



GOZDARSKI INŠTITUT SLOVENIJE
SLOVENIAN FORESTRY INSTITUTE



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CERTIFICATION OF FOREST REPRODUCTIVE MATERIAL IN SLOVENIA – THE SELF - EVALUATION REPORT

SUPPORTING THE OFFICIAL APPLICATION OF SLOVENIA TO THE OECD FOREST PLANT AND SEED SCHEME

Hojka Kraigher¹ & Saša Rus²

¹Slovenian Forestry Institute, Ljubljana, Slovenija,

²Ministry of Agriculture, Forestry and Food, Ljubljana, Slovenija

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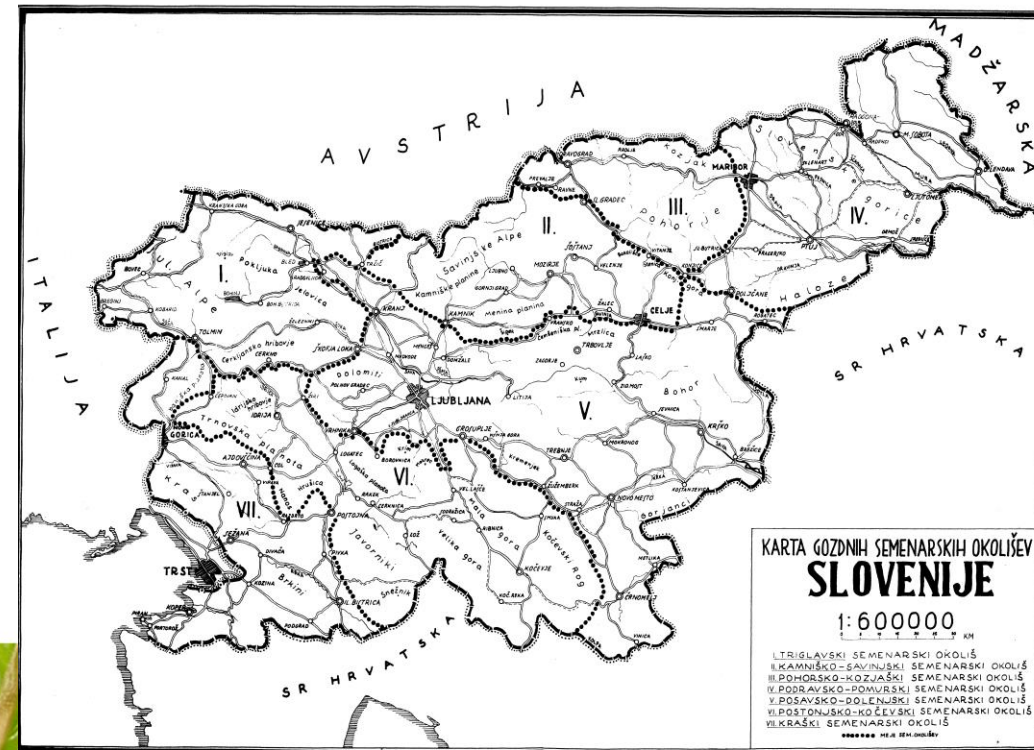
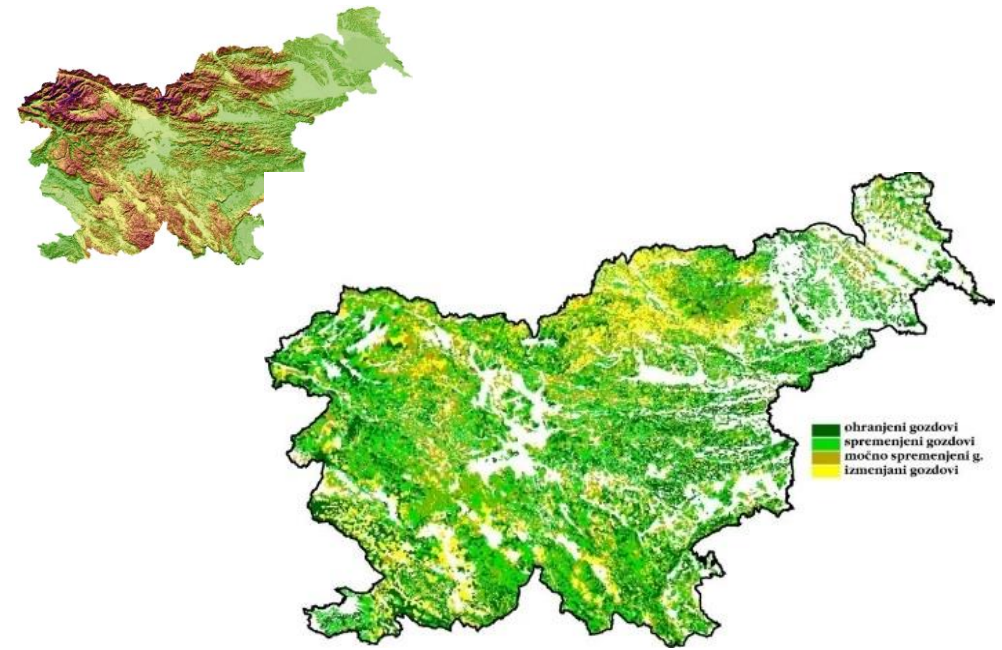
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Forests in Slovenia

