

ASSESSMENT OF INDUSTRIAL ROUNDWOOD PRODUCTION FROM PLANTED FORESTS



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ASSESSMENT OF INDUSTRIAL ROUNDWOOD PRODUCTION FROM PLANTED FORESTS

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Cover photo: Utility poles are harvested from a eucalyptus plantation in Uganda. Photo FAO.

Contents

CONTENTS	III
LIST OF TABLES.....	IV
LIST OF FIGURES.....	IV
PREFACE	V
ACKNOWLEDGEMENTS.....	V
ACRONYMS	VI
SUMMARY AND CONCLUSIONS	VII
1 INTRODUCTION.....	1
2 PLANTED FORESTS: TERMINOLOGY AND DEFINITIONS.....	1
3 PREVIOUS ASSESSMENTS	3
3.1 ABARE/PÖYRY: GLOBAL OUTLOOK FOR PLANTATIONS (1999)	3
3.2 FAO/BROWN: THE GLOBAL OUTLOOK FOR FUTURE WOOD SUPPLY FROM FOREST PLANTATIONS (2000)	4
3.3 CARLE/HOLMGREN: WOOD FROM PLANTED FORESTS – A GLOBAL OUTLOOK 2005–2030 (2008)	5
3.4 PENNA: PROJECTIONS ON WOOD SUPPLY FROM PLANTED FORESTS (2010)	5
3.5 FSC/INDUFOR: STRATEGIC REVIEW OF THE FUTURE OF FOREST PLANTATIONS (2012).....	6
3.6 SYNTHESIS OF PREVIOUS ASSESSMENTS	7
4 METHODOLOGY.....	8
4.1 DISTINCTION OF NATURAL FORESTS AND PLANTED FORESTS/PLANTATIONS	8
4.2 MAJOR INDUSTRIAL ROUNDWOOD PRODUCING COUNTRIES	8
4.3 APPLIED METHODOLOGICAL STEPS	8
5 RESULTS.....	11
5.1 INDUSTRIAL ROUNDWOOD PRODUCTION FROM PLANTATIONS	11
5.1.1 <i>Country level</i>	11
5.1.2 <i>Regional level</i>	14
5.1.3 <i>Global level</i>	15
5.1.4 <i>Time-series estimates</i>	15
5.2 INDUSTRIAL ROUNDWOOD PRODUCTION FROM THE PLANTED COMPONENT OF SEMI-NATURAL FORESTS (SNPF) IN TEMPERATE COUNTRIES	16
5.3 THE GLOBAL INDUSTRIAL ROUNDWOOD PRODUCTION FROM PLANTED FORESTS	17
6 REFERENCES	19
6.1 GENERAL REFERENCES	19
6.2 STATISTICAL REFERENCES BY COUNTRY	20
7 ANNEXES	29
7.1 LIST OF CONTRIBUTORS BY COUNTRY	29
7.2 TIME SERIES DATA 2000-2012: INDUSTRIAL ROUNDWOOD FROM FOREST PLANTATIONS	30

List of Tables

Table 1: Scope and concept of natural and planted forests	2
Table 2: Projections on industrial roundwood supply from plantations by region (ABARE/Pöyry)	4
Table 3: The projected industrial roundwood production from forest plantations as a percentage of total production (FAO/Brown)	4
Table 4: Potential industrial roundwood production from planted forests (Carle/Holmgren)	5
Table 5: Potential industrial roundwood production from forest plantations and SNPFs (Penna)	6
Table 6: Estimates of industrial roundwood production from forest plantations in 2012 and 2050 (FSC/Indufor)	7
Table 7: Summary of projections made in previous assessments	7
Table 8: Major producers of industrial roundwood in 2012 (32 priority countries)	9
Table 9: Industrial roundwood production in plantations in 2012 by country (ranked by production volume)	12
Table 10: Industrial roundwood production originating from plantations and SNPFs in temperate countries	17

List of Figures

Figure 1: Availability of data by country for estimating industrial roundwood production in forest plantations	11
Figure 2: The world's top 10 producers of industrial roundwood from plantations in 2012	13
Figure 3: Production of industrial roundwood in plantations by regions in 2012	14
Figure 4: Share (percent) of industrial roundwood originating from plantations by region	14
Figure 5: Trends in industrial roundwood production from plantations in selected countries	16
Figure 6: Assessment of the origin of the global industrial roundwood production in the year 2012	18

Preface

Planted forests play an ever more important part in the global and regional economies to secure industrial roundwood and wood fuel. In many developing countries, planted forests have formed the structural basis for an increasing forest-based manufacturing and export sector. This report assesses the production of industrial roundwood from planted forests and evaluates their significance for the global industrial roundwood supply. The assessment was conducted by using national and international primary and secondary data, some of which have not been published before. The report focuses on forest plantations, providing data from 78 countries across five continents. As for semi-natural planted forests (SNPF)¹, data could be estimated for 18 temperate-climate countries in America, Asia and Europe.

