5th MCPFE

FORESTS FOR QUALITY OF LIFE

5-7 November 2007, Warsaw Poland

STATE OF EUROPE'S FORESTS 2007

The MCPFE Report on Sustainable Forest Management in Europe

MINISTERIAL CONFERENCE ON THE PROTECTION OF FORESTS IN EUROPE

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Jointly prepared by
the MCPFE Liaison Unit Warsaw,
UNECE and FAO

WARSAW, 2007

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Published by:
Ministerial Conference on the Protection of Forests in Europe
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Design, layout and production:
www.meander.net.pl

ISBN-10: 83-922396-8-7
ISBN-13: 978-83-922396-8-0

Indicator 4.6. Genetic resources

Area managed for conservation and utilization of forest tree genetic resources (in situ and ex situ gene conservation) and area managed for seed production

Genetic diversity is the ultimate source of biodiversity at all levels. Genetic resources of tree species should be conserved for the future, both to secure the width of genetic pools and to allow use of best provenances. A loss of genetic diversity may have negative consequences for general adaptation and production, and may prevent adaptation of tree populations in response to climate change and reduce their capacity to fix CO_2.

In situ conservation is the predominant method to conserve genetic resources of forest trees, while *ex situ* collections and stands are mainly used for conserving endangered tree species or populations. *In situ* gene conservation aims at maintaining evolutionary processes within tree populations to safeguard their potential for continuous adaptation. In the face of climate change, conservation and sustainable use of forest genetic resources are becoming even more important for maintaining the long-term sustainability of European forestry and for supporting forest biological diversity at large.

The areas managed for seed production also contribute to gene conservation of forest trees, but most seed production areas have been established for a few economically important tree species. European countries have increased their capacity to produce seeds of forest trees to meet the demand for artificial regeneration, which is a common regeneration method in several countries.

Data available

A total of 38 countries provided data on this indicator to the Secretariat of the European Forest Genetic Resources Programme (EUFORGEN) at Biodiversity International (Table A23, data by country). The total area managed for gene conservation and seed production per country does not provide adequate information to assess the status of gene conservation of various tree species since their distribution ranges and biological characteristics are considerably different. Therefore, additional information was collected for selected European tree species (Table 14, data by tree species). Table 14 shows species-specific data for most of those species listed under the Council Directive (1999/105/EC) on the marketing of forest reproductive material and those identified as priority species by countries participating in EUFORGEN.

In many countries, national parks and other protected areas are often classified as "gene conservation areas", although their suitability for this purpose has not been assessed and there is no active management for gene conservation. Furthermore, genetic material cannot be collected from protected areas in several countries nor are silvicultural measures allowed in protected forest areas to favour scattered tree species. Subsequently, the data on areas managed for *in situ* gene conservation overestimate the real situation.

The data reported in the species-specific table cannot be directly compared with the data by country, since many gene conservation units are managed for several tree species.

Some land races of exotic tree species are included in the data on *in situ* conservation, but it is difficult to determine when genetic material of exotic trees species can be considered land races.

The data on area managed for *ex situ* gene conservation includes several provenance trials that do harbour valuable genetic material but that are not necessarily managed for gene conservation. The data on exotic tree species also probably includes some plantations that are not managed for *ex situ* gene conservation.

In the statistics on area managed for seed production, in addition to seed orchards, national registers of basic material include large areas of seed collection stands that are not actively managed or from which seeds have not yet been collected.

Status and trends

In Europe, a total of 135 tree species, subspecies and hybrids are included in gene conservation and seed production efforts, but most of these efforts are targeted to a limited number of tree species. A group of seven economically important tree species with large distribution areas *(Fagus sylvatica, Picea abies, Pinus sylvestris, Abies alba, Quercus petraea, Larix decidua* and *Quercus robur)* alone account for 82 percent of the total area managed for *in situ* gene conservation.

The state of gene conservation is good for many stand-forming and widely distributed tree species, but the situation needs to be improved in the case of scattered tree species. In addition, the genetic resources of several rare and endangered tree species are still inadequately conserved and need urgent attention. Furthermore, the marginal populations of many widely distributed tree species are facing new threats at the edges of their geographical range areas due to climate change.

