UNIVERSITÀ
DEGLI STUDI
FIRENZE

AA 2018-19

INVENTARI FORESTALI

Dispensa 2

Standard e armonizzazione

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Il problema dell'aggregazione degli IFN

- Così come nel XIX secolo si evidenziavano i problemi legati all'aggregazione di inventari locali per derivare statistiche su base nazionale oggi le attività di report internazionale evidenziano i problemi legati all'aggregazione degli IFN
- Gli IFN si sono sviluppati ed evoluti nel tempo, si basano su diverse definizione delle variabili inventariali
- Non si possono aggregare stime statistiche della consistenza di variabili inventariali se non si basano su:
  - Stessa definizione
  - Sistemi di stima non distorti
- Vi sono due possibili soluzioni:
  - Standardizzazione: gli IFN adottano stesse definizioni e modalità di rilievo compatibili. Lato negativo: il cambiamento delle definizioni in un IFN non permette di mantenere la confrontabilità delle serie temporali
  - Armonizzazione: gli IFN mantengono le definizioni nazionali ma vengono mette in atto dei metodi che permettono di trasformare le statistiche rendendole compatibili

Gli standard internazionali

Le definizioni adottate nell'ambito del FAO-TBFRA sono divenuti standard di riferimento internazionali
Sono disponibili però solo per un numero ridotto di variabili

TBFRA - Temperate Boreal Forest Resources Assessment definitions (FAO\FRA2005)

a. FOREST

Land spanning more than 0.5 hectares with trees higher than 5 metres and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ.

The trees should be able to reach a minimum height of 5 metres (m) in situ. Areas under reforestation that have not yet reached but are expected to reach a canopy cover of 10 percent and a tree height of 5 m are included, as are temporarily unstocked areas, resulting from human intervention or natural causes, which are expected to regenerate.

Includes: shelterbelts and corridors of trees with an area of more than 0.5 ha and width of more than 20 m;

Excludes: tree stands in agricultural production systems, for example in fruit plantations and agroforestry systems. The term also excludes trees in urban parks and gardens.

b. OTHER WOODED LAND

Land not classified as forest, spanning more than 0.5 hectares; with trees higher than 5 m and a canopy cover of 5–10 percent, or trees able to reach these thresholds in situ; or with a combined cover of shrubs, bushes and trees above 10 percent.

It does not include land that is predominantly under agricultural or urban land use.

c. OTHER LAND

All land that is not classified as forest or other wooded land.

Includes: agricultural land, meadows and pastures, built-up areas, barren land, etc.; areas classified under the subcategory 'other land with tree cover'.

d. OTHER LAND WITH TREE COVER

Land classified as other land, spanning more than 0.5 hectares with a canopy cover of more than 10 percent of trees able to reach a height of 5 m at maturity.

Includes: groups of trees and scattered trees in agricultural landscapes, parks, gardens and around buildings, provided that the area, height and canopy cover criteria are met; includes tree plantations established mainly for other purposes than wood, such as fruit orchards.

e. DEFORESTATION

The conversion of forest to another land use or the long-term reduction of the tree canopy cover below the minimum 10 percent threshold.

The term specifically excludes areas where the trees have been removed as a result of harvesting or logging, and where the forest is expected to regenerate naturally or with the aid of silvicultural measures.

Variable	Proportion[a]		
	Countries	Area of countries	Forest area of countries
Minimum area	0.96	0.99	0.99
Minimum tree crown cover	0.81	0.69	0.56
Minimum width	0.74	0.66	0.54
Minimum tree height	0.59	0.47	0.42

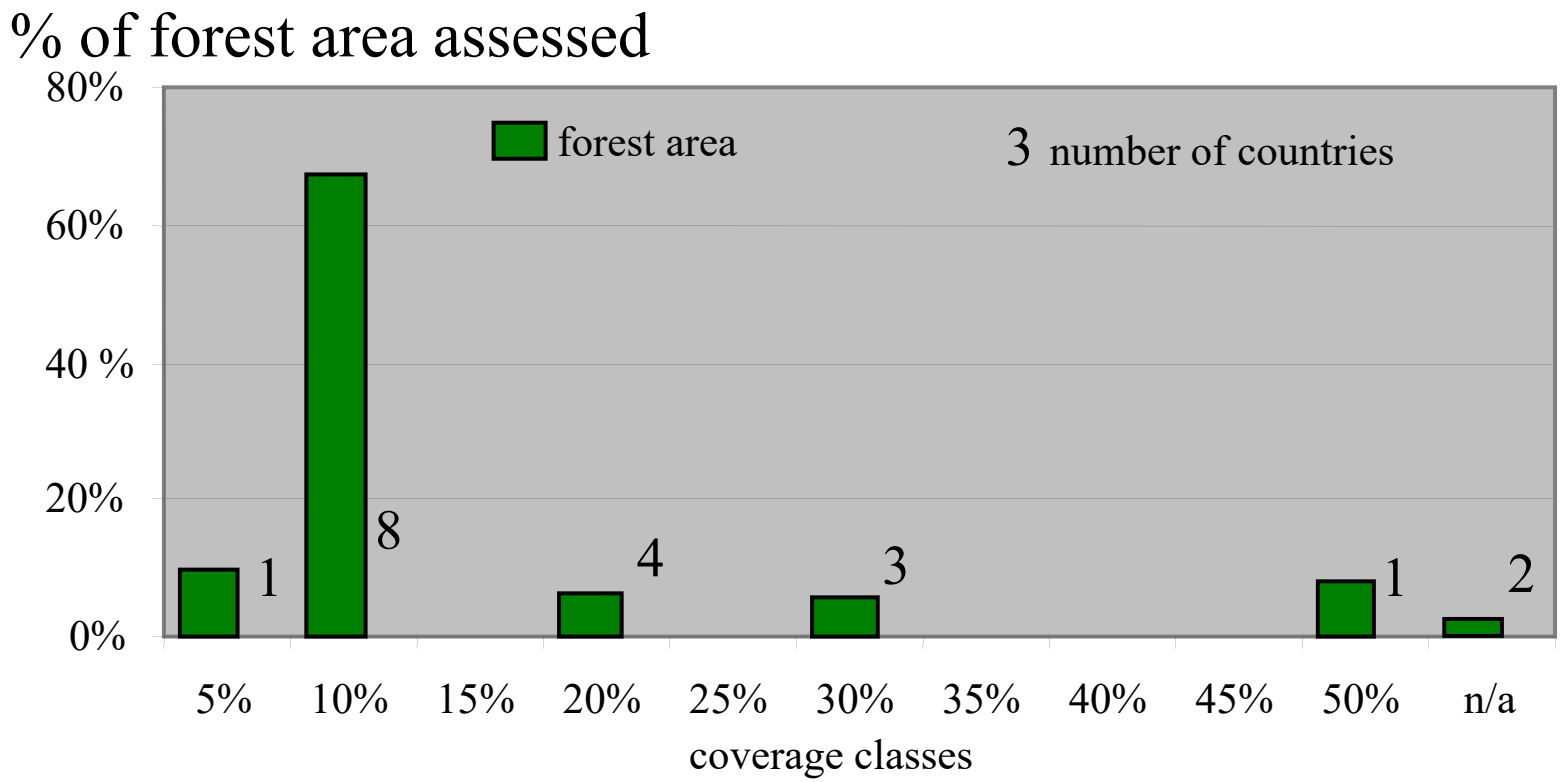
[a] Proportions for 27 European countries participating in COST Action E43.

