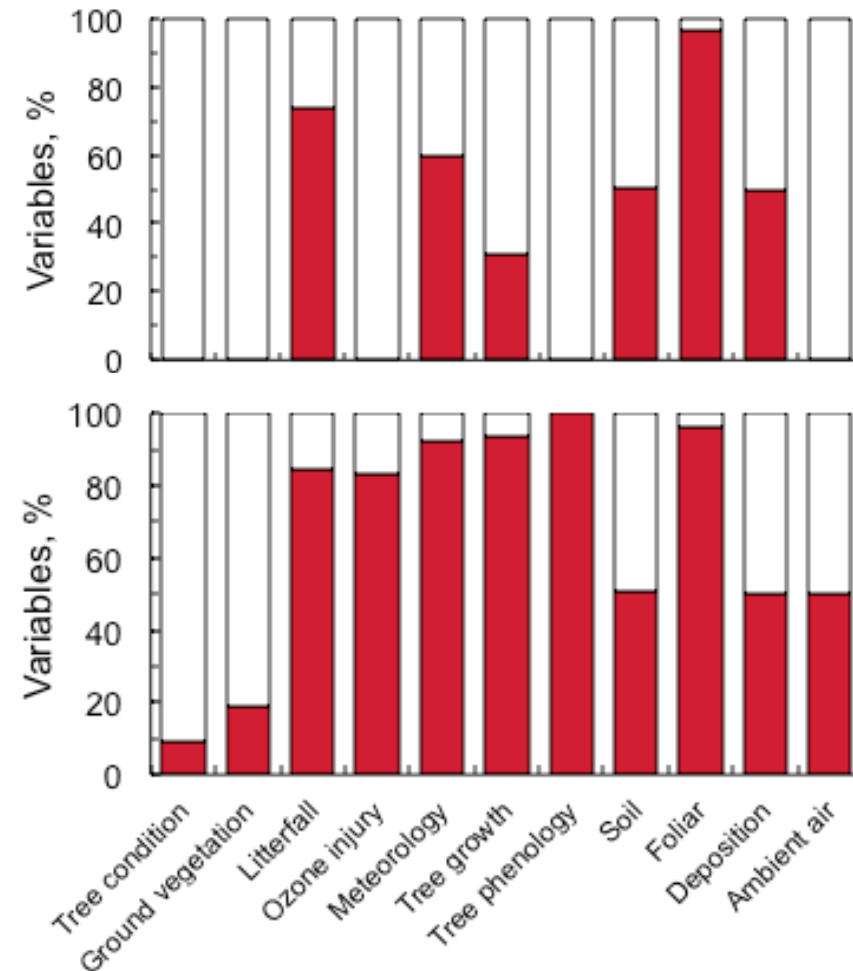


FUTMON
forest monitoring for the future

Data Quality Requirements Extended



- Before FUTMON
 - 55% of investigations
 - 33% of variables
- FUTMON
 - 100% of investigations
 - 66% of variables





FUTMON
forest monitoring for the future

Augmented Quality Control



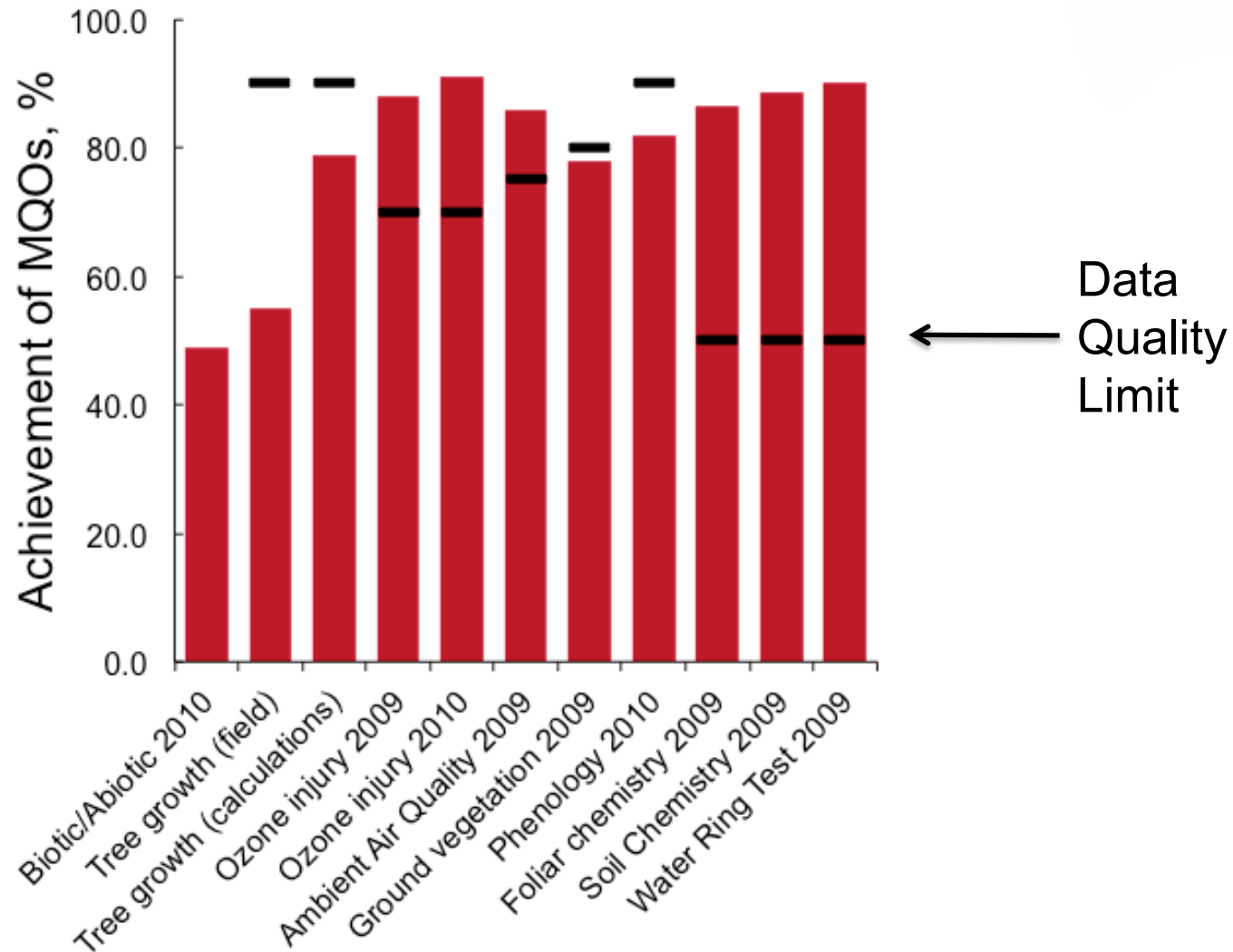
- Before FUTMON:
 - 5 investigations covered
- FUTMON:
 - 10 investigations covered

