



Food and Agriculture
Organization of the
United Nations

Global Forest Resources Assessment 2020

Report

Netherlands

Rome, 2020



FAO has been monitoring the world's forests at 5 to 10 year intervals since 1946. The Global Forest Resources Assessments (FRA) are now produced every five years in an attempt to provide a consistent approach to describing the world's forests and how they are changing. The FRA is a country-driven process and the assessments are based on reports prepared by officially nominated National Correspondents. If a report is not available, the FRA Secretariat prepares a desk study using earlier reports, existing information and/or remote sensing based analysis.

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Introduction

Report preparation and contact persons

The present report was prepared by the following person(s)

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Introductory text

Place an introductory text on the content of this report

1 Forest extent, characteristics and changes

1a Extent of forest and other wooded land

National data

Data sources

1982	References	CBS, 1985, De nederlandse bosstatistiek. Deel 1 de oppervlakte bos, 1980-1983
	Methods used	National Forest Inventory
	Additional comments	Results of the 4th National forest inventory that ran between 1980 and 1985.
2000	References	Dirkse, G.M., W.P. Daamen, C. Schuiling, 2001, Toelichting bossenkaart
	Methods used	Full-cover forest/vegetation maps
	Additional comments	In the year 2000 a national forest map is constructed as part of a new national forest inventory system (Meetnet functievervulling bos).
2006	References	Schelhaas,, M.J., A.P.P.M. Clerkx, W.P. Daamen, J.F. Oldenburger, G. Velema, P. Schnitger, H. Schoonderwoerd & H. Kramer, 2014. Zesde Nederlandse Bosinventarisatie; Methoden en basisresultaten
	Methods used	Other (specify in comments)
	Additional comments	This LULUCF 2009 map is based on the so called BasiskaartNatuur (Kramer, 2007). The BasiskaartNatuur is constructed by using the digital topographical map of the Netherlands (TOP10NL). This topographical map is based on aerial photographs from the period 2004-2008.
2010	References	Kramer, H. & J. Clement, 2015, Basiskaart Natuur 2013; een landsdekkend basisbestand voor de terrestrische natuur in Nederland
	Methods used	Other (specify in comments)
	Additional comments	The BasiskaartNatuur 2013 is constructed by using the digital topographical map of the Netherlands (TOP10NL). This topographical map is based on aerial photographs from the period 2009-2011.
2015	References	Kramer, H. & J. Clement, 2018, Basiskaart Natuur 2017; een landsdekkend basisbestand voor de terrestrische natuur in Nederland
	Methods used	Other (specify in comments)
	Additional comments	The BasiskaartNatuur 2017 is constructed by using the digital topographical map of the Netherlands (TOP10NL). This topographical map is based on aerial photographs from the period 2014-2016.

Classifications and definitions

1982	National class	Definition
	Forest	The definition for forest land in the FRA differs from the definition used in the National Forest area surveys in the Netherlands. Within the FRA land is considered forest at 10 per cent coverage, in national surveys this is 20 per cent coverage. However, no corrections in the national survey figures are made, because the forest area with coverage of 10-20 per cent is negligible in the Netherlands. In the Netherlands the area that fit to the FAO definition of 'other wooded land' is not registered as such. Some of the area other wooded land might be included in the forest area, but the percentage other wooded land of the total forest area is negligible.

2000	National class	Definition
	Forest	The definition for forest land in the FRA differs from the definition used in the National Forest area surveys in the Netherlands. Within the FRA land is considered forest at 10 per cent coverage, in national surveys this is 20 per cent coverage. However, no corrections in the national survey figures are made, because the forest area with coverage of 10-20 per cent is negligible in the Netherlands. In the Netherlands the area that fit to the FAO definition of 'other wooded land' is not registered as such. Some of the area other wooded land might be included in the forest area, but the percentage other wooded land of the total forest area is negligible.

2006	National class	Definition
	Forest	The definition for forest land in the FRA differs from the definition used in the National Forest area surveys in the Netherlands. Within the FRA land is considered forest at 10 per cent coverage, in national surveys this is 20 per cent coverage. However, no corrections in the national survey figures are made, because the forest area with coverage of 10-20 per cent is negligible in the Netherlands. In the Netherlands the area that fit to the FAO definition of 'other wooded land' is not registered as such. Some of the area other wooded land might be included in the forest area, but the percentage other wooded land of the total forest area is negligible.

2010	National class	Definition
	Forest	The definition for forest land in the FRA differs from the definition used in the National Forest area surveys in the Netherlands. Within the FRA land is considered forest at 10 per cent coverage, in national surveys this is 20 per cent coverage. However, no corrections in the national survey figures are made, because the forest area with coverage of 10-20 per cent is negligible in the Netherlands. In the Netherlands the area that fit to the FAO definition of 'other wooded land' is not registered as such. Some of the area other wooded land might be included in the forest area, but the percentage other wooded land of the total forest area is negligible.

2015	National class	Definition
	Forest	The definition for forest land in the FRA differs from the definition used in the National Forest area surveys in the Netherlands. Within the FRA land is considered forest at 10 per cent coverage, in national surveys this is 20 per cent coverage. However, no corrections in the national survey figures are made, because the forest area with coverage of 10-20 per cent is negligible in the Netherlands. In the Netherlands the area that fit to the FAO definition of 'other wooded land' is not registered as such. Some of the area other wooded land might be included in the forest area, but the percentage other wooded land of the total forest area is negligible.

Original data and reclassification

1982	Classifications and definitions		FRA classes		
	Class	Area (1000 ha)	Forest	Other wooded land	Other land

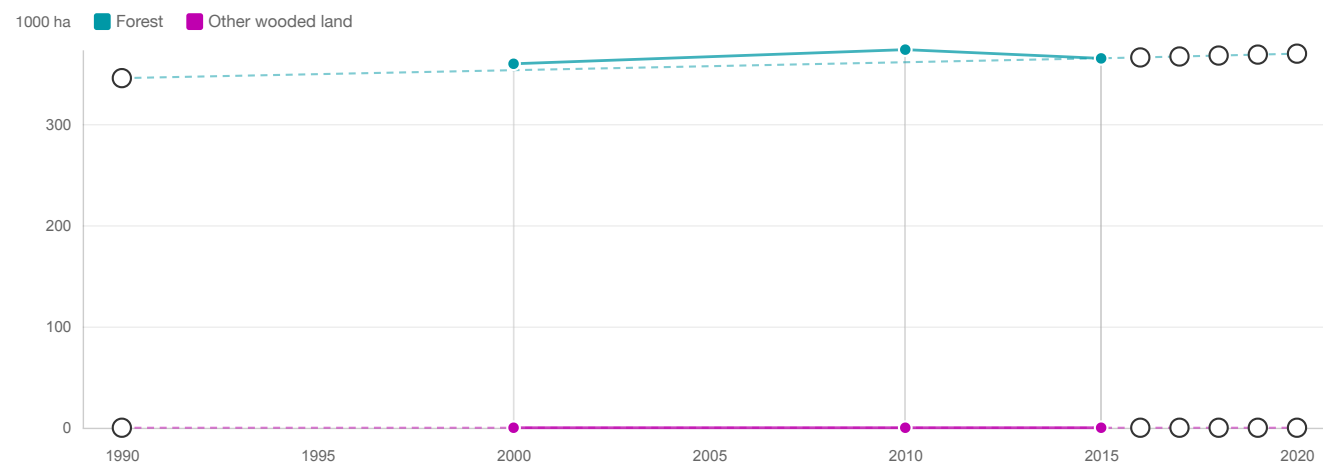
	Forest	334.00	100.00 %	0.00 %	0.00 %
	Total	334.00	334.00	0.00	0.00

2000	Classifications and definitions		FRA classes		
	Class	Area (1000 ha)	Forest	Other wooded land	Other land
	Forest	359.50	100.00 %	0.00 %	0.00 %
	Total	359.50	359.50	0.00	0.00

2006	Classifications and definitions		FRA classes		
	Class	Area (1000 ha)	Forest	Other wooded land	Other land
	Forest	373.48	100.00 %	0.00 %	0.00 %
	Total	373.48	373.48	0.00	0.00

2010	Classifications and definitions		FRA classes		
	Class	Area (1000 ha)	Forest	Other wooded land	Other land
	Forest	373.48	100.00 %	0.00 %	0.00 %
	Total	373.48	373.48	0.00	0.00

2015	Classifications and definitions		FRA classes		
	Class	Area (1000 ha)	Forest	Other wooded land	Other land
	Forest	364.83	100.00 %	0.00 %	0.00 %
	Total	364.83	364.83	0.00	0.00



FRA categories	Area (1000 ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Forest (a)	345.33	359.50	373.48	364.83	365.76	366.70	367.63	368.57	369.50
Other wooded land (a)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other land (c-a-b)	3 023.67	3 009.50	2 995.52	3 004.17	3 003.24	3 002.30	3 001.37	3 000.43	2 999.50
Total land area (c)	3 369.00	3 369.00	3 369.00	3 369.00	3 369.00	3 369.00	3 369.00	3 369.00	3 369.00

The FAOSTAT land area figure for the year 2015 is used for all reference years

Climatic domain	% of forest area 2015	Override value
Boreal	0.00	
Temperate	100.00	
Sub-tropical	0.00	
Tropical	0.00	

Comments

In 2017 a new study arose with a corrected national forest area for the Netherlands. This study showed a decline in Forest Area in the Netherlands in recent years as a consequence of transformation of forest into nature areas (heathercorridors, natural pastures, marches or waterbodies) in the light of Natura 2000. Besides this Natura 2000 development, temporary forests, planted in the late 80's and the beginning of the 90's, that were exempted from the reforestation law have been harvested in recent years.