The areas managed for gene conservation of forest trees more than doubled from 1990 to 2005. The total area managed for *in situ* gene conservation increased from 316 341 ha in 1990 to 748 382 ha in 2005 (Table A23). During the same period, the number of tree species covered by *in situ* gene conservation efforts also increased, from 59 to 93 species.

Similarly, the area managed for *ex situ* gene conservation increased from 3 234 ha to 7 392 ha and the number of tree species from 56 to 85. The areas managed for seed production also show an increasing trend. In 1990, the total area managed for seed production was 464 080 ha and covered 85 species. By 2005, the seed production area had increased to 528 707 ha with 90 species.

In conclusion, a positive trend can be observed in areas managed for the conservation of forest tree genetic resources and for seed production, but the level of gene conservation can be considered adequate for only a limited number of tree species in Europe.

Table 14. Area managed in MCPFE countries for *in situ* and *ex situ* gene conservation and for seed production by tree species, 1990, 2000 and 2005 (based on available data)

	Area managed for *in situ* gene conservation			Area managed for *ex situ* gene conservation			Area managed for seed production		
	1990	2000	2005	1990	2000	2005	1990	2000	2005
	ha								
Abies alba	33 860.3	48 545.3	52 730.0	30.8	124.8	183.8	33 017.9	27 741.1	27 258.8
Abies cephalonica	–	–	–	0.5	0.5	0.5	0.0	2.1	1 568.7
Abies grandis	–	3.5	20.3	7.9	8.5	12.3	9.2	13.7	23.4
Abies pinsapo	–	–	100.0	–	–	–	0.0	–	–
Acer campestre	19.5	152.1	550.0	–	0.4	2.4	67.6	49.8	34.0
Acer platanoides	235.2	249.5	544.2	–	1.2	1.9	46.5	78.4	99.1
Acer pseudoplatanus	22 558.8	22 856.0	23 211.5	23.1	35.8	90.0	345.2	657.0	1 644.7
Alnus glutinosa	734.6	1 232.2	1 616.9	5.8	19.6	55.4	1 448.1	1 957.6	2 198.5
Alnus incana	10.0	115.0	132.5	3.2	2.2	2.2	0.5	6.7	14.4
Betula pendula	4 970.0	6 452.0	6 556.7	7.8	94.7	127.3	1025.7	1 485.3	1 397.7
Betula pubescens	73.6	743.0	863.6	1.0	4.9	6.9	1.9	135.9	174.1
Carpinus betulus	4 808.1	6 481.5	7 146.5	–	8.4	10.5	557.7	789.3	750.8
Castanea sativa	25.3	902.0	934.7	–	10.0	11.6	537.5	547.8	991.8
Cedrus atlantica	–	–	–	4.5	4.5	4.5	1 441.6	807.7	721.0
Cedrus libani	–	–	–	3.3	3.3	3.3	2 861.3	3 643.4	3 592.0
Fagus sylvatica	105 105.8	149 784.7	166 509.3	75.3	232.7	267.7	68 893.0	80 057.2	79 988.8
Fraxinus angustifolia	351.5	746.3	835.4	–	0.2	0.7	101.8	626.3	750.1