The data and information given in this report have gone through a structured process of data collection, processing, validation, compilation and analysis. In general, however, it must be stated that many reporting countries found it difficult to provide reliable information on the origin or the sources of their industrial roundwood production.

The report, together with previous outlook studies, may give policy- and decision-makers, investors, and managers a better understanding of the key role that planted forest resources play in the provision of wood products for national and global economies. The report has been produced as a joint project between the Forest Assessment, Management and Conservation Division and the Forest Economics, Policy and Products Division of the FAO Forestry Department. Data collection, analysis and evaluation were conducted during a six-month period, from September 2013 to February 2014.

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¹ For a terminology of planted forests, please see Chapter 2.

Acronyms

FRA	Global Forest Resources Assessments, carried out by FAO every five years, last in 2010, next in 2015.
JFSQ	Joint Forest Sector Questionnaire. An initiative of the International Tropical Timber Organization (ITTO), the United Nations Economic Commission for Europe (UNECE), FAO and EUROSTAT to collect statistics on the world timber market.
MAI	Mean annual increment. The average rate of production at any particular age of a forest stand.
SNPF	Semi-natural planted forests: the planted component of semi-natural forests of mainly native species established through planting, seeding or coppice.

Summary and conclusions

1. **Objective of the report.** This report seeks to expand and improve the global forest resource statistics by estimating the production of industrial roundwood from planted forests based on official statistical sources, country reports and scientific literature, as well as data reported in questionnaires and personal communication with national experts. Thereby, the report addresses recommendations of the Third International Congress on Planted Forests, held in Estoril, Portugal, in May 2013, which advised to strengthen the available statistics on wood production from planted forests.
2. **Scope of the report.** Productive and protective plantations, together with semi-natural planted forests (SNPFs), constitute the subgroup ‘planted forests’, as defined in FAO’s global forest resources assessments 2010 and 2015. This report focuses on the industrial roundwood production in forest plantations at country, regional and global level, and relates these data to the total industrial roundwood production from all types of forest for the reference year 2012. It also includes the production originating from SNPFs in order to cover the wider concept of planted forests.
3. **Wood production in planted forests.** In many developing and developed countries, planted forests have become a substantial component of the productive and protective forest resources and play an ever more important part in securing both industrial roundwood and wood fuel. This report complements and expands on previous assessments and outlook studies, and may give policy- and decision-makers, investors and managers a better understanding of the key role that planted forest resources play in the provision of wood products for national and global economies.
4. **Previous assessments and outlook studies** on the industrial roundwood production from plantations are mainly based on scenario analysis, assumptions about the development of forest plantation areas, and different growth and yield models. In summary, they indicate that forest plantations have been providing between one third and half of the global industrial roundwood production in the past decade, amounting to 500–800 million m³ of industrial roundwood. They concur in predicting an increase in the area of forest plantations and, consequently, an increase in the industrial roundwood production that originates from them.
5. The **methodology** of this assessment faced a number of challenges that had already cropped up in previous studies. A major problem encountered was that the origin of the industrial roundwood production in most countries was not recorded according to forest type (e.g. natural forest, planted forest or forest plantation), but was rather reported as an aggregate volume for all types of forests. To overcome this, the following methodological steps were applied in each particular country to develop an accepted and consistent dataset: (1) analysis and evaluation of data reported in the Joint Forest Sector Questionnaire (JFSQ); (2) additional consultation of statistical reports, previous resource assessments, scientific literature and statistical online data; (3) conduct of a questionnaire survey in 24 selected countries, for which no or only fragmentary data were available; (4) model calculations in 12 temperate countries for which no data could be made available through steps 1–3; and (5) a trend analysis covering the period 2000–2012 through time-series data estimated for 17 countries from the available dataset reported in the JFSQ. In general, it can be stated that the depth and level of analysis applied in each country has largely been dependent on the significance of this country for the global industrial roundwood production. Large producers have been prioritized and evaluated more closely than smaller producers.
6. **Industrial roundwood production in forest plantations by country.** Data for the selected reference year 2012 have been obtained from 78 countries. The top 10 producers of industrial roundwood in forest plantations are Brazil (131.9 million m³), the United States of America (101.9 million m³), China (64.2 million m³), India (43.1 million m³), Chile (38.4 million m³), New Zealand (27.5 million m³), Australia (19.2 million m³), South Africa (15.9 million m³), Thailand (14.6 million m³) and Indonesia (12.5 million m³). They together produced 469 million m³, or 83 percent, of the global industrial roundwood production in plantations.