This change in Forest Area (from 374.73 as reported in the 6th NFI, to 364.83) shows a very steep decline in forest area in the Netherlands. However it is likely that this deforestation has taken place in a gradual fashion over the last years instead of an instant decline during a few years.

Moreover, due to the new findings it seems likely that the old forest inventories and monitoring programs contain slight errors in the reported forest area; this resulted in an overestimated forest area. Currently there is an ongoing discussion wether and how to implement corrections.

They Forest Area in the years 2016-2020 have been generated according to an extrapolation based on linear interpolation between the years 1982 and 2015.

1b Forest characteristics

National Data

Data sources + type of data source eg NFI, etc

	Data Source	Variables	Year	Additional Comments
1	Schelhaas, M.J., A.P.P.M. Clerkx, W.P. Daamen, J. Oldenburger, G. Velema, P. Schnitger, H. Schoonderwoerd, H. Kramer, 2014. Zesde Nederlandse bosinventarisatie: Methodes en basisresultaten, Concept, versie 21 januari 2014, Alterra, Wageningen.	all	2013	the results of the 6th national forest inventory
2	Dirkse, G.M., W.P. Daamen, C. Schuiling, 2001, Toelichting bossenkaart, Alterra	all	2000	In the year 2000 a national forest map is constructed as part of a new national forest inventory system (Meetnet functievervulling bos).
3	Dirkse, G.M., W.P. Daamen, H. Schoonderwoerd, M. Japink, M. van Jole, R. van Moorsel, P. Schnitger, W. Stouthamer, M. Vocks, 2006. Meetnet Functievervulling bos 2001-2005, Vijfde Nederlandse Bosstatistiek, Directie Kennis, nr. DK065, Ministerie van Landbouw, natuur en Voedselkwaliteit, Directie Kennis, januari 2006	all	2001-2005	the results of the 5th national forest inventory
4	HOSP, 1994, Houtoogst in het Nederlandse bos 1988 tot 1992	all	1988-1992	N/A

National classification and definitions

	Defenitions	
1	Naturally Regenerating Forest	Forest predominantly composed of trees established through natural regeneration.
2	Planted Forest	Forest predominantly composed of trees established through planting and/or deliberate seeding.
3	Plantation Forest	Even-aged forest area consisting of a singular species, planted in rows
4	Introduced species	A species, subspecies or lower taxon occurring outside its natural range (past or present) and dispersal potential (i.e. outside the range it occupies naturally or could occupy without direct or indirect introduction or care by humans).

Original data

Data from 6th NFI (2015):

Origin	Number of Plots	Area
Planted	2619	297616,1
Root- and trunk storage	241	27288,65
Other	315	39925,22

Previous years are congruent with previous reporting of State of Europe's Forests 2015

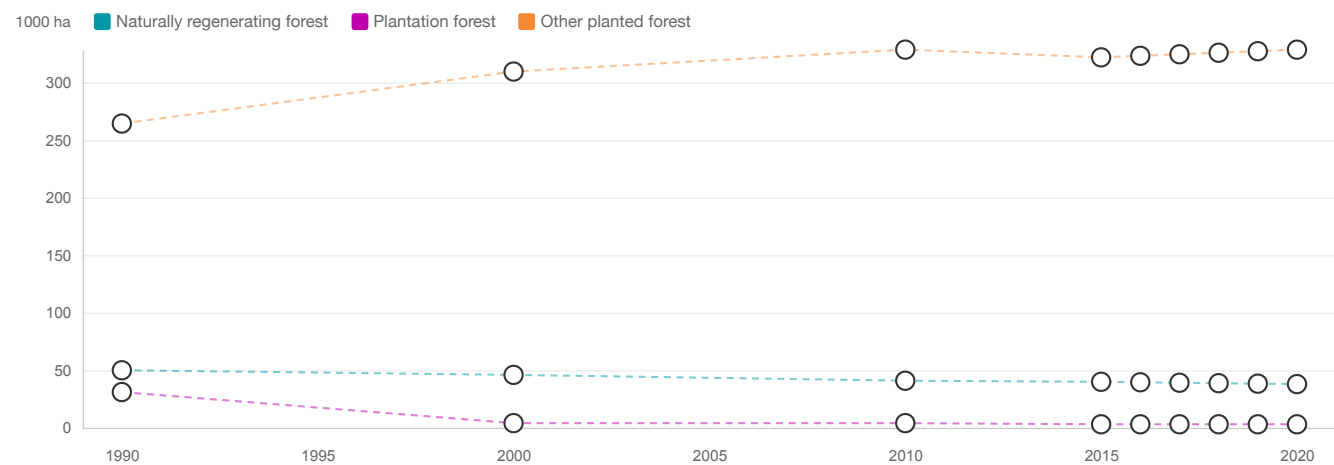
Analysis and processing of national data

Estimation and forecasting

Data available for the years 2000, 2010 and 2015. The remaining years have been calculated according to linear extrapolation.

Reclassification into FRA 2020 categories

The definition for forest land in the FRA differs from the definition used in the National Forest area surveys in the Netherlands. Within the FRA land is considered forest at 10 per cent coverage, in national surveys this is 20 per cent coverage. However, no corrections in the national survey figures are made, because the forest area with coverage of 10-20 per cent is negligible in the Netherlands



FRA categories	Forest area (1000 ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Naturally regenerating forest (a)	49.95	45.94	40.87	39.93	39.52	39.12	38.72	38.32	37.92
Planted forest (b)	295.38	313.56	332.61	324.90	326.24	327.58	328.91	330.25	331.58
Plantation forest	31.00	4.00	4.00	3.00	3.00	3.00	3.00	3.00	3.00
...of which introduced species	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other planted forest	264.38	309.56	328.61	321.90	323.24	324.58	325.91	327.25	328.58
Total (a+b)	345.33	359.50	373.48	364.83	365.76	366.70	367.63	368.57	369.50
Total forest area	345.33	359.50	373.48	364.83	365.76	366.70	367.63	368.57	369.50

Comments

The table above is congruent with 4.2 in the Pan-European report since both sections handle forest area by regeneration type, whereas 4.3 in the Pan-European report is revolved around naturalness. Forest area by regeneration type describes the way the forest area is regenerating in a certain moment of time whereas naturalness describes the establishment of the forest area, besides the regeneration, and furthermore has affiniation with the indigenousness of tree species. This affiniation with indigenousness is reflected by *Naturalised introduced species*; we consider these to be non-native tree species that have been introduced to the Netherlands and became common to the Dutch forest. Examples of these Naturalised introduced species are Douglas fir, Corsican pine, Norway spruce and Red oak.

In the Netherlands almost all forest is established through planting. As table 4.2 of the Pan-European report shows the Netherlands does not have any forest area that is *Undisturbed by man*. However a small amount of the forest area present does regenerate without planting and thus in a natural way. Hence in this table of the FRA report (and 4.2 in the Pan-European report), data from the NFI's that state that the forest is naturally regenerating has been implemented as *Naturally regenerating forest (a)*. The area of plantation forest (mainly Poplar) hasnt changed over recent years and hence isnt expect to change in the forthcoming years. All other forest is defined as *Other planted forest*.

1c Primary forest and special forest categories

National Data

Data sources + type of data source eg NFI, etc

Data Source	Year	Additional Comments
Schelhaas, M.J., A.P.P.M. Clerkx, W.P. Daamen, J. Oldenburger, G. Velema, P. Schnitger, H. Schoonderwoerd, H. Kramer, 2014. Zesde Nederlandse bosinventarisatie: Methodes en basisresultaten, Concept, versie 21 januari 2014, Alterra, Wageningen.	2013	the results of the 6th national forest inventory

National classification and definitions

Temporarily unstocked and/or recently regenerated	Forest area which is temporarily unstocked or with trees shorter than 1.3 meters that have not yet reached but are expected to reach a canopy cover of at least 10 percent and tree height of at least 5 meters.
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Original data

	NFI 6 (2015)	Updated (2015)
Largescale Clearcut	2,862	2,795715
Smallscale Clearcut	2,312	2,258453
Largescale Regeneration	2,972	2,903167
Smallscale Regeneration	3,412	3,332976
Totaal Temporarily Unstocked and/or recently Regenerated	11,558	11,29031

Analysis and processing of national data

Estimation and forecasting

The total area of Temporarily Unstocked and/or Recently Regenerated is known for the year 2015. This area was related to the Total Forest Area to gain a relative area of Temporarily Unstocked and/or Recently Regenerated. With this relative area, absolute areas for 2010 and 2020 were estimated. No accurate estimations could be provided for the years 1990 and 2000

Reclassification into FRA 2020 categories

The definition for forest land in the FRA differs from the definition used in the National Forest area surveys in the Netherlands. Within the FRA land is considered forest at 10 per cent coverage, in national surveys this is 20 per cent coverage. However, no corrections in the national survey figures are made, because the forest area with coverage of 10-20 per cent is negligible in the Netherlands

FRA categories	Area (1000 ha)				
	1990	2000	2010	2015	2020
Primary forest	0.00	0.00	0.00	0.00	0.00
Temporarily unstocked and/or recently regenerated			11.58	11.29	11.43
Bamboos	0.00	0.00	0.00	0.00	0.00
Mangroves	0.00	0.00	0.00	0.00	0.00
Rubber wood	0.00	0.00	0.00	0.00	0.00

Comments

Bamboos, Mangroves and Rubber wood not applicable in the Netherlands. Moreover, all the forest area in the Netherlands originated origionally from planting and/or seeding. Therefore the human influence defenitely plays its role throughout the Dutch forest area.Therefore, no forest area is considered to be Primary Forest.