An example of needs for harmonisation

- Minimum BH diameter of trees for volume and increment of growing stock
  - Some countries: currently 7 cm, (some even 10 cm)
  - FAO, TBFRA 2000 is, and some countries use 0 cm
  - The 7 cm definition applied in Finland will reduce **volume** by 7 % (14 %)(NFI9 1996-2003)
  - Volume **increment** by 14 % (25 %), also annual CO_2 removal by trees

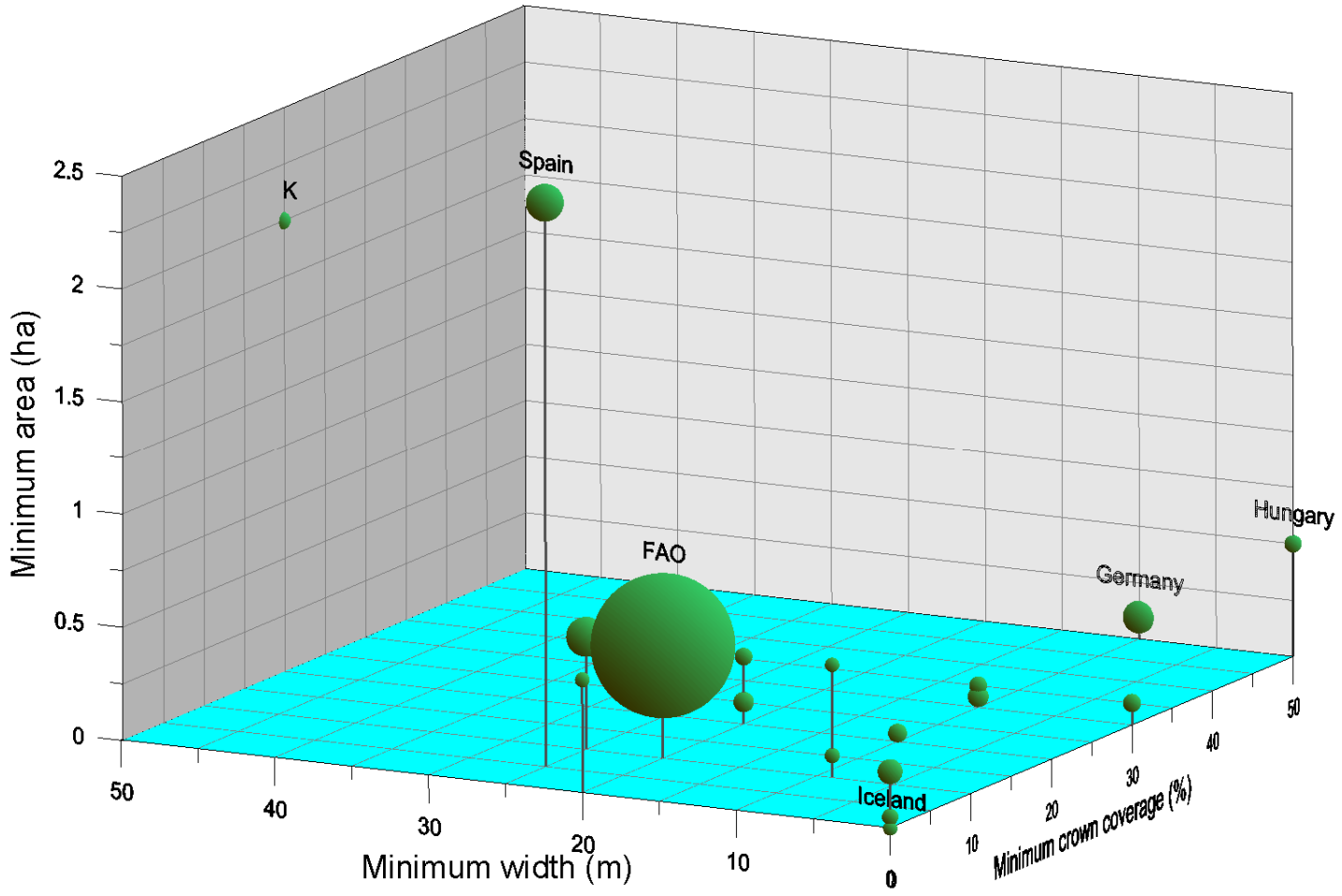
Forest definition

Crown Coverage Classes Used

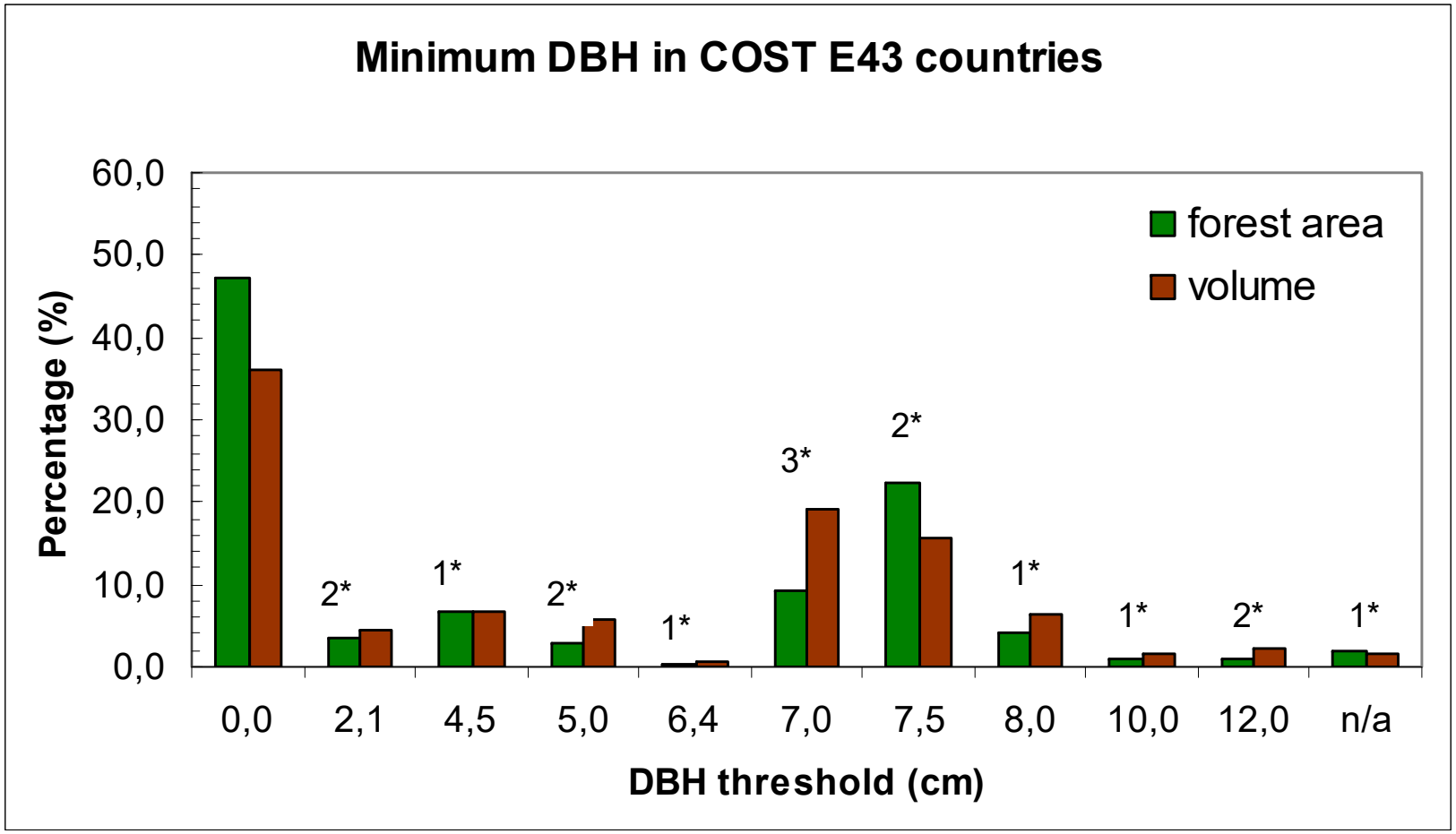


Results of WG1, Forest definition

Coverage classes used



Forest Area and Volume of Growing Stock versus DBH Threshold



Need for coordination

- Increasing international requirements for comparable data
- Sharing of knowledge and expertise
- Taking full advantage of NFIs at EU level

27 European countries, USA and New Zealand
June 2004 – June 2008

Cost Action E43

- To harmonise the definitions and concepts to produce comparable information