7. **Industrial roundwood production in forest plantations by region.** In the reference year 2012, the production of industrial roundwood in plantations was close to 200 million m³ in South America (193 million m³), followed by Asia (151 million m³) and North and Central America (104 million m³). Oceania, Europe and Africa produced considerably less industrial roundwood in plantations, ranging from 26 to 47 million m³. The share of industrial roundwood produced in plantations as compared with total production differed considerably by region. South America and Oceania produced more than 80 percent of their industrial roundwood in forest plantations. European countries produced the lowest share (8 percent) of their industrial roundwood in plantations, which may be due to the fact that important roundwood-producing countries in Europe do not qualify their forests as plantations. North and Central America also reported a rather low proportion (22 percent) of the regional roundwood production volume as originating from plantations, even though quantitatively the production from plantations was high. Asia (43 percent) and Africa (37 percent) both produced close to two fifths of their industrial roundwood in plantations.
8. **Global industrial roundwood production in plantations.** The production volume originating from plantations in 78 countries in the reference year 2012 is estimated at 562 million m³, equivalent to one third (33 percent) of the global production of industrial roundwood from all types of forests (1.683 billion m³). On a global level, the results of this study correspond to those of previous assessments. However, the production volume of 562 million m³ is certainly a lower-end estimate as it does not include a number of countries that have reported a significant planted forest area but for which no data could be made available.
9. **Trends.** Times-series data for the period 2000–2012 on the industrial roundwood production from plantations could be estimated for 17 countries based on available datasets and trend extrapolations. The established time series illustrate three trends that recurred in all observed countries. In many countries in Latin America and Asia, the industrial roundwood production from plantations had increased considerably since 2000 (e.g. in Chile, China, Brazil, Indonesia, Malaysia, Myanmar, Thailand, Uruguay and Vietnam). In Argentina, Australia, New Zealand and the United States of America, production in plantations increased as well, although at a considerably slower pace. In European countries (Portugal, Spain and Turkey) and in South Africa, the trend was basically stagnant since 2000, with some noticeable ups and downs during the reference period.
10. **Industrial roundwood production in SNPFs.** In general, temperate countries produce a minor share of industrial roundwood in plantations but a considerable volume in SNPFs, both of which are usually reported collectively in national wood production statistics. Production data for SNPFs could only be reported by five countries, while model calculations had to be applied in 12 other temperate countries to estimate industrial roundwood production figures for SNPFs. The countries observed produced in 2012 about 208 million m³ of industrial roundwood in SNPFs, equivalent to 37 percent (562 million m³) of the global production from plantations. In most of these countries (e.g. Canada, Germany, Poland and Sweden), the industrial roundwood production from SNPFs by far exceeded production in forest plantations.
11. **Total global production of industrial roundwood in planted forests.** Estimates on the global industrial roundwood production from planted forests comprising plantations and SNPFs could be ascertained for a total of 82 countries. The production volume is estimated at 770 million m³ for the year 2012, which is equivalent to almost half (46 percent) of the industrial roundwood production from all types of forests (1.683 billion m³). The industrial roundwood originating from natural forests can be estimated by subtracting the production in planted forests from the total production. It amounts to 913 million m³, equivalent to 54 percent of the global production for that year.

1 Introduction

The global area of planted forests increased considerably between 1990 and 2010, from 178 million ha to 264 million ha, a difference that corresponds to 7 percent of total forest area. During 2005–2010, the area of planted forests expanded each year by about 5 million ha on average. This expansion has been mainly achieved in Asian countries. The contribution of planted forests to addressing the major socioeconomic and environmental challenges of our time – poverty alleviation, food security, renewable energy, climate change and biodiversity conservation – is widely acknowledged. In many developing and developed countries, planted forests have become a substantial component of the productive and protective forest resources, and provide a considerable share of the industrial roundwood production (FAO, 2010; ICPF, 2013).