The sixth National Forest Inventory is the first edition that reports regeneration. This reporting of regeneration, combined with clear-cut data allows for a detailed calculation of Temporarily unstocked and/or recently regenerated forest in recent and upcoming year. However, the years 1990 and 2000 are not reported due to insufficient data, knowledge and reliability.

1d Annual forest expansion, deforestation and net change

National Data

Data sources + type of data source eg NFI, etc

Schelhaas, M., Arest, E. & Kramer, H. (2017) *Het Nederlandse bos als bron van CO2*, Vakblad natuur bos landschap.

Study based on NFI's, and Land Use and Land Use Change maps combined with corrections based on areal photographs for recent years

National classification and definitions

Forest expansion	Expansion of forest on land that, until then, was not defined as forest.
Afforestation	Establishment of forest through planting and/or deliberate seeding on land that, until then, was not defined as forest.
Natural Expansion	Expansion of forests through natural succession on land that, until then, was under another land use (e.g. forest succession on land previously used for agriculture).
Deforestation	The conversion of forest to other land use or the longterm reduction of the tree canopy cover below the minimum 10 percent threshold.

Original data

	1990-2004	2005-2009	2009-2013	2013-2017	Corrected 2013-2017		Newly Calculated 2013-2017
Total Forest Expansion	35830	16006	15534	9383	6745		22279
Annual Forest Expansion	2559,286	4001,5	3883,5	2345,75	1686,25		2784,875

Analysis and processing of national data

Estimation and forecasting

Annual Forest Expansion in 2015-2020 has been calculated using the average value of the previous timeperiods

Reclassification into FRA 2020 categories

The definition for forest land in the FRA differs from the definition used in the National Forest area surveys in the Netherlands. Within the FRA land is considered forest at 10 per cent coverage, in national surveys this is 20 per cent coverage. However, no corrections in the national survey figures are made, because the forest area with coverage of 10-20 per cent is negligible in the Netherlands

FRA categories	Area (1000 ha/year)			
	1990-2000	2000-2010	2010-2015	2015-2020
Forest expansion (a)	2.56	4.00	2.79	3.12
...of which afforestation	2.56	4.00	2.79	3.12
...of which natural expansion	0.00	0.00	0.00	0.00
Deforestation (b)	1.14	2.60	4.52	2.19
Forest area net change (a-b)	1.42	1.40	-1.73	0.93

Comments

Forest Expansion and Deforestation are measured by combining topographical, and LULUCF maps of the Netherlands. These measurements are conducted at certain periods in time; 1990, 2004, 2009, 2013 and 2017. Given these set timeframes, comparison of landuse and hence monitoring landuse change is only possible between these years. This makes reporting the annual Forest expansion and Deforestation rather complex. Add the correction of Forest Area in 2015 to this and the complexity even increases. This mismatch in the timeframe of datagathering has lead to the decision only to report the forest expansion. The deforestation is therefore an automatic given, derived from deducting the forest area net change (prefilled, generated through Q1a) from the Forest Expansion.

The Forest Expansion of 2015-2020 has been generated by averaging the total forest expansion of previous timeperiods.

1e Annual reforestation

National Data

Data sources + type of data source eg NFI, etc

Data Source	Year	Additional Comments
Schelhaas, M.J., A.P.P.M. Clerkx, W.P. Daamen, J. Oldenburger, G. Velema, P. Schnitger, H. Schoonderwoerd, H. Kramer, 2014. Zesde Nederlandse bosinventarisatie: Methodes en basisresultaten, Concept, versie 21 januari 2014, Alterra, Wageningen.	2013	the results of the 6th national forest inventory
Dirkse, G.M., W.P. Daamen, C. Schuiling, 2001, Toelichting bossenkaart, Alterra	2000	In the year 2000 a national forest map is constructed as part of a new national forest inventory system (Meetnet functievervulling bos).
Dirkse, G.M., W.P. Daamen, H. Schoonderwoerd, M. Japink, M. van Jole, R. van Moorsel, P. Schnitger, W. Stouthamer, M. Vocks, 2006. Meetnet Functievervulling bos 2001-2005, Vijfde Nederlandse Bosstatistiek, Directie Kennis, nr. DK065, Ministerie van Landbouw, natuur en Voedselkwaliteit, Directie Kennis, januari 2006	2001-2005	the results of the 5th national forest inventory

National classification and definitions

Reforestation	Natural regeneration or re-establishment of forest through planting and/or deliberate seeding on land already in forest land use
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Original data

	NFI 6	Updated (2015)		NFI 5	Updated (2000)
Largescale Clearcuts	2,862	2,795715		1,1	1,252217
Smallscale Clearcuts	2,312	2,258453			
Total Clearcuts	5,174	5,054167			
Coppice	4,073	3,978667		5,7	6,488759
Totaal Reforestation	9,247	9,032834		6,8	7,740975
Total Forest Area	373,48	364,83		315,8	359,5

Analysis and processing of national data

Estimation and forecasting

The data concerning reforestation were known for the years 2000 and 2015 (NFI 5 and 6), other years have been extrapolated accordingly (based on their total forest area and growtrate of reforestation)

Reclassification into FRA 2020 categories

Reforestation is calculated as following:

Clearcuts that have been reforested + Origionally planted coppice areas

FRA categories	Area (1000 ha/year)			
	1990-2000	2000-2010	2010-2015	2015-2020
Reforestation	6.40	7.70	9.00	10.30

Comments

1f Other land with tree cover

National Data

Data sources + type of data source eg NFI, etc

Data Source	Year	Additional Comments
Herder et al. (2017) <i>Current extent and stratification of Agroforestry in the European Union</i> , Agriculture, Ecosystems and Environment, Vol. 241, pp. 121 - 132	2017	Estimation of Agroforestry based on LUCAS data. For the Netherlands it is probably an underestimation
Agrimatie - Section related to Wageningen University that monitors the agricultural sector in the Netherlands	2000-2015	Provided Data on Tree orchards in the Netherlands
Central Bureau for Statistics Netherlands - Landbouwtelling	2000-2015	Provided Data on Tree orchards in the Netherlands

National classification and definitions

Other land with Tree Cover	Land classified as “other land”, spanning more than 0.5 hectares with a canopy cover of more than 20 percent of trees able to reach a height of 5 meters at maturity
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Original data

	Agrimatie	Herder et al
2000 - Fruittrees Orchards	20,6	
2010 - Fruittrees Orchards	19,5	
2015 - Fruittrees Orchards	19,77	
Area of Agroforestry		27,8

Analysis and processing of national data

Estimation and forecasting

No Estimation and Forecasting has been used for the data prested beneath due to the large insecurity about the data present

Reclassification into FRA 2020 categories

Instead of the 10% of tree canopy cover as propesed by FRA 2020, The Netherlands use a canopy cover of 20% in their National Forest Inventories. Hence also for the definition of Other land with Tree cover, a canopy cover of 20% will be used.

FRA categories	Area (1000 ha)				
	1990	2000	2010	2015	2020
Palms (a)	0.00	0.00	0.00	0.00	0.00
Tree orchards (b)		20.60	19.50	19.77	21.55
Agroforestry (c)				27.80	
Trees in urban settings (d)					
Other (specify in comments) (e)					
Total (a+b+c+d+e)	0.00	20.60	19.50	47.57	21.55
Other land area	3 023.67	3 009.50	2 995.52	3 004.17	2 999.50

Comments

Within the National forest monitoring system, no such a factor as *other land with tree cover* is included. However, some specific indicators can be estimated according to other available sources. The area of Tree orchards for example has been provided by the Central Bureau of Statistics Netherlands. This area was later slightly nuanced by agrimatie, a section within the Wageningen University and Research that monitors the agricultural sector in the Netherlands. However, whether the area of tree orchards (mainly fruittree orchards) comply with the definition given by FRA 2020 for other land (larger then 0.5ha and tree able to grow up to 5 meters) is uncertain.

Monitoring and reporting of Agroforestry in the Netherlands is not present in the current methodology of land registration. This is to be explained by the fact that the essence of agroforestry revolves around a duality in landuse, which makes it quite complex to register. Therefore no national data on the area of Agroforestry is present. However a recent study Herder et al. (2017) attempted to inventory Agroforestry on a European scale. Using LUCAS data they estimated the total area of Agroforestry to be 27.8 (x1000) hectares. According to a Dutch expert on this subject, this is probably and underestimation, however this is the only estimation on the area of agroforestry available.

Finally, the area of Trees in Urban Settings as defined by FRA 2020 is not registered in the Netherlands, hence no area is reported for this parameter.