- To support countries, particularly with new inventories
- To promote the use of scientifically sound and validated methods

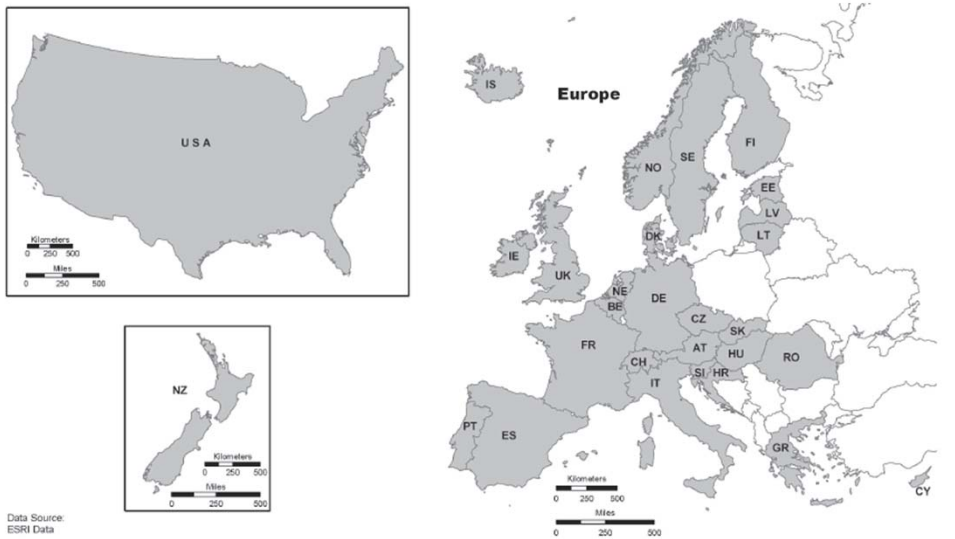
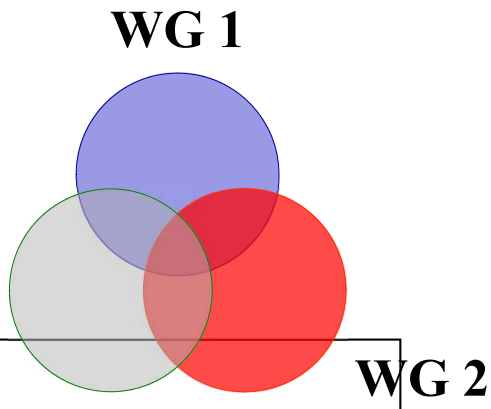


Figure 1. Countries participating in COST Action E43: Austria (AT), Belgium (BE), Croatia (HR), Cyprus (CY), Czech Republic (CZ), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany (DE), Greece (GR), Hungary (HU), Iceland (IS), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Netherlands (NE), New Zealand (NZ), Norway (NO), Portugal (PT), Romania (RO), Slovenia (SI), Slovak Republic (SK), Spain (ES), Sweden (SE), Switzerland (CH), United Kingdom (UK), and United States of America (USA).

3 WGs of COST E43



1. Harmonised definitions
   and measuring practices of NFIs
2. Harmonized estimation
   procedures for carbon pools
   and carbon pool changes
3. Harmonized indicators
   and estimation procedures for assessing
   components of biodiversity with NFI data