- Forests: 60%, growing stock $357 \times 10^6 \text{ m}^3$, $303 \text{ m}^3/\text{ha}$; annual increment $7,5 \text{ m}^3/\text{ha}$; 54% broadleaves
- About 3300 indigenous plant species, 330 woody plants, about 75 forest tree species
- Part of the European 'biodiversity hotbelt'
- Sustainable, close-to-nature and multifunctional forest management - Forest Act 1993 & Nat. Forestry Programme 2006
- **Directive EC/105/1999 → Act on FRM 2002 → conservation of FGR → 77 forest tree spp**
- ❖ 1950 M. Wraber: „Silviculture based on forest genetics“
- ❖ 1951/61/71 M. Brinar



Overview of relevant Slovenian legislation considering the application to join the OECD Forest Seed and Plant Scheme

- All national legislation is harmonized with the European Directive on marketing of FRM (EC/105/1999), relevant FRM and plant health regulations
- Forest Act (ZOG, 1993), Official Gazette of the Republic of Slovenia 30/93, 56/99, 67/02, 110/02, 115/06, 110/07, 106/10, 63/13, 101/13, 17/14, 24/15, 9/16, 77/16.
- Forest Reproductive Material Act (ZGRM, 2002) Official Gazette of the Republic of Slovenia 58/02, 85/02, 45/04, 77/11.
- Order on the list of tree species and artificial hybrids (Lista vrst, 2010), Official Gazette of the Republic of Slovenia, No. 4/10.
- Rules: i) on the conditions and procedure for the approval ..."qualified" and "tested" ..., ii) "known origin" and "selected", iii)... for entry in the register of suppliers..., iv)...determination of areas of provenance, v)...on certificates and master certificates..., vi)...on determining data for forest tree seeds, vii)...for inspection at import, viii)... on compulsory health inspection ...



The List of 47 spp (EC/105/1999); orange: deleted in Si (2006); blue: non-native spp. remaining in the List; green: added
Total 2010: 77 spp