2 Forest growing stock, biomass and carbon

2a Growing stock

National Data

Data sources + type of data source eg NFI, etc

Data Source	Year	Additional Comment
HOSP, 1994, Houtoogst in het Nederlandse bos 1988 tot 1992	1988 - 1992	Growing Stock
Schoonderwoerd, H., W.P. Daamen, 2000, Kwantitatieve aspecten van het bos en bosbeheer in Nederland: Resultaten Houtoogststatistiek 1995-1999	1995 - 1999	Growing Stock
Dirkse, G.M., W.P. Daamen, H. Schoonderwoerd, M. Japink, M. van Jole, R. van Moorsel, P. Schnitger, W. Stouthamer, M. Vocks, 2006, Meetnet Functievervulling bos 2001-2005, Vijfde Nederlandse Bosstatistiek, Directie Kennis, nr. DK065, Ministerie van Landbouw, natuur en Voedselkwaliteit, Directie Kennis, januari 2006	2001 - 2005	Results of the 5th NFI
Daamen, W.P., 2002, Forest biomass stocks (IPCC), Stichting Bosdata	1990 - 2000	Above- and Belowground Biomass
Schelhaas, M.J., A.P.P.M. Clerkx, W.P. Daamen, J. Oldenburger, G. Velema, P. Schnitger, H. Schoonderwoerd, H. Kramer, 2014. Zesde Nederlandse bosinventarisatie: Methodes en basisresultaten, Concept, versie 21 januari 2014, Alterra, Wageningen, 102 p	2012 - 2013	Results of the 6th NFI
Nabuurs, G.J., I.J. van den Wyngaert, W.D. Daamen, A.T.F. Helmink, W. de Groot, W.C. Knol, H. Kramer, P. Kuikman, 2005. National System of Greenhouse Gas Reporting for Forest and Nature Areas under UNFCCC in The Netherlands. Wageningen, Alterra, Alterra-report 1035.1. 57 p.	2005 - 2010	Data on Carbon in above- and below ground biomass
Lesschen, JP., Heesmans, H., Mol-Dijkstra, J., Doorn van, A., Verkaik, E., Wyngaerd van den, I. & Kuikman, P. (2012) Mogelijkheden voor koolstofvastlegging in de Nederlandse landbouw en natuur, Alterra-rapport 2396, ISSN 1566-7197	2012	Data on soil and litter Carbon

National classification and definitions

Growing Stock	Volume over bark of all living trees with a minimum diameter of 5 cm at breast height. Includes the stem from ground level up to a top diameter of 0 cm, excluding branches.
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Original data

	Growing Stock
1990	52,4
2000	61,1
2005	71,07
2015	79,02

Analysis and processing of national data

Estimation and forecasting

2016-2020 Growing stock values have been estimated based on the linear increase of standing volume between 2000 and 2015, combined with the increasing total forest area.

Reclassification into FRA 2020 categories

Based on the definition of the Dutch Growing Stock, congruent with the Dutch NFI's, Growing stock is defined as all trees with a minimal diameter of 5cm dbh. The FRA definition states trees with at least a dbh of 10cm

FRA categories	Growing stock m³/ha (over bark)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Naturally regenerating forest	151.75	170.00	203.57	216.63	218.12	219.58	221.07	222.60	223.89
Planted forest	151.70	169.95	203.48	216.59	218.06	219.52	221.00	222.47	223.93
...of which plantation forest	151.61	170.00	202.50	216.67	216.67	220.00	220.00	223.33	223.33
...of which other planted forest	151.71	169.95	203.49	216.59	218.07	219.55	221.01	222.46	223.93
Forest	151.71	169.96	203.49	216.59	218.07	219.53	221.01	222.45	223.92
Other wooded land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

FRA categories	Total growing stock (million m³ over bark)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Naturally regenerating forest	7.58	7.81	8.32	8.65	8.62	8.59	8.56	8.53	8.49
Planted forest	44.81	53.29	67.68	70.37	71.14	71.91	72.69	73.47	74.25
...of which plantation forest	4.70	0.68	0.81	0.65	0.65	0.66	0.66	0.67	0.67
...of which other planted forest	40.11	52.61	66.87	69.72	70.49	71.26	72.03	72.80	73.58
Forest	52.39	61.10	76.00	79.02	79.76	80.50	81.25	81.99	82.74
Other wooded land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Comments

Growing stock has been based on available NFI data concerning the standing volume combined with the total forest area. The 5th NFI (2000) gave a standing volume of 194.7, compared to a standing volume in 2015 (6th NFI) of 216.6. This increase in standing volume has been extrapolated to the years 2016-2020. The total standing volume multiplied by the total forest area results in the Total Growing Stock.

2b Growing stock composition

National Data

Data sources + type of data source eg NFI, etc

HOSP, 1994, Houtoogst in het Nederlandse bos 1988 tot 1992	1988 - 1992	Growing Stock
Schoonderwoerd, H., W.P. Daamen, 2000, Kwantitatieve aspecten van het bos en bosbeheer in Nederland: Resultaten Houtoogststatistiek 1995-1999	1995 - 1999	Growing Stock
Dirkse, G.M., W.P. Daamen, H. Schoonderwoerd, M. Japink, M. van Jole, R. van Moorsel, P. Schnitger, W. Stouthamer, M. Vocks, 2006, Meetnet Functievervulling bos 2001-2005, Vijfde Nederlandse Bosstatistiek, Directie Kennis, nr. DK065, Ministerie van Landbouw, natuur en Voedselkwaliteit, Directie Kennis, januari 2006	2001 - 2005	Results of the 5th NFI
Daamen, W.P., 2002, Forest biomass stocks (IPCC), Stichting Bosdata	1990 - 2000	Above- and Belowground Biomass
Schelhaas, M.J., A.P.P.M. Clerkx, W.P. Daamen, J. Oldenburger, G. Velema, P. Schnitger, H. Schoonderwoerd, H. Kramer, 2014. Zesde Nederlandse bosinventarisatie: Methodes en basisresultaten, Concept, versie 21 januari 2014, Alterra, Wageningen, 102 p	2012 - 2013	Results of the 6th NFI

National classification and definitions

Native Tree Species	A tree species occurring within its natural range (past or present) and dispersal potential (i.e. within the range it occupies naturally or could occupy without direct or indirect introduction or care by humans).
Introduced Tree Species	A tree species occurring outside its natural range (past or present) and dispersal potential (i.e. outside the range it occupies naturally or could occupy without direct or indirect introduction or care by humans).

Original data

Scientific Name	Common Name	Introduced	Volume 2015	2015%	Volume 2000	2000%
Pinus sylvestris	Scots Pine	0	18,52293	0,234408	15,6424	0,256013
Quercus Robur	European Oak	0	15,244	0,192913	11,43575	0,187165
Fagus Sylvatica	Beech	0	8,15977	0,103262	4,948701	0,080993
Pseudotsuga menzii	Douglas fir	1	7,973577	0,100906	6,04117	0,098873
Lariks kaempferi	Japanese Lariks	1	4,430467	0,056068	4,195314	0,068663
Quercus Rubra	Red Oak	1	4,101205	0,051901	2,843984	0,046546
Populus	Poplar	0	3,463978	0,043837	3,783024	0,061915
Betula sp	Birch	0	3,202521	0,040528	2,468258	0,040397
Picea abies	Norway spruce	1	2,925271	0,037019	2,330287	0,038139
Pinus nigra corsicana	Black pine	1	2,468748	0,031242	1,853727	0,030339
Fraxinus exelcior	Ash	0	1,44547	0,018292	0,891815	0,014596
Salix sp	Williw sp	0	1,07779	0,013639	0,645152	0,010559
Pinus Nigra nigra	Austrian Pine	1	0,752125	0,009518	0,66038	0,010808
Alnus glutinosa	Common alder	0	0,734372	0,009293	0,53888	0,00882
Acer sp	Maple sp	0	0,628276	0,007951	0,525464	0,0086
Castanea sp	Chestnut	0	0,413778	0,005236	0,313719	0,005135

Abies grandis	Grand fir	1	0,379223	0,004799	0,280256	0,004587
Picea sitchensis	Sitka spruce	1	0,310561	0,00393	0,259609	0,004249

Analysis and processing of national data

Estimation and forecasting

The Growing stock composition of 2020 has been estimated based on the trend (in- or decrease) of tree species' growing stock in the period 2000 (5th NFI) and 2015 (6th NFI). This has been related to the total estimated growing stock (2a) to get to a total value of growing stock per species. 2010 is the result of linear interpolation between 2000 and 2015. And the values in 1990 have been extracted from data and inventories where possible.

Reclassification into FRA 2020 categories

Small Reclassification compared to FRA 2015 was made based on more accurate data

FRA categories	Scientific name	Common name	Growing stock in forest (million m³ over bark)				
			1990	2000	2010	2015	2020
Native tree species							
#1 Ranked in terms of volume	Pinus sylvestris	Scots Pine	17.29	15.64	18.36	18.52	18.80
#2 Ranked in terms of volume	Quercus Robur	European Oak	7.33	11.44	14.16	15.24	16.12
#3 Ranked in terms of volume	Fagus Sylvatica	Beech	3.67	4.95	7.28	8.16	9.16
#4 Ranked in terms of volume	Populus	Poplar	0.79	3.78	3.79	3.46	3.13
#5 Ranked in terms of volume	Betula sp	Birch	2.62	2.47	3.08	3.20	3.36
#6 Ranked in terms of volume	Fraxinus exelcior	Ash	1.05	0.89	1.30	1.45	1.62
#7 Ranked in terms of volume	Salix sp	Williw sp	0.79	0.65	0.96	1.08	1.21
#8 Ranked in terms of volume	Alnus glutinosa	Common alder	1.57	0.54	0.69	0.73	0.78
#9 Ranked in terms of volume	Acer sp	Maple sp	0.52	0.53	0.62	0.63	0.64
#10 Ranked in terms of volume	Castanea sp	Chestnut		0.31	0.40	0.41	0.44
Remaining native tree species				0.50	1.30	1.70	2.14
Total volume of native tree species			35.63	41.70	51.94	54.58	57.40
Introduced tree species							
#1 Ranked in terms of volume	Pseudotsuga menzii	Douglas fir	3.14	6.04	7.62	7.97	8.40
#2 Ranked in terms of volume	Lariks kaempferi	Japanese Larch	4.19	4.20	4.58	4.43	4.29
#3 Ranked in terms of volume	Quercus Rubra	Red Oak	2.62	2.84	3.81	4.10	4.44
#4 Ranked in terms of volume	Picea abies	Norway spruce	2.62	2.33	2.84	2.93	3.03
#5 Ranked in terms of volume	Pinus nigra corsicana	Black pine		1.85	2.35	2.47	2.61

FRA categories	Scientific name	Common name	Growing stock in forest (million m³ over bark)				
			1990	2000	2010	2015	2020
Native tree species							
Remaining introduced tree species			4.19	2.14	2.51	2.53	2.57
Total volume of introduced tree species			16.76	19.40	23.71	24.43	25.34
Total growing stock			52.39	61.10	75.65	79.01	82.74

Comments

Based on available data NFI's. 2015 (6th National Forest Inventory) has been selected as a base year. Based on the data of the Meetnet Functie Vervulling (2000) and the 6th NFI (2015) concerning the species composition, a trend (of relative in- or decrease) per species has been established. Based on this trend combined with the Total Growing Stock a Growing Stock Composition has been presented. Growing stock composition in the year 1990 is based on the HOSP 1988-1992 using relative abundance, multiplied by the calculated total growing stock.