Il processo di armonizzazione nell'azione COST E43

Studio bibliografia
+
Questionari

Definizioni internazionali

Approfondita conoscenza di tutti gli IFN

References Definitions

Studio delle opzioni di armonizzazione

Building Bridges

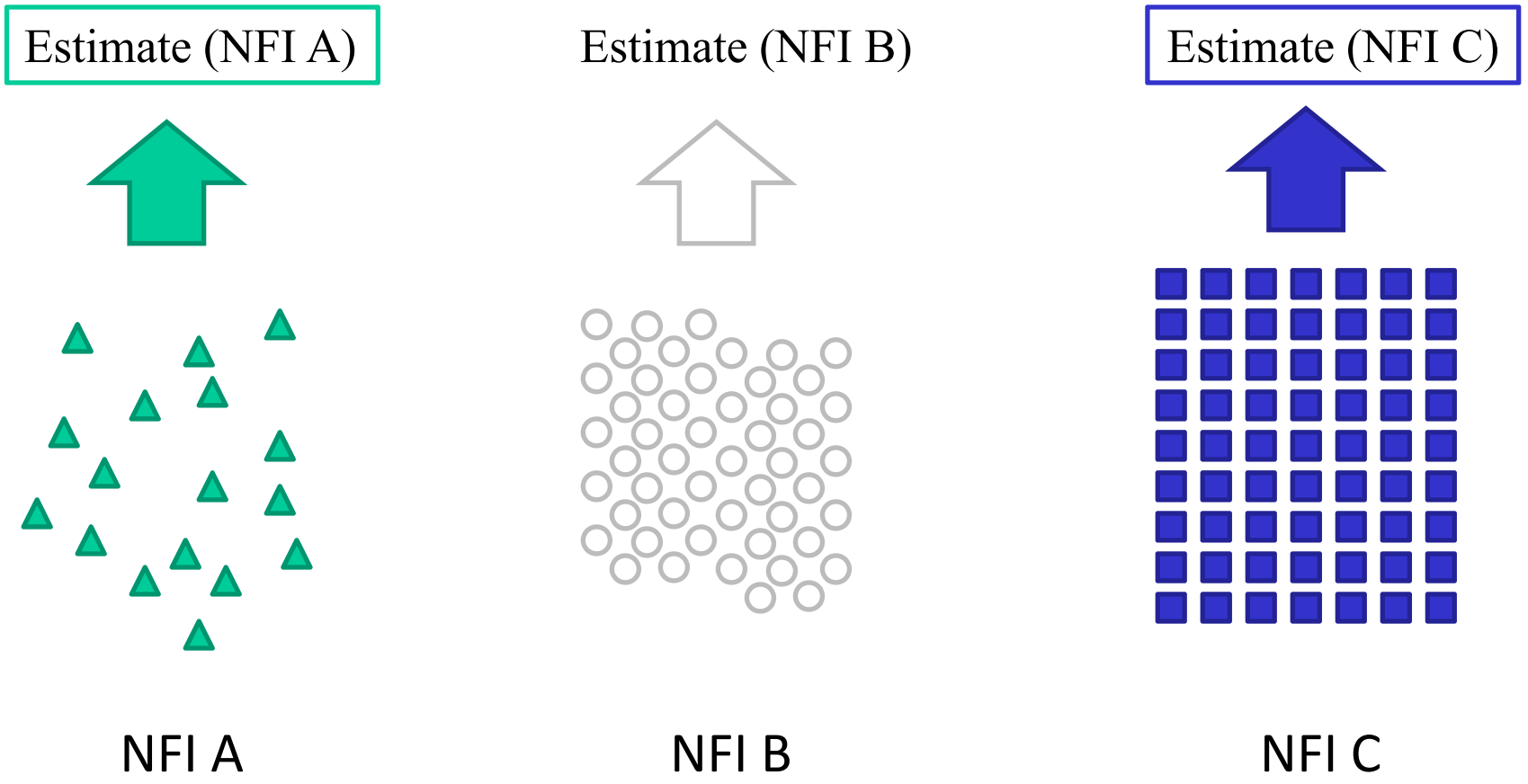
Raccomandazioni per i futuri IFN per semplificare l'armonizzazione