	Before FUTMON	FUTMON
Tree condition	Yes	Yes
Biotic/Abiotic	No	Yes
Tree growth	No	Yes
Ozone injury	Yes	Yes
Ambient Air Quality	No	Yes
Ground vegetation	No	Yes
Phenology	No	Yes
Foliar chemistry	Yes	Yes
Soil Chemistry	Yes	Yes
Water chemistry	Yes	Yes



FUTMON
forest monitoring for the future

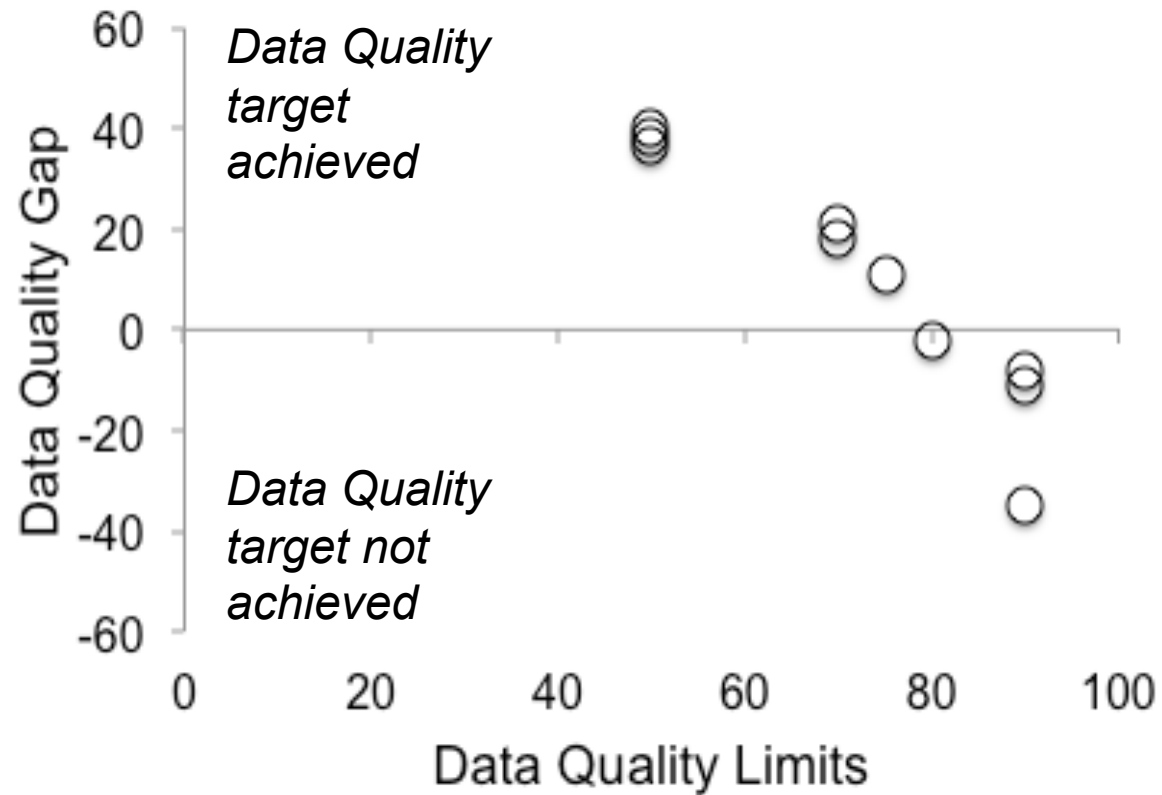
Data quality documented





FUTMON
forest monitoring for the future

...still gaps remain



- **Unprecedented QA effort.** An unprecedented, large amount of QA/QC activity has been carried out under FUTMON.
- **Credibility and defensibility.** It is now possible to document the quality of forest monitoring data for all the investigations. Improved data quality is obvious. This helps making results defensible.
- **Further effort needed.** Despite the progress, QA gaps remain. Field sampling, field observation and DQR settings need additional effort.

Acknowledgements

- All the FUTMON C1 Actions leaders
- All the experts across Europe that participated in the intercalibration exercises and ring-tests.
- The CB team at vTI for support and assistance
- The Italian AB Corpo Forestale dello Stato for trust, support and assistance