<i>Abies alba</i>	<i>Larix decidua</i>	<i>Populus x spp.</i>
<i>Abies cephalonica</i>	<i>Larix kaempferi</i>	<i>Prunus avium</i>
<i>Abies grandis</i>	<i>Larix x eurolepis</i>	<i>Pseudotsuga menziesii</i>
<i>Abies pinsapo</i>	<i>Larix sibirica</i>	<i>Pyrus pyraeaster</i>
<i>Acer platanoides</i>	<i>Malus sylvestris</i>	<i>Quercus cerris</i>
<i>Acer pseudoplatanus</i>	<i>Picea abies</i>	<i>Quercus ilex</i>
<i>Alnus glutinosa</i>	<i>Picea sitchensis</i>	<i>Quercus petraea</i>
<i>Alnus incana</i>	<i>Pinus brutia</i>	<i>Quercus pubescens</i>
<i>Betula pendula</i>	<i>Pinus canariensis</i>	<i>Quercus robur</i>
<i>Betula pubescens</i>	<i>Pinus cembra</i>	<i>Quercus rubra</i>
<i>Carpinus betulus</i>	<i>Pinus contorta</i>	<i>Quercus suber</i>
<i>Castanea sativa</i>	<i>Pinus halepensis</i>	<i>Robinia pseudoacacia</i>
<i>Cedrus atlantica</i>	<i>Pinus leucodermis</i>	<i>Sorbus aria</i>
<i>Cedrus libani</i>	<i>Pinus nigra</i>	<i>Sorbus aucuparia</i>
<i>Fagus sylvatica</i>	<i>Pinus pinaster</i>	<i>Sorbus domestica</i>
<i>Fraxinus angustifolia</i>	<i>Pinus pinea</i>	<i>Sorbus torminalis</i>
<i>Fraxinus excelsior</i>	<i>Pinus radiata</i>	<i>Tilia cordata</i>
<i>Juglans regia</i>	<i>Pinus sylvestris</i>	<i>Tilia platyphyllos</i>
		<i>Ulmus glabra</i>

Additional species in the List of species in SI (2010)

<i>Acer campestre</i>	<i>Olea europaea</i>
<i>Acer monspessulanum</i>	<i>Ostrya carpinifolia</i>
<i>Acer obtusatum</i>	<i>Phillyrea latifolia</i>
<i>Acer tataricum</i>	<i>Pinus mugo</i>
<i>Alnus viridis</i>	<i>Pistacia terebinthus</i>
<i>Carpinus orientalis</i>	<i>Populus alba</i>
<i>Celtis australis</i>	<i>Populus nigra</i>
<i>Cercis siliquastrum</i>	<i>Populus tremula</i>
<i>Ficus carica</i>	<i>Prunus mahaleb</i>
<i>Fraxinus ornus</i>	<i>Prunus padus</i>
<i>Ilex aquifolium</i>	<i>Pyrus amygdaliformis</i>
<i>Laburnum alpinum</i>	<i>Quercus crenata</i>
<i>Laburnum alschingeri</i>	<i>Salix x spp.</i>
<i>Laburnum anagyroides</i>	<i>Taxus baccata</i>
<i>Laurus nobilis</i>	<i>Ulmus laevis</i>
<i>Mespilus germanica</i>	<i>Ulmus minor</i>