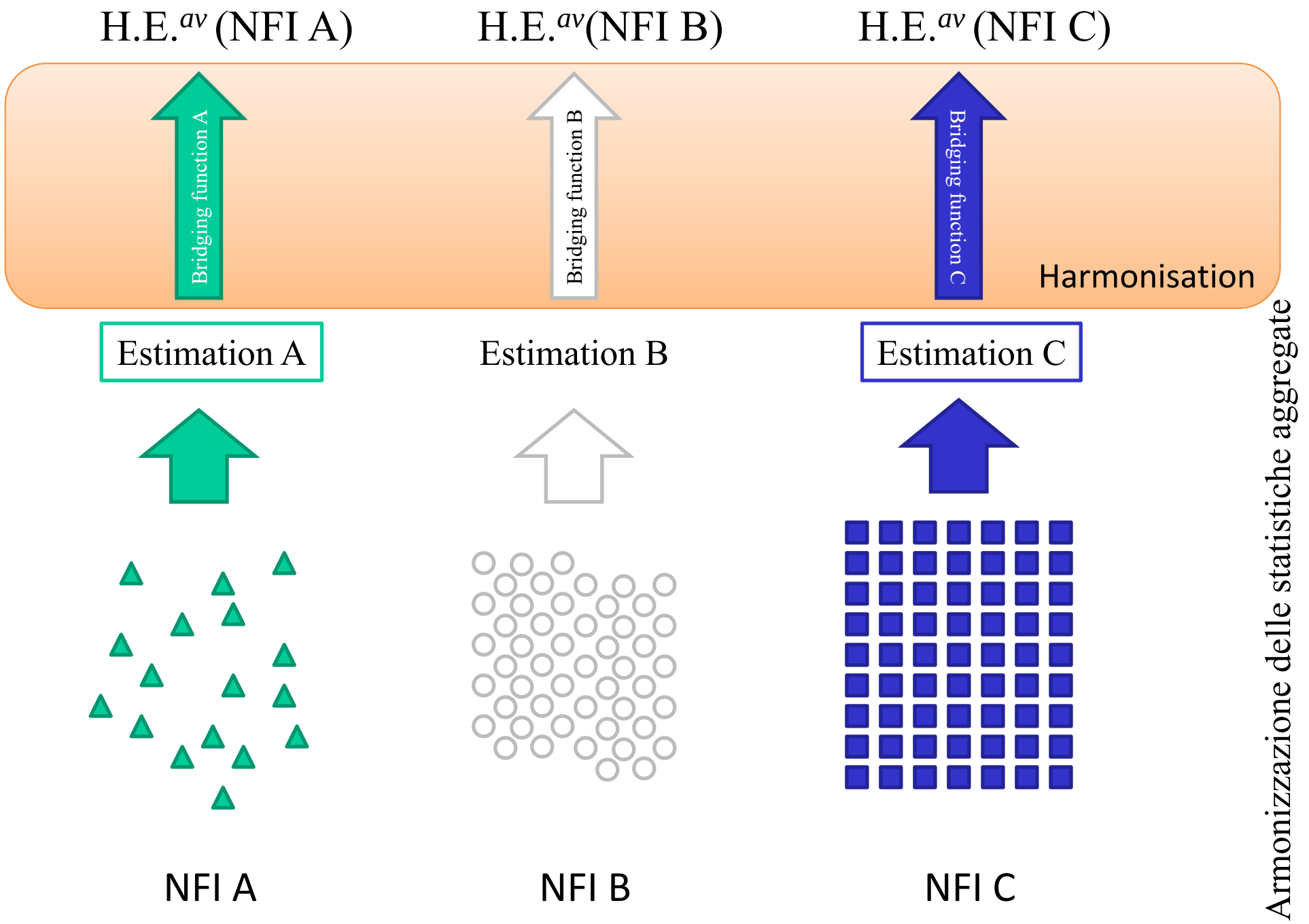
Tipi di armonizzazione

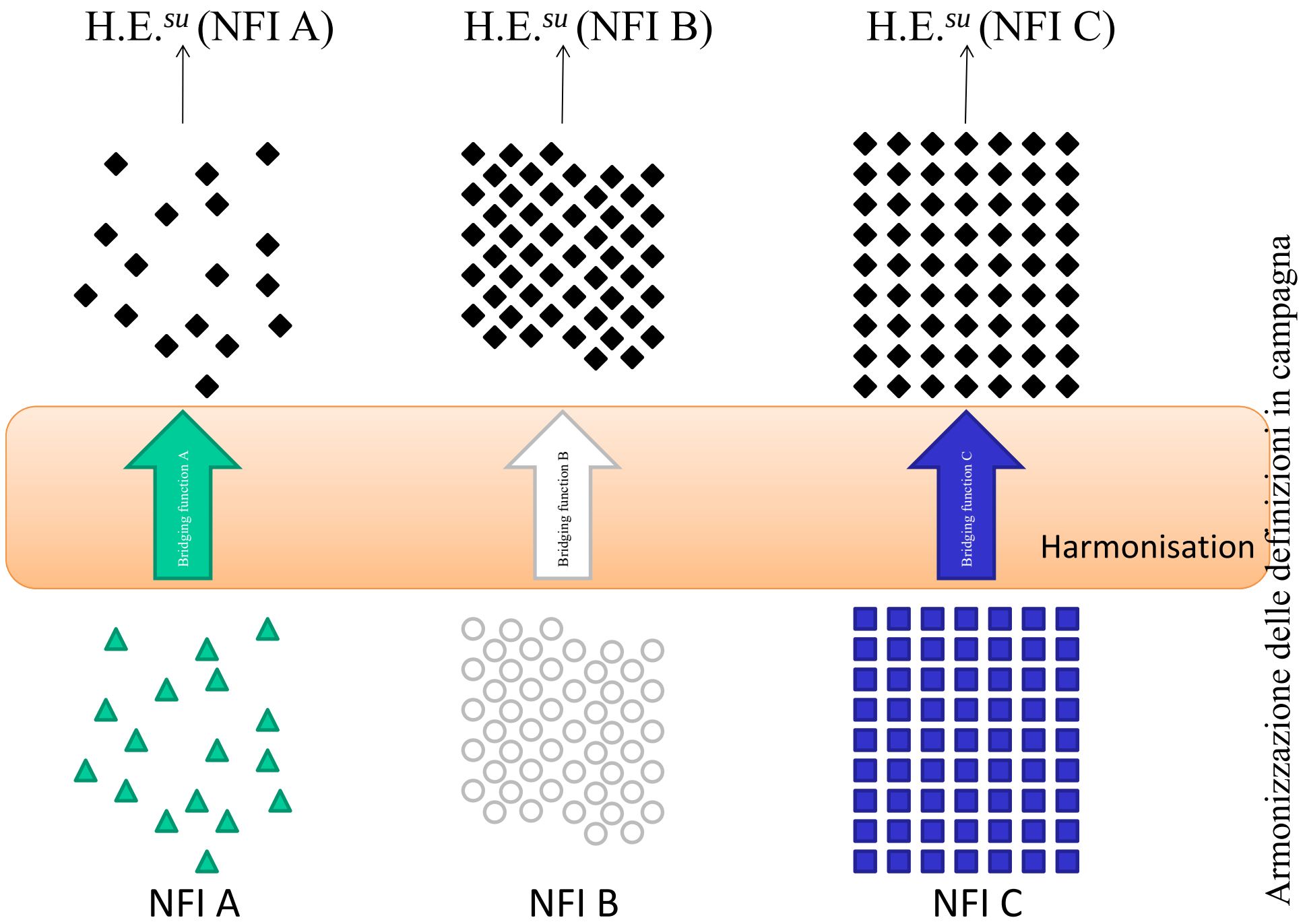
1. Se possibile si armonizzano solo le statistiche prodotte dagli inventari. In questo modo non è necessario acquisire nuovi dati e modificare il protocollo di rilievo a terra
2. Altrimenti è necessario armonizzare le definizioni e talvolta i metodi di rilievo a terra. In questo modo è necessario acquisire di nuovo i dati a terra e modificare il protocollo di rilievo

Situazione pre-armonizzazione

Le statistiche prodotte dai diversi IFN non possono essere aggregate perchè si basano su definizioni locali diverse tra di loro

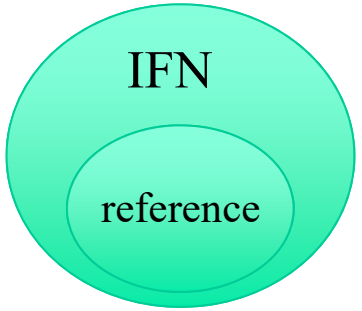


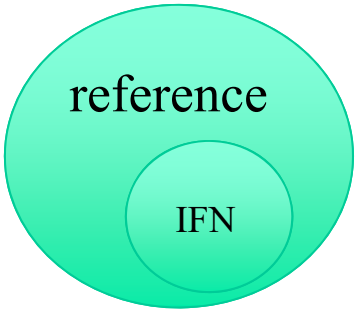

H.E.^{av} (NFI A)
H.E.^{av}(NFI B)
H.E.^{av} (NFI C)
Bridging function A
Bridging function B
Bridging function C
Harmonisation
Estimation A
Estimation B
Estimation C
NFI A
NFI B
NFI C
Armonizzazione delle statistiche aggregate


H.E.su (NFI A)
H.E.su (NFI B)
H.E.su (NFI C)
Bridging function A
Bridging function B
Bridging function C
Harmonisation
NFI A
NFI B
NFI C
Armonizzazione delle definizioni in campagna

Tipi di *bridges*

1. NEUTRE: se le differenze tra *reference* e definizioni IFN sono limitate, in genere solo nomenclaturali, si può procedere a rinominare le variabili. Il risultato dell'armonizzazione è MOLTO SICURO perché le statistiche non vengono alterate
2. RIDUTTIVE: se la definizione IFN contiene completamente la definizione *reference*, il bridge estrae un sottoinsieme dei dati dell'IFN. Il risultato dell'armonizzazione è SICURO perché non vengono alterati i dati di origine
3. ESPANSIVE: se la definizione IFN non contiene completamente la definizione di reference i dati dell'IFN devono essere estrapolati. Il risultato dell'armonizzazione NON È SICURO perché i dati di origine sono alterati