2c Biomass stock

National Data

Data sources + type of data source eg NFI, etc

HOSP, 1994, Houtoogst in het Nederlandse bos 1988 tot 1992	1988 - 1992	Growing Stock
Schoonderwoerd, H., W.P. Daamen, 2000, Kwantitatieve aspecten van het bos en bosbeheer in Nederland: Resultaten Houtoogststatistiek 1995-1999	1995 - 1999	Growing Stock
Dirkse, G.M., W.P. Daamen, H. Schoonderwoerd, M. Japink, M. van Jole, R. van Moorsel, P. Schnitger, W. Stouthamer, M. Vocks, 2006, Meetnet Functievervulling bos 2001-2005, Vijfde Nederlandse Bosstatistiek, Directie Kennis, nr. DK065, Ministerie van Landbouw, natuur en Voedselkwaliteit, Directie Kennis, januari 2006	2001 - 2005	Results of the 5th NFI
Daamen, W.P., 2002, Forest biomass stocks (IPCC), Stichting Bosdata	1990 - 2000	Above- and Belowground Biomass
Schelhaas, M.J., A.P.P.M. Clerkx, W.P. Daamen, J. Oldenburger, G. Velema, P. Schnitger, H. Schoonderwoerd, H. Kramer, 2014. Zesde Nederlandse bosinventarisatie: Methodes en basisresultaten, Concept, versie 21 januari 2014, Alterra, Wageningen, 102 p	2012 - 2013	Results of the 6th NFI
Nabuurs, G.J., I.J. van den Wyngaert, W.D. Daamen, A.T.F. Helmink, W. de Groot, W.C. Knol, H. Kramer, P. Kuikman, 2005. National System of Greenhouse Gas Reporting for Forest and Nature Areas under UNFCCC in The Netherlands. Wageningen, Alterra, Alterra-report 1035.1. 57 p.	2005 - 2010	Data on Carbon in above- and below ground biomass
Lesschen, JP., Heesmans, H., Mol-Dijkstra, J., Doorn van, A., Verkaik, E., Wyngaerd van den, I. & Kuikman, P. (2012) Mogelijkheden voor koolstofvastlegging in de Nederlandse landbouw en natuur, Alterra-rapport 2396, ISSN 1566-7197	2012	Data on soil and litter Carbon

National classification and definitions

Above-ground Biomass	All living biomass above the soil including stem stump branches bark seeds and foliage.
Below-Groun Biomass	All biomass of live roots. Fine roots of less than 2 mm diameter are excluded because these often cannot be distinguished empirically from soil organic matter or litter.
Dead Wood	All non-living woody biomass not contained in the litter either standing lying on the ground or in the soil. Dead wood includes wood lying on the surface dead roots and stumps larger than or equal to 5 cm in diameter

Original data

	Above-Ground Biomass	Below-Ground Biomass	Dead Wood
1990	34,06	6,85	0,94
2000	40,07	8,06	1,29
2005	46,84	9,42	2,82
2015	52,65	10,58	3,85

Analysis and processing of national data

Estimation and forecasting

Data for 2010 and 2020 were generated based on extrapolation between 2005 and 2015. This extrapolation has been performed using observed trends in standing volume, composition of broadleaved and coniferous species and the amount of dead wood (both standing and lying). With this detailed extrapolation values could also be generated for the years 2016-2019 based on the values for 2015 and 2020, on the bases of linear interpolation.

1990 values based on data extraploated from HOSP-source, with similar calculations compared to 2010 and 2015

Reclassification into FRA 2020 categories

no reclassification was needed

FRA categories	Forest biomass (tonnes/ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Above-ground biomass	34.00	40.00	48.00	52.65	53.14	53.63	54.13	54.63	55.13
Below-ground biomass	7.00	8.00	10.00	10.58	10.68	10.78	10.88	10.98	11.08
Dead wood	1.00	1.00	3.00	3.85	3.96	4.07	4.18	4.29	4.41

Comments

The Biomass Stock has been calculated according to the data available in the NFI's. The Total Growing Stock (2a) forms the basis for this calculation. For each year the Total Growing Stock has been divided in coniferous and broadleaved species, according to their composition in the year at hand. To convert the Growing Stock into Biomass Stock a conversion factor has been used (0.494 and 0.614 for coniferous and broadleaved respectively). This results into a (living) Biomass Stock contained in the trunks of trees. Another set of conversion factors allows for the calculation of the Total (living) Above-Ground Biomass (1.2) and Below-Ground Biomass (0,20104875).

The Biomass in Dead Wood has been calculated separately for Standing- and Lying Dead Wood. Before the 5th NFI (2005) an assumption was made based on Woodstock and SYHI of a Total Volume Lying Dead Wood of 1% of the total Growing Stock. Standing Dead Wood has been monitored in this period. For the years 2005 and 2015 (NFI 5 & 6) the volume of Lying- and Standing Dead Wood has been inventoried. We observe an increase in volume of dead wood as a consequence of policy (stimulating biodiversity) in this period. Based on these two years, 2010 and 2020 could be extrapolated.

2d Carbon stock

National Data

Data sources + type of data source eg NFI, etc

HOSP, 1994, Houtoogst in het Nederlandse bos 1988 tot 1992	1988 - 1992	Growing Stock
Schoonderwoerd, H., W.P. Daamen, 2000, Kwantitatieve aspecten van het bos en bosbeheer in Nederland: Resultaten Houtoogststatistiek 1995-1999	1995 - 1999	Growing Stock
Dirkse, G.M., W.P. Daamen, H. Schoonderwoerd, M. Japink, M. van Jole, R. van Moorsel, P. Schnitger, W. Stouthamer, M. Vocks, 2006, Meetnet Functievervulling bos 2001-2005, Vijfde Nederlandse Bosstatistiek, Directie Kennis, nr. DK065, Ministerie van Landbouw, natuur en Voedselkwaliteit, Directie Kennis, januari 2006	2001 - 2005	Results of the 5th NFI
Daamen, W.P., 2002, Forest biomass stocks (IPCC), Stichting Bosdata	1990 - 2000	Above- and Belowground Biomass
Schelhaas, M.J., A.P.P.M. Clerkx, W.P. Daamen, J. Oldenburger, G. Velema, P. Schnitger, H. Schoonderwoerd, H. Kramer, 2014. Zesde Nederlandse bosinventarisatie: Methodes en basisresultaten, Concept, versie 21 januari 2014, Alterra, Wageningen, 102 p	2012 - 2013	Results of the 6th NFI
Nabuurs, G.J., I.J. van den Wyngaert, W.D. Daamen, A.T.F. Helmink, W. de Groot, W.C. Knol, H. Kramer, P. Kuikman, 2005. National System of Greenhouse Gas Reporting for Forest and Nature Areas under UNFCCC in The Netherlands. Wageningen, Alterra, Alterra-report 1035.1. 57 p.	2005 - 2010	Data on Carbon in above- and below ground biomass
Lesschen, JP., Heesmans, H., Mol-Dijkstra, J., Doorn van, A., Verkaik, E., Wyngaerd van den, I. & Kuikman, P. (2012) Mogelijkheden voor koolstofvastlegging in de Nederlandse landbouw en natuur, Alterra-rapport 2396, ISSN 1566-7197	2012	Data on soil and litter Carbon

National classification and definitions

Carbon in above-ground biomass	Carbon in all living biomass above the soil including stem stump branches bark seeds and foliage.
Carbon in below-ground biomass	Carbon in all biomass of live roots. Fine roots of less than 2 mm diameter are excluded because these often cannot be distinguished empirically from soil organic matter or litter.
Carbon in dead wood	Carbon in all non-living woody biomass not contained in the litter, either standing, lying on the ground. Dead wood includes wood lying on the surfaceand stumps larger than or equal to 5 cm in diameter.
Carbon in Litter	Carbon in all non-living biomass with a diameter less than the minimum diameter for dead wood lying dead in various states of decomposition above the mineral or organic soil.
Soil carbon	Organic carbon in mineral and organic soils (including peat) to a soil depth of 30 cm.

Original data

	Above-Ground Carbon	Below-Ground Carbon	Dead Wood Carbon	Litter Carbon	Soil Carbon
2015	26,32	5,29	1,93	12,14	35,02
2005	21,00	4,20	1,40	9,00	40,00
2000	20,00	4,00	0,60	9,00	39,00
1990	17,10	3,40	0,50	9,00	37,00

Analysis and processing of national data

Estimation and forecasting

Based on the new insight in data in 2015, values for soil and litter carbon 2016-2020 have been extrapolated based on the total forest area combined with te new sources concerning these parameters.