	Area managed for *in situ* gene conservation			Area managed for *ex situ* gene conservation			Area managed for seed production		
	1990	2000	2005	1990	2000	2005	1990	2000	2005
	ha								
Fraxinus excelsior	8 064.0	10 373.7	11 497.4	5.5	26.7	51.3	2 628.2	3 213.5	4 175.1
Junglas regia	41.1	54.2	53.2	7.9	11.0	25.0	1.0	12.9	54.6
Larix decidua	28 478.0	29 902.3	30 495.9	247.4	302.8	328.4	6 873.1	7 061.0	8 485.6
Larix sibirica	1 924.0	1 924.0	3 989.0	–	4.0	10.3	49.0	183.6	84.9
Picea abies	85 482.2	126 804. 3	156 284.0	618.6	956.5	1 284.8	163 798.3	153 202.9	129 816.7
Pinus brutia	26.0	7 862.6	8 820.6	10.1	10.1	20.0	8 038.6	12 091.7	12 714.1
Pinus canariensis	–	–	–	–	–	–	–	–	108.8
Pinus cembra	1 206.1	2 105.7	2 106.7	21.8	33.0	34.0	13.4	202.7	1 729.1
Pinus contorta	–	–	1.1	38.0	39.4	40.5	191.5	950.2	965.6
Pinus halepensis	1 982.0	1 898.0	1 858.7	22.6	17.0	17.0	331.8	477.0	2 176.7
Pinus leucodermis	3 160.0	3 354.9	4 381.9	–	–	–	61.2	77.9	307.5
Pinus nigra	636.0	13 463.8	15 992.7	55.6	78.9	151.7	20 373.5	38 592.5	38 611.9
Pinus pinaster	2 923.0	2 922.0	2 905.0	5.6	58.4	58.4	1 505.9	5 730.6	7 198.3
Pinus pinea	589.0	904.0	893.0	9.1	9.1	9.1	1 496.6	4 214.8	5 841.5
Pinus sylvestris	27 826.31	77 990.03	120 858.38	1 608.06	2 443.40	2 673.54	63 132.50	77 189.29	69 536.17
Populus alba	–	43.0	64.6	2.3	2.1	12.1	33.5	32.0	58.8
Populus nigra	637.0	683.5	725.2	3.1	115.3	117.6	5.0	105.7	88.1
Populus tremula	297.90	1 010.65	1 495.68	3.20	4.46	31.16	220.03	183.85	164.04
Prunus avium	2 328.6	2 395.5	2 618.0	2.8	25.4	65.1	315.9	643.7	830.7
Pyrus pyraster	0.2	8.6	14.1	–	6.4	6.7	5.0	14.9	62.9
Quercus cerris	2 391.7	4 958.5	4 868.3	–	–	–	2 451.4	3 143.3	3 072.1
Quercus frainetto	38.0	5 017.2	5 123.7	–	–	2.5	4 770.2	5 078.4	5 031.5
Quercus ilex	2 542.0	2 608.0	2 567.0	–	–	–	–	1 855.9	3 437.8
Quercus petraea	15 177.2	32 207.7	32 839.0	50.0	42.7	70.6	40 609.2	41 450.5	46 982.1
Quercus pubescens	2 993.0	3 332.0	3 377.8	3.6	4.7	1.1	41.7	57.5	43.9
Quercus robur	20 471.62	23 939.91	25 195.52	90.2	480.53	792.50	18 049.92	19 186.20	19 944.23
Quercus suber	–	–	–	–	48.8	48.8	10.7	16 480.9	19 656.0
Sorbus aucuparia	31.0	254.7	915.7	4.3	6.1	7.1	14.7	31.2	56.1
Sorbus domestica	–	2.1	2.1	0.2	2.8	10.1	–	4.7	14.7
Sorbus torminalis	1 867.2	1 876.2	1 972.7	0.8	9.9	26.1	63.2	35.0	44.4
Taxus baccata	132.4	218.5	292.1	2.0	49.9	18.1	0.0	12.3	45.5
Tilia cordata	6 215.81	6 533.49	7 003.61	1.7	13.0	28.3	743.17	1 047.89	1 605.24
Tilia platyphyllos	233.4	906.1	1 113.7	–	2.4	1.3	154.8	737.1	608.0
Ulmus glabra	3 080.0	3 071.9	3 244.9	11.4	17.3	24.1	9.5	78.4	151.9
Ulmus laevis	450.0	517.2	514.3	3.8	11.3	22.7	0.7	7.7	8.3