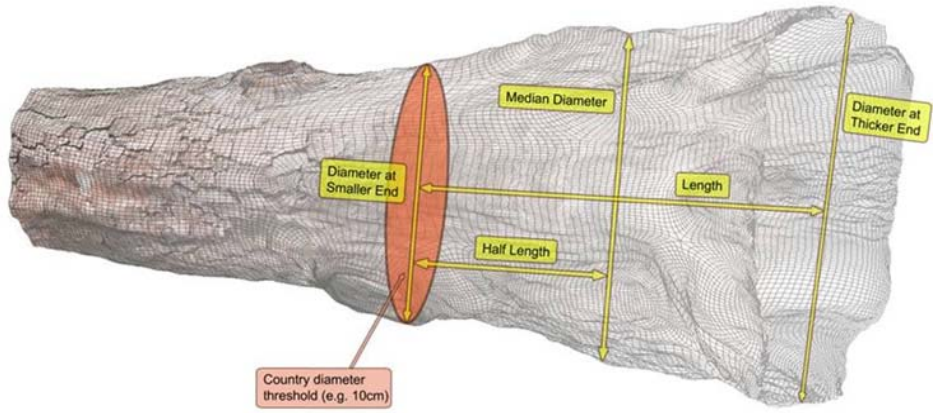


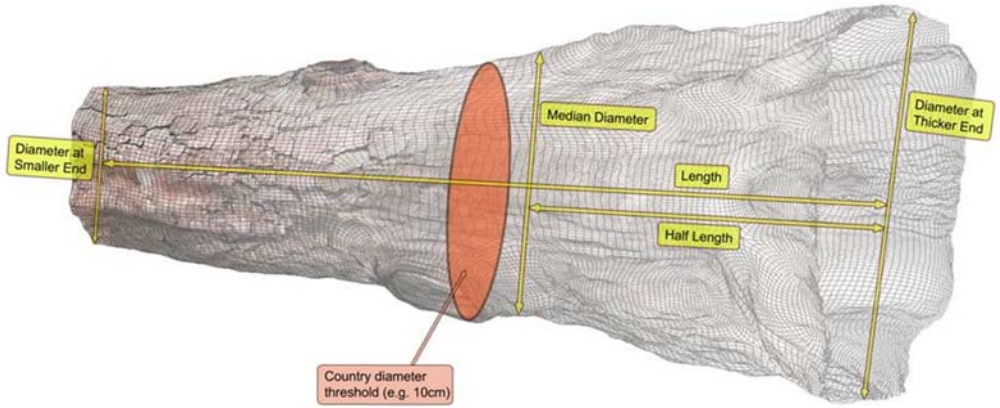


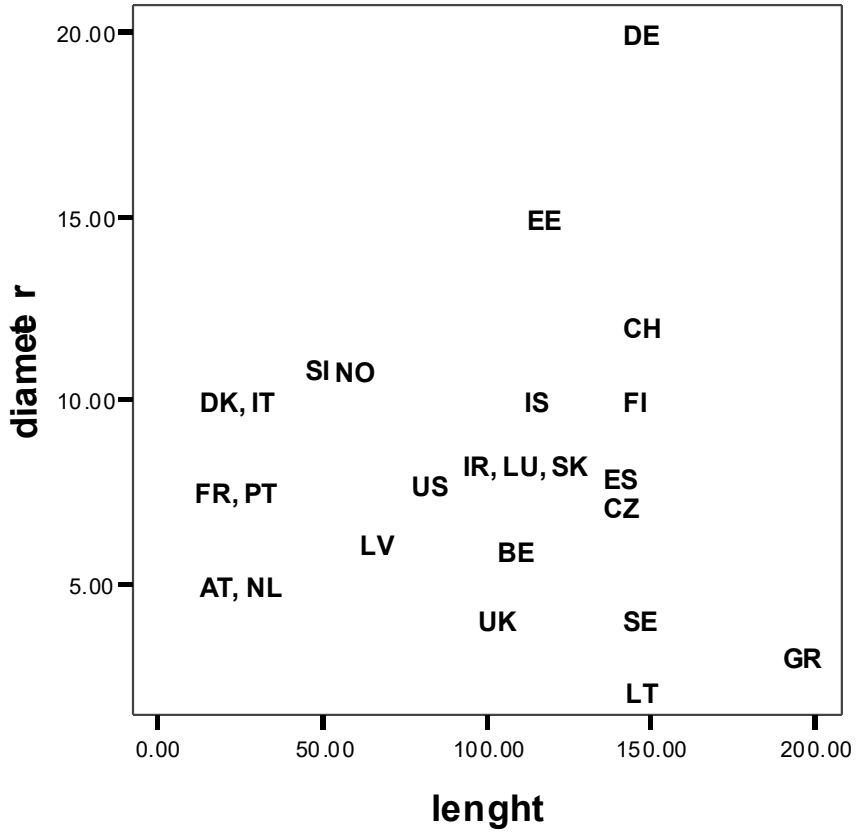
Esempi di *bridge*

Definizione IFN		Definizione *reference*
La provvigione è calcolata considerando il cavallettamento degli alberi aventi DBH > 5 cm	*bridge* riduttiva	La provvigione è calcolata considerando il cavallettamento degli alberi aventi DBH > 10 cm
La provvigione è calcolata considerando il cavallettamento degli alberi aventi DBH > 10 cm	*bridge* espansiva	La provvigione è calcolata considerando il cavallettamento degli alberi aventi DBH > 5 cm

Differenze nelle definizioni di legno morto







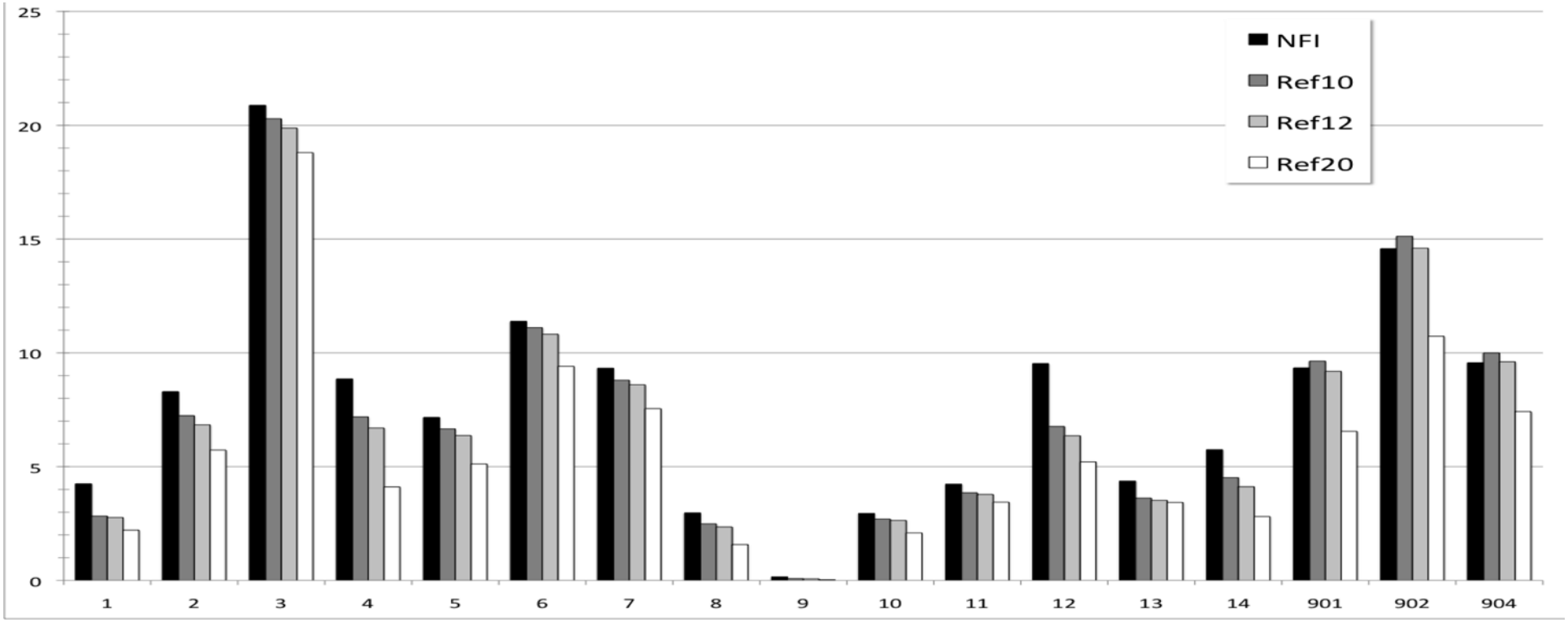


Figure 8. Mean volumes (in m^3ha^{-1}) per European forest categories and American forest types before (NFIs definitions: NFI) and after harmonisation (Reference definitions: Ref10, Ref12 and Ref20). Mean of 9208 plots. Description of forest categories/types are in Table 6.