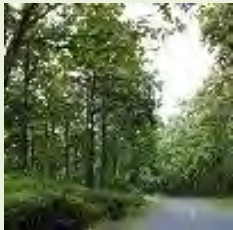



The Third International Congress on Planted Forests, held in Estoril, Portugal, in May 2013, noted in its summary report that statistics on wood production from planted forests were incomplete and differed widely (ICPF, 2013). As a consequence, this study has been conducted by the FAO Forestry Department as part of its core work of collecting, evaluating and disseminating up-to-date data and information on the forest sector and assessing status and trends in the development of global forest resources and industrial roundwood production. The study seeks to expand and improve the global forest resource statistics by estimating the current production of industrial roundwood from planted forests at national levels based on actual reported and estimated production figures in each country. As such, the study provides a quantitative baseline from which to assess future trends of wood supply from planted forests.

A number of earlier studies, which are summarized in Chapter 3, have provided estimates on the level of industrial roundwood production from plantations and planted forests using modelling approaches based on a range of assumptions. In summary, they have estimated that planted forests provide between one third and half of the global industrial roundwood consumption during the past two decades (ABARE/Pöyry, 1999; FAO/Brown, 2000; Carle and Holmgren, 2008; FSC/Indufor, 2012). This study, in contrast, has systematically collected recent quantitative data on industrial roundwood production from official statistical sources, country reports and scientific literature, as well as through questionnaires and personal communication with national experts, in order to develop new estimates on the production of industrial roundwood from planted forests and compare them with the results of previous studies.

2 Planted forests: terminology and definitions

Since 1980, FAO, through its Forest Resources Assessments (FRA), has been collecting data on forest areas for two main categories of forests: natural forests and forest plantations. In 2005, the FRA introduced two additional forest categories: modified natural forests and semi-natural forests (Evans, 2009), which resulted in five major forest categories based on the degree of human intervention and the silvicultural method of forest regeneration: (1) primary forest; (2) modified natural forest; (3) semi-natural forest, comprising natural and planted regeneration (SNPF); (4) plantations comprising productive and protective plantations; and (5) trees outside forests (see Table 1).

Table 1: Scope and concept of natural and planted forests

Natural forest			Planted forest			Non-forest
Primary	Modified natural forests	Semi-natural forests	Plantations			Trees outside forest (TOF)
		Assisted natural regeneration	Planted component	Productive	Protective	
						
Forest of native species, where there are no clearly visible indications of human activity and ecological processes are not significantly disturbed	Forest of naturally regenerated native species, where there are clearly visible indications of human activity	Intensive silvicultural management, e.g. weeding, fertilizing, thinning, selective logging	Forest of native species, established through planting, seeding, coppice	Forest of primarily introduced and native species, established through planting or seeding mainly for production of wood or non-wood products	Forest of native or introduced species, established through planting or seeding mainly for provision of environmental services	Smaller than 0.5 ha; tree cover in agricultural land (e.g. agroforestry), trees in urban environments, and scattered along roads and in landscapes

Source: Carle and Holmgren, 2008, modified and illustrated.

Productive and protective plantations, together with SNPFs, constitute the subgroup ‘planted forests’, as defined in FRA 2015² and used in this report. The planted component of SNPFs includes areas where deliberate efforts are made to increase the proportion of desirable species, thus leading to changes in the structure and composition of the forest, but still with the possible presence of naturally regenerated trees from species other than those planted or seeded. The logic behind the creation of the planted forests subgroup is that the planted component of SNPF, with its often intensive management, is not always significantly different from that of forest plantations. Often, the only distinction is that SNPF are composed of native species and continue the overall character and species composition of the previous forest on the specific site. Plantations, on the other hand, often use planting stock of improved genetic characteristics, are often managed through fertilization and apply similar methods of establishment (e.g. regular spacing), tending, thinning and pruning; in addition, they have wood product outputs that are uniform in size and technical specification (Evans, 2009).