Table A23. Genetic resources, 1990–2005

Country	Area managed for *in situ* gene conservation			Area managed for *ex situ* gene conservation			Area managed for seed production		
	Reference year			Reference year			Reference year		
	1990	2000	2005	1990	2000	2005	1990	2000	2005
	ha	ha	ha	ha	ha	ha	ha	ha	ha
Albania	–	–	–	–	–	–	–	–	–
Andorra	–	–	–	–	–	–	–	–	–
Austria	1693,7	14364,3	14416,5	16,8	93,7	95,4	–	–	7175,0
Belarus	5248,3	5248,3	6086,3	1021,6	1823,6	1796,4	1434,4	2301,8	2101,3
Belgium	1003,9	1448,1	1700,3	65,6	88,8	119,2	1407,2	3579,0	3876,4
Bosnia and Herzegovina	3559,8	–	4942,0	11,0	–	11,8	1766,1	–	3233,7
Bulgaria	–	131744,2	145105,2	161,6	514,5	540,0	50035,7	52840,4	51267,0
Croatia	5162,0	5274,6	4977,0	75,7	80,7	80,7	22,6	27,1	74,6
Cyprus	250,0	5445,0	5445,0	–	–	3,0	19,0	19,0	19,0
Czech Republic	106001,7	106001,7	106001,7	338,9	357,9	357,9	149000,0	137361,5	111794,4
Denmark	–	–	4650,5	–	–	–	–	–	1632,5
Estonia	3551,0	3224,0	3195,0	222,0	256,2	227,6	–	–	2546,0
Finland	0,0	7030,0	6941,9	0,0	6,3	7,4	3041,1	2830,8	2824,5
France	–	9762,0	10228,0	–	28,0	32,0	75408,9	66254,1	60695,8
Georgia	–	–	–	–	–	–	–	–	–
Germany	1891,2	11093,3	12618,9	268,2	1112,7	1123,9	102,7	801,5	625,0
Greece	30797,0	30797,0	30797,0	2,7	3,6	6,7	–	–	7532,9
Holy See									
Hungary	–	–	2289,2	27,0	57,9	91,4	3773,9	4400,4	4359,0
Iceland	0,0	0,0	0,0	0,0	14,0	14,0	0,0	9,0	10,0
Ireland	–	–	–	25,4	29,7	29,7	2282,0	–	3828,6
Italy	92914,0	92914,0	92914,0	49,6	34,0	34,0	13,0	13,6	13,6
Latvia	4950,0	5565,0	4883,0	238,0	328,0	438,0	7583,0	7452,0	7067,0
Liechtenstein	–	–	1278,9	–	–	–	–	51,0	51,0
Lithuania	3081,6	3144,8	4650,7	25,0	35,9	35,5	1310,6	1450,7	1992,4
Luxembourg	0,0	0,0	0,0	0,0	0,0	6,0	106,9	–	144,2
Malta	–	–	–	–	–	–	–	–	–
Monaco	–	–	–	–	–	–	–	–	–
Montenegro	–	–	–	–	–	–	–	–	–
Netherlands	0,0	0,0	0,0	–	5,2	12,6	28,6	47,5	47,0
Norway	20,2	48,1	48,1	–	78,1	78,1	207,1	217,1	217,1
Poland	0,0	4737,0	5258,0	0,0	45,0	584,0	13331,0	16028,0	17086,0
Portugal	0,0	0,0	0,0	0,0	91,8	104,8	–	23855,0	25294,3
Republic of Moldova	–	1991,9	1991,9	–	25,7	25,7	–	31,1	31,1
Romania	–	10702,5	12150,9	114,8	129,7	135,4	59058,7	59058,7	59775,7
Russian Federation*	26621,5	25927,6	91623,0	1,0	17,9	241,0	153,7	1970,2	1201,9
Serbia	–	–	78419,2	13,0	16,5	16,5	–	2060,3	1902,0
Slovakia	–	9631,3	21540,7	232,1	381,5	373,5	51860,0	59072,9	60388,4
Slovenia	0,0	0,0	0,0	0,0	0,0	0,0	2399,0	2295,7	3567,2
Spain	0,0	0,0	320,0	0,0	10,0	52,0	0,0	33560,4	29642,4
Sweden	520,0	520,0	520,0	0,0	26,0	26,0	0,0	4054,0	4054,0
Switzerland	–	–	1464,0	–	–	–	–	2270,6	2680,6
The former Yugoslav Republic of Macedonia	–	–	–	–	–	–	–	–	–
Turkey	–	20387,3	27477,2	24,7	27,7	38,4	35916,6	45377,4	46219,3
Ukraine	29075,4	30363,7	26566,2	121,6	397,6	397,6	1445,7	1490,1	1490,1
United Kingdom	–	17882,0	17882,0	177,9	249,9	256,0	2372,1	2621,2	2245,6

* Data received only for the Komi, Arkhangelsk, Karelia and Vologda Regions

Source:
European Forest Genetic Resources Programme,
Bioversity International