“Growing stock is the volume of living and standing
stems over a specified land area. Included are
stem volumes from the stump height to the stem top and the bark. Branches are excluded.”

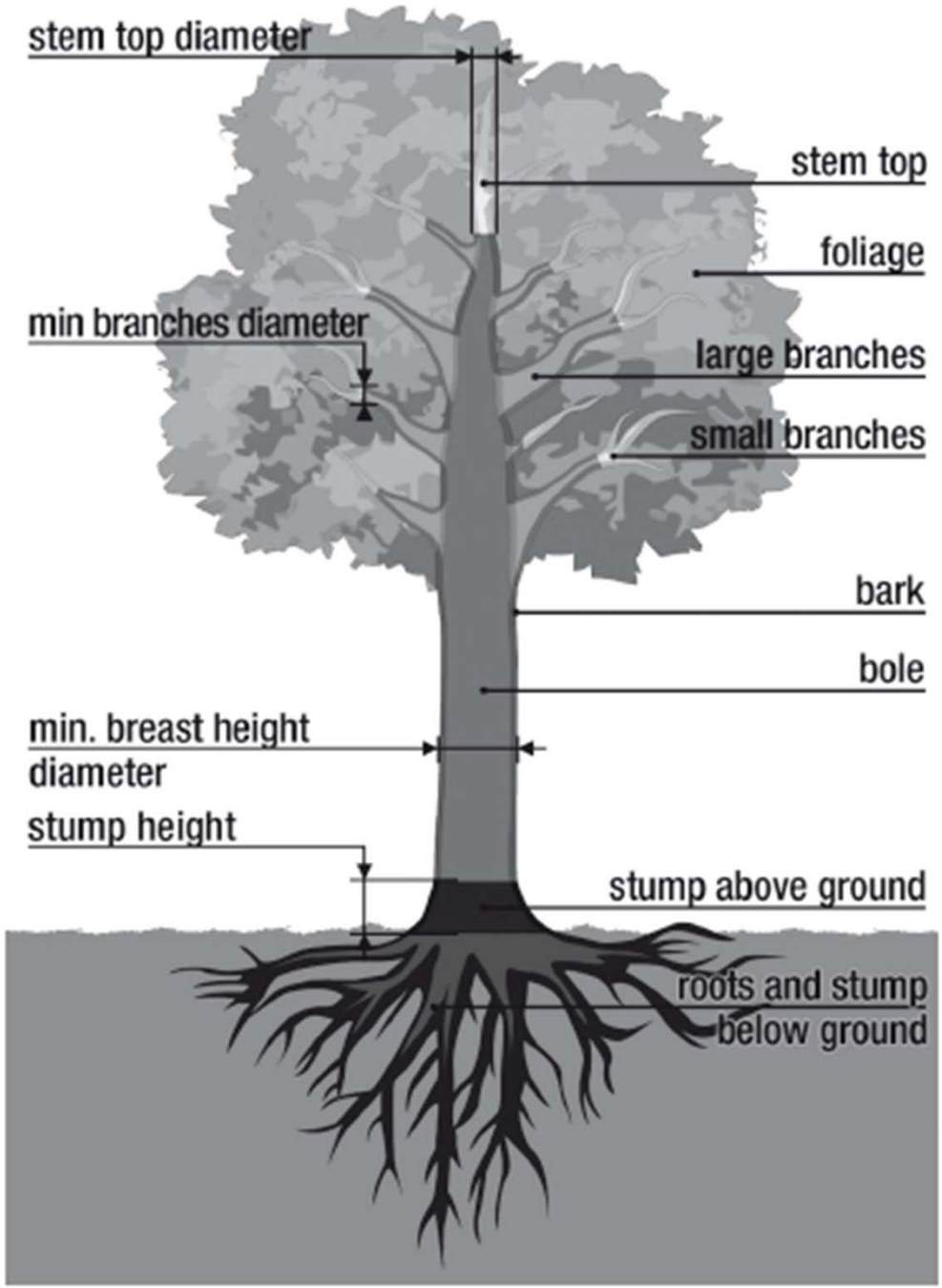


Table 2.1 National definitions of forest and estimators for forest area

Country	Forest area				Estimation method
	Crown cover (%)	Minimum area (ha)	Minimum width (m)	Minimum tree height in situ (m)	
Austria	30	0.05	10		Field plots
Belgium (Walloon Region)	***10***	0.1		***5***	Photo dot grid
China	20	0.0667			Field plots
Cyprus	***10***	***0.5***		***5***	Photo interpretation
Czech Republic	20	0.04	10		Map
Denmark	***10***	***0.5***	***20***	***5***	Field plots
Estonia	***30***	***0.1***			Field plots
Finland	***10***	0.5	20	***5***	Field plots
France	***10***	***0.5***		***5***	Photo interpretation
Germany	50	0.1	10		Field plots
Great Britain	20	***0.5***	***20***		Map
Greece	***10***	***0.5***	30	***5***	Photo dot grid
Hungary	50	***0.5***	***20***		Photo interpretation
Iceland	***10***	***0.5***	***20***	***2***	Field plots
Ireland	20	0.1	***20***	***5***	Photo interpretation
Italy	***10***	***0.5***	***20***	***5***	Photo interpretation
Korea	30	1.0			Map
Latvia	20	0.1		7	Photo interpretation
Lithuania	30	0.1	10	5	Field plots
Luxembourg	***10***	0.1		***5***	Photo dot grid
The Netherlands		***0.5***	***20***		Map
New Zealand	30	1.0		***5***	Field plots
Norway	***10***			***5***	Field plots
Romania	***10***		***20***	***5***	Photo dot grid
Slovak Republic	20	0.3		***5***	Field plots
Slovenia		0.25		***5***	Map
Spain	20			***5***	Map
Sweden	***10***	***0.5***		***5***	Field plots
Switzerland	20		25–50	3	Field points
USA	25	0.4	36.58		Field plots

Bold, italicised entries indicate conformity with the COST Action E43 definition.