Carbon values in above- and below-ground biomass and dead wood have been calculated using set conversionfactors on the calculated biomass stock (2c)

Reclassification into FRA 2020 categories

2015 has been slightly reclassified compared to FRA 2015, due to more recent and accurate data

FRA categories	Forest carbon (tonnes/ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Carbon in above-ground biomass	17.10	20.00	24.10	26.32	26.57	26.82	27.06	27.31	27.56
Carbon in below-ground biomass	3.40	4.00	4.80	5.29	5.34	5.39	5.44	5.49	5.54
Carbon in dead wood	0.50	0.60	1.70	1.93	1.98	2.04	2.09	2.15	2.20
Carbon in litter	9.00	9.00	9.00	12.14	2.17	12.20	12.23	12.26	12.29
Soil carbon	37.00	39.00	40.50	35.02	35.11	35.20	35.29	35.38	35.47

Soil depth (cm) used for soil carbon estimates	30.00
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Comments

Carbon Stock in Above- & Below-Ground Biomass and Dead wood has been calculated based on the Biomass Stock of each compenent using a conversion coefficient of 0.5.

Carbon in Litter and Soil requested a more complex calculation. The average amount of carbon in the Litter and Soil of forests has been calculated according to foresttype and their adherent soil and litter carbon (Lesschen et al. 2012). From these data, an average soil and litter carbon amount (ton C/ha) has been calculated. This has been multiplied by the total forest area, giving a total amount of Carbon in the Soil and Litter of Forests. These data have been used to generate values for the years 2015-2020.

3 Forest designation and management

3a Designated management objective

National Data

Data sources + type of data source eg NFI, etc

Data Source	Year	Additional Comments
Dirkse, G.M., W.P. Daamen, H. Schoonderwoerd, M. Japink, M. van Jole, R. van Moorsel, P. Schnitger, W. Stouthamer, M. Vocks, 2006, Meetnet Functievervulling bos 2001-2005, Vijfde Nederlandse Bosstatistiek, Directie Kennis, nr. DK065, Ministerie van Landbouw, natuur en Voedselkwaliteit, Directie Kennis, januari 2006	2001-2005	Results 5th NFI
Kuiper, L.C. (ed.), 2000. Nederlands bos in beeld. Probos, Wageningen	2000	
Schelhaas, M.J., A.P.P.M. Clerkx, W.P. Daamen, J. Oldenburger, G. Velema, P. Schnitger, H. Schoonderwoerd, H. Kramer, 2014. Zesde Nederlandse bosinventarisatie: Methodes en basisresultaten, Concept, versie 21 januari 2014, Alterra, Wageningen, 102 p.	2010-2015	Results 6th NFI
Bosschap, 2011. Jaarverslag. Bosschap, Driebergen.	2010	
Schelhaas, M.J., A.P.P.M. Clerkx, Schoonderwoerd, H., Daamen, W. & Oldenburger, J. (2018) <i>Meer hout uit het Nederlandse bos</i> , Vakblad natuur bos landschap	2015-2020	

National classification and definitions

Definitions match FRA 2020

Original data

	1990	2000	2015
Production	31	4	3,00
Protection of soil and water	0	0	0,00
Conservation of biodiversity	34,33	89,5	143,43
Social Services	0	0	0,00
Multiple use	280	266	218,47

Analysis and processing of national data

Estimation and forecasting

The values of 2015 have been used to generate values for 2020. The values for 2020 are estimated according to a similar division in 2015 but corrected for the estimated Total Forest Area in 2020.

Reclassification into FRA 2020 categories

No Reclassification Needed

Primary designated management objective

FRA 2020 categories	Forest area (1000 ha)				
	1990	2000	2010	2015	2020
Production (a)	31.00	4.00	4.00	3.00	3.00
Protection of soil and water (b)	0.00	0.00	0.00	0.00	0.00
Conservation of biodiversity (c)	34.33	89.50	95.73	143.43	145.27
Social Services (d)	0.00	0.00	0.00	0.00	0.00
Multiple use (e)	280.00	266.00	273.75	218.40	221.23
Other (specify in comments) (f)	0.00	0.00	0.00	0.00	0.00
None/unknown (g)	0.00	0.00	0.00	0.00	0.00
Total forest area	345.33	359.50	373.48	364.83	369.50

Total area with designated management objective

FRA 2020 categories	Forest area (1000 ha)				
	1990	2000	2010	2015	2020
Production	266.00	245.40	254.60	223.70	226.50
Protection of soil and water	4.50	4.50	4.50	1.72	1.72
Conservation of biodiversity	314.30	335.50	370.70	361.90	366.50
Social Services	245.20	291.50	307.70	307.60	311.60
Other (specify in comments)					

Comments

The reasonable small area of forest primary designated for production comes forth from the policy and management of Dutch forests. Where initially most forests in the Netherlands were planted with the intention of a production function, a shift in management and policy towards a more integrated, natural oriented and multifunctional forest was soon implemented. This resulted in a rapid decline of forest area assigned to production as a main management objective. Moreover, the only forests that are considered to have production as a primary objective are the plantations (Mostly *Populus*). The remainder of the forest area has been assigned two main management objectives; Conservation of biodiversity and Multiple use. Based on the available data of the National Forest Inventories a deviation was made between the two main management objectives. This deviation relies on the assignment of naturetypes (SNL-natuurbestemming).

However, the total area (not exclusive) with the designated production objective is relatively large (100% of Production forest, 32% of Conservation of Biodiversity Forest and 80% of Multiple use forest). The calculation of the total area designated for production is based on the subsidy restrictions for naturetypes in the Netherlands. Conservation of Biodiversity is the combined area of both primary management objectives of Conservation of Biodiversity and Multiple Use. Forest designated for Social Services mainly consists out of recreational purposes and hence has been calculated as the cumulative area of Multiple Use and Conservation of Biodiversity Forest and subsequently multiplied by the percentage forest available for public recreation.

3b Forest area within protected areas and forest area with long-term management plans

National Data

Data sources + type of data source eg NFI, etc

Source	Year	Additional Comments
Kuiper, L.C. (ed.), 2000. Nederlands bos in beeld. Probos, Wageningen.	2000	Forest arae within procted areas
Dort, K.W. van, 1999, Evenwichtig netwerk bosreservaten, Vakblad Natuurbeheer, 7 (1999), p. 101-105	1999	Forest arae within procted areas
Daamen, W.P., 2000, Interpretatie Protectie codes IUCN, Ten behoeve van de Forest Resource Assessment 2000, Stichting Bosdata, Wageningen, 28 p.	2000	Interpretation of IUCN-codes
Website on forest reserves in the Netherlands, through http://www.bosreservaten.wur.nl/NL/Nederlandse+Bosreservaten/	2000-2020	Area of Forest Reserves
Digital Topographical Map of the Netherlands (TOP10NL)	2018	Adjusted by Probos
Digital Map op National Parks of the Netherlands, PDOK ministry of economic affairs	2017	National Park Area
Digital Map of Natura 2000, European Environment Agengy	2017	Natura 2000 Area

National classification and definitions

Congruent with FRA.

However, it is impossible to distinguish protection classes (as congruent with the MCPFE classes in Natura 2000 areas). Hence, all forest area in National Parks, Strict Forest Reserves and Natura 2000 areas have been difined as Forest Area within protected areas.

Original data

N/A, data generated in GIS

Analysis and processing of national data

Estimation and forecasting

Data based on new calculations executed in 2018. No substantial expansion in either National Parks, Natura 2000 or Strict Forest reserves is forseen till 2020.

Reclassification into FRA 2020 categories

In the new methis used, it is impossible to distinguish protection classes (as congruent with the MCPFE classes in Natura 2000 areas). Hence, all forest area in National Parks, Strict Forest Reserves and Natura 2000 areas have been difined as Forest Area within protected areas.

FRA categories	Area (1000 ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Forest area within protected areas		83.00	217.00	217.00	217.00	217.00	217.00	217.00	217.00
Forest area with long-term forest management plan	274.00	283.90	293.20	285.60	286.20	286.60	287.30	287.90	288.50
...of which in protected areas									

Comments

In the Netherlands there is no obligation for both public and private forest owners to have a forest management plan. It is assumed however that there is a long term management plan for the total forest area owned and managed by public organisations and nature conservation organisations. Next to this it is estimated that one third of the private forest owners have a long term management plan. In total the estimated forest area with a management plan is quite a bit higher than reported in the previous FRA. This is the result of different assumptions in the estimation based on new information. Pretty much all forest area in the Netherlands are managed as multifunctional forest. For part of these forests there is emphasis one of the forest funtions, but it is not known which part of the management plans is mainly focused on production and which part on nature conservation.

Concerning the Forest Area within protected areas, a new calculation has been executed in 2018. This calculation has been based the following definition of Forest Area within Protected Areas: Forest area in 1) Strict Forest Reserves + 2) National Parks + 3) Natura 2000 Areas. The Forest Area within Protected Area according to this defenition has been generated by overlaying 3 types of maps in GIS; The topographocal map (TOP10NL), the map op national parks and the map of natura 2000 areas. The topographical map has been altered to a grid file of 25x25m to match the methodology used in the NFI's. In this grid file forest has been indicated only when it maches or exceeds 8 connected grids (0.5ha). The area of forest within strict forest reserves is known. Based on the overlay of these 3 maps, the forest area of both national parks and Natura 2000 areas could be generated. After correction for overlap between the 3 levels of protection, and correction with the recalculated total forest area, a value of 214 (x1000 ha) was generated. This analysis was conducted in 2018, however we assume that the forest area within protected areas did not change since 2003 when natura2000 was introduced in the Netherlands.