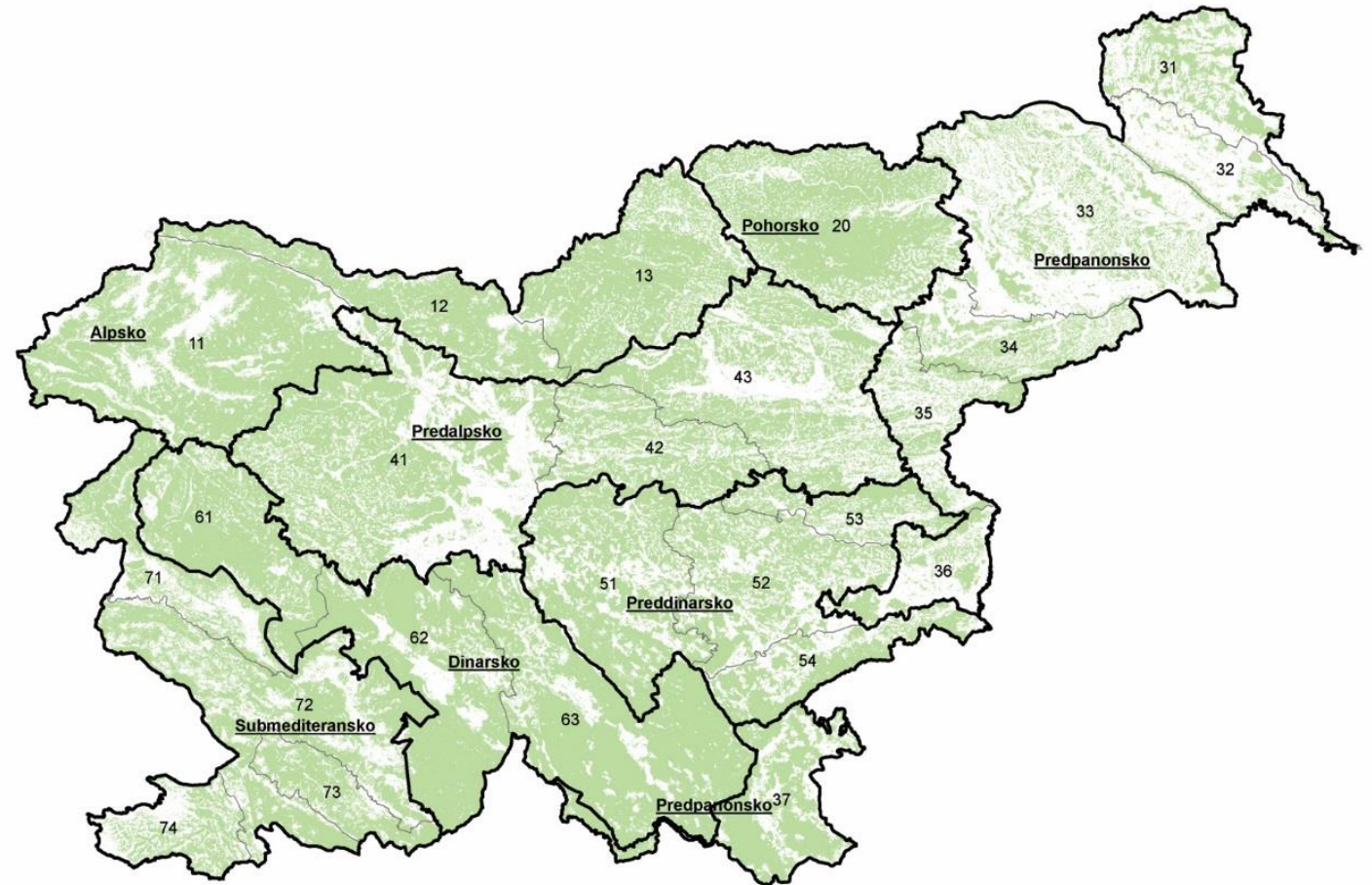
Regions of Provenances - based on ecological regions & subregions

Majority spp: *Abies alba*, *Picea abies*, *Fagus sylvatica*, *Quercus robur*, *Q. petraea*

1. Alpine
2. Pohorje
3. Prepannonian
4. Prealpine
5. Predinaric
6. Dinaric
7. Submediterranean

ELEVATION ZONES

- > 300 m a.s.l.
- 301-700 m a.s.l.
- 701-1000 m a.s.l.
- < 1000 m a.s.l.



Provenienčna območja in ekoregije



11, Julijske Alpe	32, Murska ravan	37, Bela Krajina	52, Mirnsko - Raduljsko hribovje	63, Kocevsko - Ribniško pogorje
12, Z Karavanke - Kamniške Alpe	33, Slovenske gorice - Ptujsko p.	41, Škofjeloško h.-Savska dolina	53, Bohor	71, Goriška Brda - Vipavska d.
13, Savinjske Alpe - V Karavanke	34, Haloze - Dravinjske gorice	42, Posavsko hribovje	54, Gorjanci	72, Kras - Vremsko gricevje
20, Pohorska	35, Obsotelsko gricevje	43, Savinjsko - Šaleško območje	61, Trnovski gozd	73, Brkini
31, Goricko	36, Krško - Bizeljsko gricevje	51, Suha kraj. - J Zasavsko hrib.	62, Notran. - Snežniško pogorje	74, Šavrinsko gricevje

Criteria for approval of forest seed objects (= basic material)

Origin: for indigenous spp primarily autochthonous

Isolation: origin & quality

Population size: 1-2 tree height distances &

majority spp: 5 ha; 70 trees

minority spp.: 25 or min. 10 trees

Developmental phase: form older poles stands

Homogeneity at the time of production

Adaptation to ecological conditions: 9 criteria

Health condition: defined at the time of approval

Increment: depending on the average manag.
unit index

Wood quality: depending on the sp & other
stands in the region

Growth characteristics: negative phenotypes
allowed to 20% selected, 40% source identified



Adaptation to ecological conditions
= *The longterm capability of the stand to survive in its environment:*

- sexual (flowering, fructification) or vegetative **reproduction**,
- survival** of natural regeneration,
- adaptation** to climate conditions,
- capability to **regenerate after stress**,
- adaptation** to the water regime & to soil conditions,
- competitiveness** in the plant community,
- tree vitality**,
- adaptation** to other stressful environmental conditions.