In this report, the methodical focus is on assessing the industrial roundwood production from forest plantations, for which data could be made available from 78 countries, and, to a lesser extent, on the planted component of SNPF (the two boxed columns in Table 1). Most countries, in particular in temperate regions, found it difficult to provide data on the proportion of the industrial roundwood production originating from SNPF, for which data could only be reported by four countries, while data on SNPF from 13 other temperate countries had to be estimated through model calculations.

Industrial roundwood from the rubber tree (*Hevea brasiliensis*) has become an important forest resource in many Southeast Asian countries. The definitions of FRA 2015 include tropical rubber plantations in the category of planted forests. However, the industrial roundwood production from rubber trees could not be included in this report due to a lack of sufficiently recent and reliable data from key rubber-producing countries. It should be noted, however, that this production is believed to be significant.

3 Previous assessments

Since 1999, several assessments on planted forests resources have been conducted by different authors, with the primary aim of modelling the current and future wood supply from plantations and/or planted forests and estimating the capacity of these forests in satisfying the estimated future wood demand. These assessments have mainly based their calculations and assumptions on the data available for the global planted forests area as reported in FAO’s global FRA, the recorded and presumed future establishment rate of planted forests, and the recorded mean annual increment (MAI) of different species groups in different geographic and climatic regions.

The methodology applied in previous studies is not comparable with that applied for this report, which primarily used data reported by each country except those where information was incomplete and had to be supplemented by assumptions based on the planted forest area and the MAI, or on official statistics on the production of wood products.

The most significant publications on the assessment of industrial roundwood production covering the period 1999–2012 are summarized below.

3.1 ABARE/Pöyry: global outlook for plantations (1999)

The Australian Bureau of Agriculture and Resource Economics (ABARE) published a study in 1999 entitled the *Global outlook for plantations*. The report was designed to provide technical information for the Intergovernmental Forum on Forests (IFF). Based on current and expected future rates of plantation establishment, presumed future gains in plantation productivity, and presumed trends in demand for plantation products, it assessed the most likely implications of plantation expansion on global wood supply for individual regions up to the year 2040.

² Planted forests are forested areas of more than 0.5 ha with trees higher than 5 metres and a canopy cover of more than 10 per cent. They are predominantly (more than 50 percent of growing stock) composed of trees of native or introduced species established through planting and/or deliberate seeding. They include coppice from trees that were originally planted or seeded, as well as rubberwood plantations.

The study was based on FAO's FRA 1990 dataset, which was updated to 1995 in 1997, and used the prevailing forest plantation definitions at that time, as detailed by FAO (FAO, 1998). The study estimated that there would be a considerable increase in the global roundwood supply from 1.800 billion m³ in 2000 to 2.275 billion m³ in 2040, which would largely be met by production from plantations. Although the productive forest plantation area was estimated at only 116 million ha, or about 3 percent of the global forest area, in the year 2000, the study predicted that plantations would meet 35 percent of the global roundwood supply in that year, rising to 44 percent by 2020 and 46 percent by 2040 (see Table 2). In quantitative terms, this indicates that the industrial roundwood production from plantations would increase by 67 percent, from 624 million m³ in 2000 to 1043 million m³ in 2040.

Table 2: Projections on industrial roundwood supply from plantations by region (ABARE/Pöyry)

	million m ³			% of total roundwood supply		
	2000	2020	2040	2000	2020	2040
Africa	16	38	41	20	39	40
Asia	112	213	229	32	46	48
Europe	236	334	355	46	53	55
North America	145	225	251	22	29	31
Oceania	27	42	44	55	66	67
South America	88	117	123	63	65	66
World	624	969	1 043	35	44	46

Source: ABARE/Pöyry, 1999.

3.2 FAO/Brown: the global outlook for future wood supply from forest plantations (2000)

This report was produced in 1999 as part of FAO's broader *Global forest products outlook study* (GFPOS) (FAO/Brown, 2000). The main objectives of the GFPOS were to assess the current status and future trends in forest plantation establishment, to evaluate economic and policy issues associated with forest plantation development, and to predict potential wood supply and demand, including an assessment of the potential wood supply from forest plantations.

The study was also based on FAO's FRA 1990 dataset, and also used the prevailing forest plantation definitions at that time, as detailed by FAO (1998). It was estimated that in the year 1995, 124 million ha of forest plantations (3.5 percent of the global forest area) had yielded more than 22 percent of the global industrial roundwood production, and that this number would increase to 31–34 percent by 2010, to 46 percent by 2020, and to 64 percent by 2050, depending on the forest plantation production scenario and extrapolation of industrial roundwood consumption (see Table 3).