4 Forest ownership and management rights

4a Forest ownership

National Data

Data sources + type of data source eg NFI, etc

Data Source	Year	Additional Comments
Dirkse, G.M., W.P. Daamen, H. Schoonderwoerd, M. Japink, M. van Jole, R. van Moorsel, P. Schnitger, W. Stouthamer, M. Vocks, 2006, Meetnet Functievervulling bos 2001-2005, Vijfde Nederlandse Bosstatistiek, Directie Kennis, nr. DK065, Ministerie van Landbouw, natuur en Voedselkwaliteit, Directie Kennis, januari 2006	2001-2005	Results 5th NFI
Bosschap jaarverslag	1990, 2000, 2010	
Schelhaas, M.J., A.P.P.M. Clerkx, W.P. Daamen, J. Oldenburger, G. Velema, P. Schnitger, H. Schoonderwoerd, H. Kramer, 2014. Zesde Nederlandse bosinventarisatie: Methodes en basisresultaten, Concept, versie 21 januari 2014, Alterra, Wageningen, 102 p.	2013-2013	Results 6th NFI
Forest Ownership Records -Kadaster	2016	

National classification and definitions

Congruent with FRA 2020

Original data

	1990	2000	2010
Private	169	182	192
Individuals		52	50
business		62	80
communities	0	0	0
Public	176	177.5	181

Analysis and processing of national data

Estimation and forecasting

Due to the recent reported change in Total Forest Area, the estimation of ownership categories also slightly changed for 2015. This change has been implemented based on NFI 6 results and national ownership records

Reclassification into FRA 2020 categories

Non reclassification Needed

FRA categories	Forest area (1000 ha)			
	1990	2000	2010	2015
Private ownership (a)	169.00	182.00	192.24	187.79
...of which owned by individuals		52.00	52.00	48.90
...of which owned by private business entities and institutions		62.00	80.00	78.25
...of which owned by local, tribal and indigenous communities	0.00	0.00	0.00	0.00
Public ownership (b)	176.00	177.50	181.24	177.04
Unknown/other (specify in comments) (c)	0.33	0.00	0.00	0.00
Total forest area	345.33	359.50	373.48	364.83

Comments

New information became available in recent years. First of all, a correction was made in the Total Forest Area which affected the absolute numbers of forest ownership. Second, data concerning forest ownership records became available in a more detailed form, provided by the Cadastre.

4b Holder of management rights of public forests

National Data

Data sources + type of data source eg NFI, etc

Data Source	Year	Additional Comments
Dirkse, G.M., W.P. Daamen, H. Schoonderwoerd, M. Japink, M. van Jole, R. van Moorsel, P. Schnitger, W. Stouthamer, M. Vocks, 2006, Meetnet Functievervulling bos 2001-2005, Vijfde Nederlandse Bosstatistiek, Directie Kennis, nr. DK065, Ministerie van Landbouw, natuur en Voedselkwaliteit, Directie Kennis, januari 2006	2001-2005	Results 5th NFI
Bosschap jaarverslag	1990, 2000, 2010	
Schelhaas, M.J., A.P.P.M. Clerkx, W.P. Daamen, J. Oldenburger, G. Velema, P. Schnitger, H. Schoonderwoerd, H. Kramer, 2014. Zesde Nederlandse bosinventarisatie: Methodes en basisresultaten, Concept, versie 21 januari 2014, Alterra, Wageningen, 102 p.	2013-2013	Results 6th NFI
Forest Ownership Records -Kadaster	2016	

National classification and definitions

Congruent with FRA 2020

Original data

	1990	2000	2010
Public	176	177,5	181

Analysis and processing of national data

Estimation and forecasting

2015 has been estimated according to new insights on corrected total forest area, based on 6th NFI data, supplemented with Cadastre ownership records

Reclassification into FRA 2020 categories

No Reclassification Needed

FRA categories	Forest area (1000 ha)			
	1990	2000	2010	2015
Public Administration (a)	176.00	177.50	181.00	177.04
Individuals (b)	0.00	0.00	0.00	0.00
Private business entities and institutions (c)	0.00	0.00	0.00	0.00
Local, tribal and indigenous communities (d)	0.00	0.00	0.00	0.00
Unknown/other (specify in comments) (e)	0.00	0.00	0.24	0.00
Total public ownership	176.00	177.50	181.24	177.04

Comments

5 Forest disturbances

5a Disturbances

National Data

Data sources + type of data source eg NFI, etc

Expert estimations

National classification and definitions

Congruent with FRA 2020

Original data

N/A

Analysis and processing of national data

Estimation and forecasting

Due to the monitoring system of the Netherlands, and nature of the disturbances we are unable to provide an area affected by the different forms of disturbances. The only disturbance of which we were able to make an estimate is the development of the recent *Chalara fraxinea*. Expert estimations state that currently 80% of the ash population is affected by this disease. The percentage is expected to rise to 90-95% in the near future. Using these estimates, we were able to indicate an area affected by this disease (based on the total area of Ash population generated from the 6th NFI). These values are presented below

Reclassification into FRA 2020 categories

No Reclassification Needed, or impossible to do so

FRA categories	Area (1000 ha)																	
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Insects (a)																		
Diseases (b)																9.56	10.20	10.84
Severe weather events (c)																		
Other (specify in comments) (d)																		
Total (a+b+c+d)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9.56	10.20	10.84
Total forest area	359.50	–	–	–	–	–	373.48	–	–	–	373.48	–	–	–	–	364.83	365.76	366.70

Comments

Throughout the Netherlands there are disturbances as a consequence of Insects. However it is hard to monitor the amount of damage that they cause en hence to report the area that is affected. The following outbreaks of Insects are known in the Netherlands:

- Ips typographus, 2004
- Operophtera brumata, 2007
- Erannis defoliaria, 2007
- Tortrix viridana, 2007
- Thaumetopoea processionea, Multiple years

Disturbance as a consequence of diseases is slightly better to monitor. However, in the early stages (or years) of the disease, the area affected is hard to indicate. Once the disease develops and its symptoms are more clear, the monitoring gets more accurate. This has aslo been the case with *Chalara fraxinea*. This disease, damaging and causing mortality among Ash trees has been recording since 2010. However only in recent years the amount of damage it has caused became apparent. In 2016 the disease is estimated to have damaged 80% of the entire Ash population. Predictions say this number will grow to 90-95% in the near future.

The Netherlands does not know any disturbance as a consequence by severe weather events other then damage by storm. Heavy storms of which the damage has been reported took place in 1990, 2007 (and 2018). The damage monitoring has been reported in cubic meters (m3) wood rather then in the damaged area (hectare). The reported stromdamage was 600.000 m3 and 250.000m3 in 1990 and 2007 respectively (Schelhaas & De Vos, 2010).

5b Area affected by fire

National Data

Data sources + type of data source eg NFI, etc

Data Source	Year	Additional Comments
EFFIS data on forest fires	2007-2018	

National classification and definitions

Congruent with FRA 2020

Original data

firedate	country	area_ha	place_name	province	yearseason	fireid
2011-05-02	NL	148	Bergen	Alkmaar en omgeving	2011	23541
2015-04-14	NL	22	Oldebroek	Veluwe	2015	29118
2014-04-20	NL	396	Ede	Veluwe	2014	28282

Analysis and processing of national data

Estimation and forecasting

N/A

Reclassification into FRA 2020 categories

N/A

FRA categories	Area (1000 ha)																	
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total land area affected by fire	0.29	0.00	0.00	0.29	0.19	0.10	0.06	0.19	0.06	0.33	0.00	0.48	0.06	0.00	0.40	0.02	0.00	0.00
...of which on forest	0.02	0.00	0.00	0.02	0.04	0.04	0.00	0.00	0.00	0.17	0.00	0.15	0.00	0.00	0.40	0.02	0.00	0.00

Comments

Data concerning Total land area affected by fire have been obtained through the EFFIS (European Forest Fire Information System). These data seem to be divergent from pervious reported numbers. However the data provided by the EFFIS appears to be the most reliable data.

5c Degraded forest

Does your country monitor area of degraded forest		No
If "yes"	What is the national definition of "Degraded forest"?	Forest land severely damaged by e.g. the desertification, fires, grazing, air pollution, erosion, unsustainable management, etc. that lost tree cover and with soil damaged to a degree, that severely hampers or delays the re-establishment of stocking. Note: After stocking is re-established, the area can be still considered degraded forest, but not degraded forest land.
	Describe the monitoring process and results	

Comments

The Netherlands does not have any degraded forest areas conform the definition as described above

6 Forest policy and legislation

6a Policies, Legislation and national platform for stakeholder participation in forest policy

National Data

Data sources + type of data source eg NFI, etc

N/A

National classification and definitions

N/A

Original data

N/A

Indicate the existence of	Boolean (Yes/No)	
	National	Sub-national
Policies supporting SFM	Yes	Yes
Legislations and regulations supporting SFM	Yes	No
Platform that promotes or allows for stakeholder participation in forest policy development	No	No
Traceability system(s) for wood products	No	No

Comments

The Netherlands does have policies implied that supports Sustainable Forest Management on both National and Sub-national level. These policies are not specifically directed to SFM, however they do contribute to SFM overall. SFM is more or less the standard for forest management throughout Dutch forestry.

From 01-2017 a new law, Law Natureprotection, has been installed. This law, replacing Natureprotection 1998-, Forest- and Flora- and Fauna Law, legally protects forests. Moreover, this law enforces Sustainable Forest Management till a certain degree.