The FRM certification system in Slovenia

Protocol for approval of basic material – forest seed objects

- Request by the forest owner / manager
- On-field assessment by the committee (SFI leading, SFS head of silviculture and possibly the local forest ranger, owner representative, others if needed)
 - Check the criteria & compare to other stands in the region
 - **Decree on approval**, includes **directives for tending and for seed production**
- Inscription into the **Register – National list of seed objects & FOREMATIS**



Protocol for certification of FRM

- Seed dealer files an application at the local SFS office 14 days before production (for the seed orchard to SFI at time of flowering); forest owner's agreement stated
- Professional control by the local & regional SFS foresters; receives the SFS **Field confirmation** with quantity per day and total → sent to SFI
- SFS or seed dealer to provide a **sample from each tree** used for collection (fruits / seeds / cones or buds) to SFI (with a copy of the Field confirmation)
- **SFI issues a master certificate**, providing the directives from the decree on approval were fulfilled, and, when needed, source was confirmed by molecular methods



During the field evaluation SFI gives **the directives:**

- **for tending of seed object & for production of FRM**
- **aimed to safeguarding the adaptability potential of future forests = genetic diversity**

- The directives (agreed with SFS & the owner) **are written in the decree on approval and become obligatory** parts of the detailed silvicultural plans and **their fulfillment is considered in certification of FRM.**



Overview of approved seed objects in Slovenia

Type of forest seed object (FSO)	Nr.	Forest gene reserve
Forest stands or groups of trees for production of FRM category 'Source identified'	93	6
Forest stands for production of FRM category 'Selected'	161	34
Seed orchards, parents of families, clones or clonal mixtures for production of FRM category 'Qualified'	1	/
Plus trees*	15	/
Provenance regions for production of FRM category 'Not for use in forestry'**	127	/
Total	397	40

*The database of plus trees, which may be used in future for collection of material from which seed orchards or clones or clonal mixtures might be established, has also been included in the national Register.

**The national Register also includes the list of provenance regions (for majority spp) or whole Slovenia (for all other species) per species as 'seed objects' with the purpose 'Not for use in forestry'; therefore all FRM, produced in Slovenia, receives a Master certificate with a specific purpose, including 'not for forestry purposes'.

Field confirmation

- Application by the seed producer / supplier (to SFS *in situ* or SFI *ex situ*)
- SFS (*in situ*): controls the owner's consent, the collection on the field, issues Field confirmation and sends samples from each tree to SFI

Master certificate

- SFI checks the obtained Field confirmation and sample material and issues the Master certificate of origin to the supplier
- SFI keeps the samples in the Seed bank (part of the Slovenian forest gene bank) for any inspection requirements
- When required, SFI provides also Seed Quality confirmation
- According to the mid-term planning, SFS stores seed reserves in the centralized Seed storage
- The nursery production is controlled by the Forestry Inspectorate in collaboration with SFS and SFI

Records and reporting

- The supplier reports on FRM production to MAFF once per year
- SFS reports the list of Field confirmations to the MAFF once per year
- SFI reports to the MAFF and Forestry Inspectorate the list of Master certificates
- In case of need the SFI receives an application to provide an expert opinion on the adequacy of FRM from neighbouring countries for use in Slovenian forests, as well as for information transfer across borders
- MAFF is the authority for international reporting, for keeping records, registering the suppliers, and providing information flow among all institutions