Table 2.2 Components of national growing stock volume definitions

Country	Land[a]	Minimum *dbh* (cm)	Diameter at top height (cm)	Stumps	Branches	Deadwood
Austria	Productive FL	5.0	0.0	No	No	Yes
Belgium (Wallonia)	Productive FL	7.0	7.0			
Estonia	FL, OWL	0.0	0.0	No	No	No
Finland	Productive and poorly productive FL, OWL	0.0	0.0	No	No	Yes
France	Productive and non-productive FL, OWL	7.5	7.0	Yes	No	No
Germany	Productive and non-productive FL	7.0	7.0	Yes	Yes[b]	Yes[d]
Great Britain	Conifer and hardwood plantations	7.0	7.0	No	No	No
Greece	Productive and non-productive FL	5.0	7.0	Yes	No	No
Iceland	Plantation, some natural birch forests	0.0	0.0	No	No	No
Ireland	FL	7.0	7.0[e] 0.0[f]	Yes	No	No
Latvia	FL, plots on non-FL with trees or bushes	2.1	0.0	Yes	No	No
Lithuania	FL	0.0	0	Yes	No	No
Slovak Republic		7.0	7.0		Yes[c]	
Slovenia	FL	10.0	7.0	Yes	Yes[c]	Yes
Spain	Crown cover ≥5%	7.5	7.5	No	No	No
Sweden	FL or all land	0.0	0.0	No	No	No
Switzerland	FL	12.0	0.0	Yes	No	No
USA	FL	12.7	10.1	No	No	No

[a]FL = forest land, OWL = other wooded land.
[b]Main branches of deciduous trees.
[c]Minimum diameter = 7 cm.
[d]Newly dead trees only.

Table 2.3 Features of probability-based sampling designs used by NFIs

Country	Systematic grid spacing for plots or clusters of plots (km × km)	Strata criteria for stratified sampling	Random component in plot location	Number of field plots per cluster	Permanent plots (proportion of all plots)	Last NFI cycle	Current/ future NFI cycle
Austria	3.889 × 3.889	–	–	4	1.00	2000–2002	2007–2009
Belgium (Walloon Region)	1 × 0.5	–	–	1	1.00	1994–2008	2008–2018
Brazil	20 × 20	–	–	4	–	–	2009–
Canada	20 × 20	Terrestrial ecozone	–	1	1.00	2000–2006	2007–
China	–	–	–	1	1.00	2004–2008	–
Cyprus	–	–	–	1	1.00	2001–2005	–
Czech Republic	2 × 2	–	Within 300 m of grid point	1	1.00	2001–2004	–
Denmark	2 × 2	–	–	4	Approximately 0.33	2002–2006	2007–2011
Estonia	5 × 5	–	–	16	0.25–0.50	2004–2008	2009–2013
Finland	3 × 3 to 10 × 10	In North Lapland[a]	No	9–14	Approximately 0.25	2004–2008	2009–2013
France	1.41 × 1.41	–	Within 900 × 900-m cell	2	0.00	2004–2009	–
Germany	2 × 2 to 4 × 4	–	–	4	1.00	2000–2002	2011–2012
Great Britain	–	Forest type	Within polygons	1	–	1995–1999	2009–2013
Iceland	0.5 × 1 to 1.5 × 3	Plantation and birch	–	1	1.00	–	2005–2009
Ireland	2 × 2	–	Within 100 m of grid point	1	1.00	2004–2006	–
Italy	1 × 1	Administrative region and land cover	–	1	0.00[b]	2003–2007	–
Japan	4 × 4	–	–	1	1.00	2004–2008	–
Korea	4 × 4	–	–	4	1.00	1996–2005	2006–2010
Latvia	2 × 2 to 4 × 4	–	–	1	1.00	2004–2008	2009–2013
Lithuania	4 × 4	–	–	1	0.75	2003–2007	2008–2012
Luxembourg	1 × 0.5	–	–	1	1.00	1999–2001	2008–2010
Netherlands	1 × 1	–	Within 1 × 1-km grid cell	1	0.5	2001–2005	2010–
New Zealand	4 × 4 and 8 × 8	Forest category	–	1 or 4	1.00	1945–1955	2002–2010
Norway	3 × 3			4	Some	2000–2004	2005–2009
Poland	4 × 4			1	1.00	–2001	–2009
Portugal	2 × 2			1	0.00	2005–2006	
Romania	2 × 2 to 4 × 4			4		2007–2008	
Slovak Republic	4 × 4			1	0.00	2005–2006	
Slovenia	4 × 4			5	1.00	2007	
Spain	1 × 1			1	1.00	1997–2007	2008–2018
Sweden	varying			4–12	Approximately 0.60	1993–2002	2003–2012
Switzerland	1.41 × 1.41			1	1.00	2004–2006	
USA	2,400 ha systematic hexagonal tessellation		Within 2,400 ha hexagon	4	1.00	2004–2008	2009–2013

[a]Percent non-productive forest land, volume, cumulative day-time temperature.
[b]All plots marked for possibility of future measurement.

Table 2.4 Number of plots per NFI and the approximate forest area represented by each plot

Country	Number of interpreted "photo-plots"	Number of field sample plots on land	Number of field sample plots on forest land	Approximate forest area represented by each field plot (ha)
Austria		22,236		178
Belgium (Walloon Region)			Approximately 11,000	50
Canada	18,850	1,885	1,150	269,700
China	2,844,4000	415,000		407
Croatia	30,000		Approximately 6,000	
Cyprus			1,970	88
Czech Republic	Approximately 39,000		Approximately 14,000	197
Denmark	42,793		7,610 (on forest and OWL)	87
Estonia		4,500	2,300	1,040
Finland		69,388	51,845	129.3–1996.5
France	275,000	50,000	35,000	449
Germany			54,009	205
Great Britain	100% land coverage		Approximately 15,000	170
Greece	95,220	2,744		916
Iceland			Plantations –663 Birch woodlands – 203	Plantation – 50 Birch – 450
Ireland	17,423	17,423	1,742	400
Italy	301,000 (first phase)	301,000 (first phase)	30,000 (second phase – forest and OWL), 6,865 (third phase – forest)	1,310
Japan			15,700	
Korea			4,000	1,598
Latvia				300
Lithuania			5,600 permanent and 1,900 temporary	300
Luxembourg			Approximately 1,800	50
Netherlands			3,622	99
New Zealand			889 indigenous forest 253 post-1989 plantations	7,005
Norway		16,522		900
Portugal	355,737		6,478	525
Romania			24,000 permanent and 5,000 temporary	
Russia			Approximately 150,000	
Slovak Republic	12,268	1,486	1,161	731
Slovenia		778	778	1,600
Spain			95,327	272.58
Switzerland	165,000		Approximately 7,000	
USA (excluding Alaska)		325,812	91,988	2,400

Tecniche per rendere più semplice l'armonizzazione

- Se esistono standard internazionali ADOTTARLI!
- Se si vuole mantenere la confrontabilità con le statistiche acquisite in passato sulla base di definizioni locali diverse dagli standard si possono acquisire i dati con **doppia definizione**
- Utilizzare DBH minimo pari a 0 cm
- Registrare la posizione delle piante cavallettate

- Le definizioni *reference* è probabile che si trasformino in futuro in standard