The government has set goals to import 100% certified timber in the future. Certified timber(product) allow for a better traceability. Also various marketmeasurement are conducted, in which the origin of wood(products) is inventoried.

6b Area of permanent forest estate

National Data

Data sources + type of data source eg NFI, etc

National Gouvernement Law System

National classification and definitions

Congruent with FRA 2020

Original data

N/A

FRA 2020 categories	Forest area (1000 ha)					
	Applicable?	1990	2000	2010	2015	2020
Area of permanent forest estate	Yes	345.33	359.50	373.48	364.83	369.50

Comments

The entire forest area of the Netherlands is regarded as permanent forest estate since it is under protection by law (Nature Protection Law - Wet Natuurbescherming (01-2017, previously Forest Law)). This law prevents forest area designated as forest to be converted into other landuse. Exemptions can be made, however that does not influence the definition. Hence the entire forest area is reported.

7 Employment, education and NWFP

7a Employment in forestry and logging

National Data

Data sources + type of data source eg NFI, etc

Data Source	Year	Additional Comments
CBS, 2004, Bedrijven naar aantal werknemers en economische activiteit, statline.cbs.nl, 09-08-2004, Heerlen/Voorburg	1993-2002	
CBS, 2008, Banen van werknemers; economische activiteit en geslacht, statline.cbs.n, 22-10-2008, Heerlen/Voorburg	2006	
Boschap, 2013. Eindrapportage arbeidsmarktonderzoek. Aequor, Ede	2010	
Website Statistics Netherlands, via http:// statline.cbs.nl/StatWeb/? LA=nl	1990-2015	

National classification and definitions

Congruent with FRA 2020

Original data

	Type werkenden	Totaal	Totaal	Totaal		Werknemers	Werknemers	Werknemers	Zelfstandigen	Zelfstandigen	Zelfstandigen
	Geslacht	Totaal mannen en vrouwen	Mannen	Vrouwen		Totaal mannen en vrouwen	Mannen	Vrouwen	Totaal mannen en vrouwen	Mannen	Vrouwen
	Bedrijfstakken/branches (SBI 2008)	x 1 000	x 1 000	x 1 000		x 1 000	x 1 000	x 1 000	x 1 000	x 1 000	x 1 000
2015	02 Bosbouw	2	2	1		2	1	0	1	1	0
2010	02 Bosbouw	2	2	0		2	1	0	1	1	0
2005	02 Bosbouw	2	2	0		2	1	0	1	0	0
2000	02 Bosbouw	2	2	1		2	1	0	1	0	0
1990	02 Bosbouw										

FRA 2020 categories	Full-time equivalents (1000 FTE)											
	1990			2000			2010			2015		
	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male
Employment in forestry and logging	1.80	0.13	1.67	1.46	0.11	1.35	1.61	0.21	1.40	2.10	0.30	1.80
...of which silviculture and other forestry activities												
...of which logging												
...of which gathering of non wood forest products												
...of which support services to forestry												

Comments

Data obtained for the Central Bureau of Statistics (CBS). Employment could only be reported for the overarching class of Forestry and Logging, since there were no data available on the sub-clases as stated in the above table.

7b Graduation of students in forest-related education

National Data

Data sources + type of data source eg NFI, etc

Data Source	Year
Promovendi Service - Wageningen University	1990-2015
CBS Statline - Onderwijs	1990-2015

National classification and definitions

Doctoral's Degree	University (or equivalent) education with a total duration of about 8 years.
Master's Degree	University (or equivalent) education with a total duration of about 5 years.
Bachelor's Degree	University education with a duration of about 3 years, or applied sciences degree with a duration of about 4 years
Technician Certificate / Diploma	Qualification issued from a technical education institution consisting of 1 to 4 years post-secondary education. (MBO)

Original data

	HBO			WO					
	BSc			BSc			MSc		
	M	V	Totaal	M	V	Totaal	M	V	Totaal
98/99	63	23	86						
99/00	77	25	102						
00/001	78	35	113						
2000	72,7	27,7	100,3	0,0	0,0	0,0	0,0	0,0	0,0
2008-2009	84	25	109	20	9	29	32	27	59
2009-2010	84	35	119	20	17	37	34	29	63
2010-2011	64	26	90	18	9	27	18	39	57
2010	77,3	28,7	106,0	19,3	11,7	31,0	28,0	31,7	59,7
2013/2014	66	22	88	29	15	44	30	32	62
2014-2015	61	14	75	35	19	54	39	27	66
2015-2016	55	18	73	19	17	36	35	45	80
2015	60,7	18,0	78,7	27,7	17,0	44,7	34,7	34,7	69,3

	PhD
1990	1
1991	0
1992	3

1990	1,3
1999	5
2000	0
2001	0
2000	1,7
2009	9
2010	9
2011	10
2010	9,3
2013	11
2014	13
2015	6
2015	10

FRA 2020 categories	Number of graduated students											
	1990			2000			2010			2015		
	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male
Doctoral degree	1.00			2.00			9.00			10.00		
Master's degree	237.00	80.00	156.00	126.00	43.00	83.00	127.00	51.00	76.00	105.00	55.00	50.00
Bachelor's degree	0.00	0.00	0.00	0.00	0.00	0.00	109.00	51.00	58.00	129.00	53.00	76.00
Technician certificate / diploma							135.00			94.00		
Total												

Comments

Data on Bachelor and Master graduates retrieved from Central Bureau of Statistics Netherlands (CBS). Prior to 2002 there was no distinction between Bachelor and Master degrees. Therefore all graduates prior to 2002 have been considered to be Master degree students. Techician certificate/dimploma has been interpreted as MBO-graduates (in the dutch system this represents a level beneath the Bachelor of Applied sciences). These data have also been provided by the CBS, data only available for 2010 and 2015.

The number of Doctoral degrees has been provided by the promovendi service of the Wageningen University, the only university in the Netherlands where a doctoral degree in Forestry can be aquired.

7c Non wood forest products removals and value 2015

National Data

Data sources + type of data source eg NFI, etc

Data Sources	Year
Product Tuinbouw - Consumer research	2005
Royal Dutch Hunting Association	2015

National classification and definitions

Non Wood Forest Product	Goods derived from forests that are tangible and physical objects of biological origin other than wood.
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Original data

Game Meat:	Absolute	Marketed
Red Deer	1075	860
Fallow Deer	425	340
Wild Boar	4200	3360
Roe Deer	22000	17600

	Name of NWFP product	Key species	Quantity	Unit	Value (1000 local currency)	NWFP category
#1	Game meat	Capreolus capreolus (79%), Sus scrofa (15%), Cervus elaphus (4%) and Cervus dama (2%)	592	Tonnes meat	2 663	12 Wild meat
#2	Christmas Trees	Picea abies	114	1000 pieces	363	6 Ornamental plants
#3						
#4						
#5						
#6						
#7						
#8						
#9						
#10						
All other plant products						
All other animal products						
Total					3 026	

Name of currency	Euro
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Comments

The Netherlands knows two Non Wood Forest Products worth naming; Game meat and Christmas trees.

The Game meat value was determined by a count of the total amount of forest animals (Roe deer, Red deer, Fallow deer and Wild boar) that were shot in the year 2015/2016. Note that this covers a timeframe of april 2015 to april 2016, congruent with the hunting season in the Netherlands. Roughly 80% of the animals shot are sold to poultries, butchers and restaurants. Hence this 80% is considered marketed. The total value of Game meat has been generated by multiplying the marketed share of Game meat (total weight of the animals shot * 80%) by an average price per kg. Data have been provided by the Royal Dutch hunters association and remain to be validated.

The valuation of the Christmas trees is based on FAO statistics

8 Sustainable Development Goal 15

8a Sustainable Development Goal 15

SDG Indicator 15.1.1 Forest area as proportion of total land area 2015

Indicator	Percent							
	2000	2010	2015	2016	2017	2018	2019	2020
Forest area as proportion of total land area 2015	10.67	11.09	10.83	10.86	10.88	10.91	10.94	10.97

Name of agency responsible	CBS (Statistics Netherlands)
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SDG Indicator 15.2.1 Progress towards sustainable forest management

Sub-Indicator 1	Percent						
	2000-2010	2010-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
Forest area annual net change rate	0.38	-0.47	0.25	0.26	0.25	0.26	0.25

Name of agency responsible	CBS (Statistics Netherlands)
----------------------------	------------------------------

Sub-Indicator 2	Forest biomass (tonnes/ha)							
	2000	2010	2015	2016	2017	2018	2019	2020
Above-ground biomass stock in forest	40.00	48.00	52.65	53.14	53.63	54.13	54.63	55.13

Name of agency responsible	CBS (Statistics Netherlands)
----------------------------	------------------------------

Sub-Indicator 3	Percent (2015 forest area baseline)							
	2000	2010	2015	2016	2017	2018	2019	2020
Proportion of forest area located within legally established protected areas	22.75	59.48	59.48	59.48	59.48	59.48	59.48	59.48

Name of agency responsible	CBS (Statistics Netherlands)
----------------------------	------------------------------

Sub-Indicator 4	Percent (2015 forest area baseline)							
	2000	2010	2015	2016	2017	2018	2019	2020
Proportion of forest area under long-term forest management plan	77.82	80.37	78.28	78.45	78.56	78.75	78.91	79.08

Name of agency responsible	CBS (Statistics Netherlands)
----------------------------	------------------------------

Sub-Indicator 5	Forest area (1000 ha)							
	2000	2010	2015	2016	2017	2018	2019	2020
Forest area under independently verified forest management certification schemes	53.06	152.09	167.14	136.31	169.65	171.24	–	–