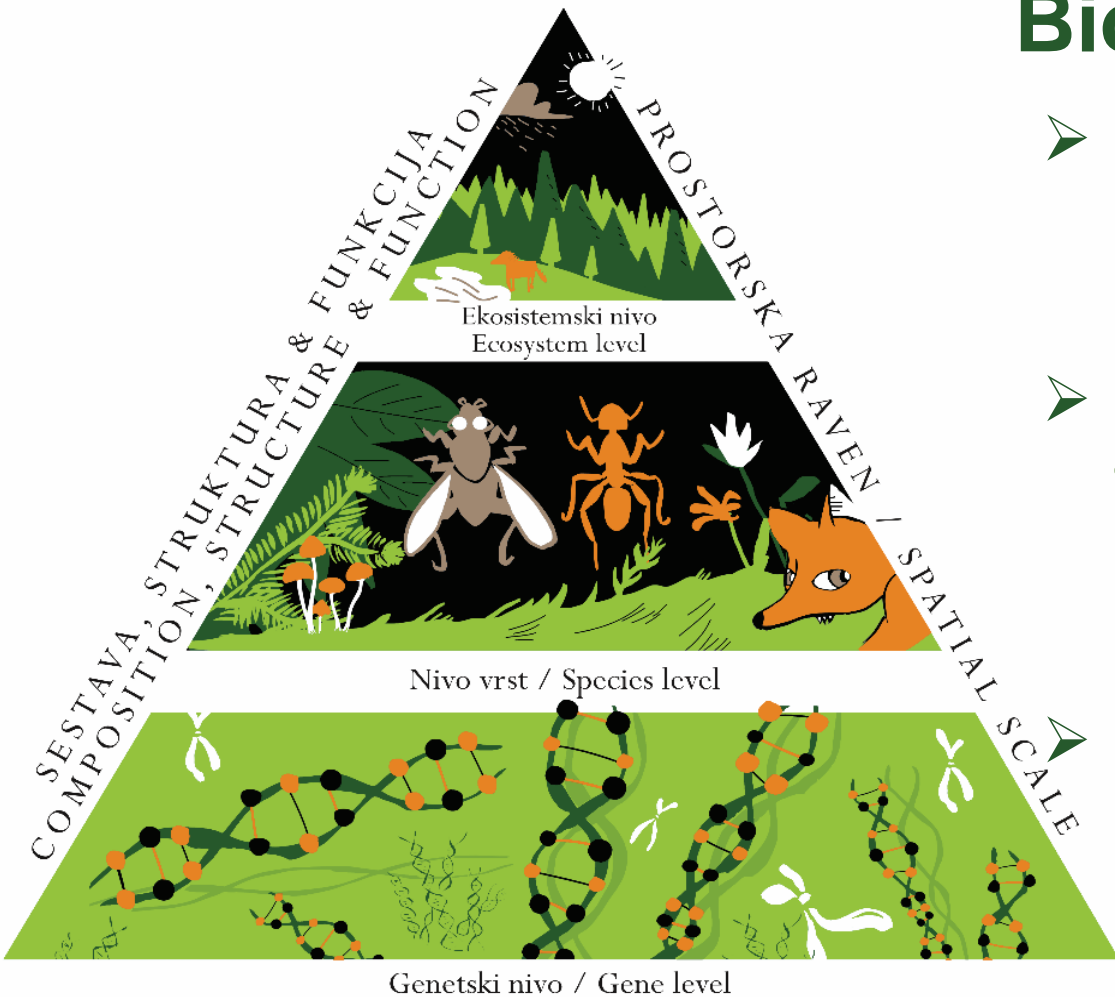
The flow of certification of FRM and its control in Slovenia

Institutions and overview of their roles & authorizations in certification of FRM

- **MAFF:** 2nd control body, information exchange, records on marketing, register of suppliers.....
- **SFS:** Field confirmation (*in situ*), seed storage, forest management planning, decree on silvicultural measures, evidences, forest data...
- **SFI:** Approval of FSO, Master certificate, Register of FSO, FOREMATIS, Slovenian forest gene bank, diagnostic services, field confirmation (*ex situ*), expert opinion, comparative tests...
- **Inspectorates:**
 - Forestry: master certificate for mixed lot, control in nurseries, use of FRM
 - Phytosanitary: control at borders (import)



Biodiversity at different scales



Drawing by D. Finžgar

- Ecosystem, species & functional diversity can diminish the impacts of stress and disturbances
- Genetic diversity (GD) ensures that future populations of forest trees can survive, adapt & evolve in changing environmental conditions

Act on FRM: conservation of GD (#2 and #3)



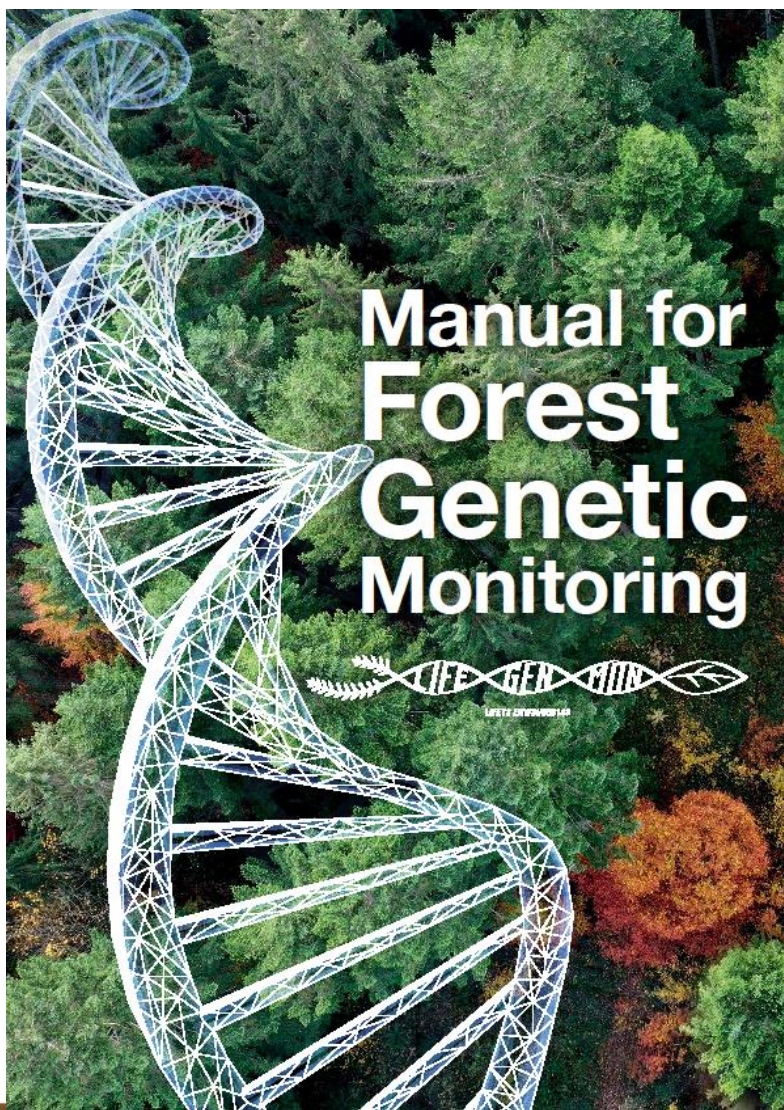
Food and Agriculture Organization of the United Nations





Measures for genetic protection of forests - adaptive forest management:

- Every measure to be considered **with respect to its impact on genetic diversity** of the stand/population(s)
- **Support natural regeneration,**
- **Assist regeneration** by co-planting and co-sowing of a high number of tree species based on site-matching (**enrichment planting**),
- Use adequate forest reproductive material (**FRM**) of **high genetic diversity**, through
 - **i) defining the minimum number of reproducing trees & seed trees for seed collection,**
 - **ii) collection of FRM in full mast years,**
 - **iii) adequate mixing of seed units,**
- Use **advanced seed and seedling production systems,**
- **Test provenances for transfer and mixing of FRM.**
- **⇒ Monitor changes in time following forest management & operations & to observe consequences of changing environment before visual deterioration ⇒ implement forest genetic monitoring - locally, nationally & across borders.**



SEPARATE

Guidelines for genetic monitoring of

Silver fir
(*Abies alba* Mill.)
and
King Boris fir
(*Abies borisii-regis* Mattf.)



SEPARATE

Guidelines for genetic monitoring of

Common ash
(*Fraxinus excelsior* L.)