Table 3: The projected industrial roundwood production from forest plantations as a percentage of total production (FAO/Brown)

Forest plantation scenario	Estimated share in 1995 (%)	Estimated future share (%)		
		2010	2020	2050
Scenario 1	22.2	30.6	31.5–32.5	19.7–29.6
Scenario 2	22.2	31.2	34.1–35.1	28.0–37.0
Scenario 3	22.2	34.1	45.1–46.5	48.4–64.0

Source: FAO/Brown, 2000, p. 101.

3.3 Carle/Holmgren: wood from planted forests – a global outlook 2005–2030 (2008)

This outlook study investigated the global industrial roundwood supply from the wider concept of ‘planted forests’ as opposed to previous studies focusing on forest plantations. The baseline data for the study were obtained from a survey on the status of planted forests in 61 countries, representing about 95 percent of the estimated global planted forest area of 271 million ha in 2005, and comprising 128.1 million ha of forest plantations and 132.4 million ha of SNPF (Penna, 2010). The questionnaire survey collected in-depth information about planted forests in each country, including species distribution, ownership, end-use of removals, rotation lengths, MAI and age-class distribution.

Based on these data, model calculations for three scenarios were developed on the potential wood supply from planted forests for the period 2005–2030. These scenarios took into consideration potential changes in the planted forest area (mainly through new plantings), as well as opportunities for increased productivity resulting from more efficient management practices, new technology and genetic improvements. Input data missing from the country survey and missing data for area, efficiency and productivity changes were completed by expert estimates. The major results of the model calculations indicate that:

- the area of planted forests is expected to increase in all given scenarios;
- the potential industrial wood production in 2005 from planted forests was estimated at 1.2 billion m³, or about two thirds of the overall wood production in that year;
- the total wood production from planted forest for industrial use will increase considerably from 1.2 billion m³ in 2005 to 1.39, 1.48 and 1.89 billion m³ respectively in the three scenarios in 2030 (see Table 4); and
- the proportion of wood for industrial use (comprised of the sum of the end-use categories pulp/fiber and wood products) is about 85 percent of all wood from planted forests.

Table 4: Potential industrial roundwood production from planted forests (Carle/Holmgren)

	2005 (million m³)	2030 (million m³)
Scenario 1	1 220	1 389
Scenario 2	1 220	1 477
Scenario 3	1 220	1 897

Source: Carle and Holmgren, 2008; modified to show data for industrial roundwood production by subtracting fuelwood and harvesting loss from totals.

3.4 Penna: projections on wood supply from planted forests (2010)

In 2010, Penna re-analysed the database of the Carle/Holmgren study of 2008 and estimated new results by splitting the scenario projections for the category ‘planted forests’ into two distinct subgroups for (a) forest plantations and (b) SNPFs. The results indicate that the industrial roundwood production from forest plantations would increase considerably up to 2030 to constitute 69–74 percent of the total industrial roundwood production from planted forests (see Table 5). The production from SNPFs, on the other hand, is predicted to decline in scenarios 1 and 2 and to only show a slight increase in scenario 3.

Table 5: Potential industrial roundwood production from forest plantations and SNPFs (Penna)

		2005 (million m ³)	2030 (million m ³)
Forest plantations	Scenario 1	736	965
	Scenario 2	736	1 042
	Scenario 3	736	1 401
SNPFs	Scenario 1	484	424
	Scenario 2	484	435
	Scenario 3	484	496
Total	Scenario 1	1 220	1 389
	Scenario 2	1 220	1 477
	Scenario 3	1 220	1 897

Source: Penna, 2010, p. 67–68; modified to show data for industrial roundwood production by subtracting fuelwood and harvesting loss from totals. Note that the totals correspond to total production in the Carle/Holmgren study.

3.5 FSC/Indufor: Strategic review of the future of forest plantations (2012)

This review conducted by Indufor on behalf of the Forest Stewardship Council (FSC) investigated the impact of a number of parameters, e.g. forest ownership patterns and investment trends, on the future extent and significance of forest plantations, and, based on these assumptions, assessed the global wood supply from forest plantations in 2012, 2022 and 2050. Forest plantations in this context included productive industrial forest plantations of fast-growing and high-yielding tree species, as well as intensively managed plantations with slow growth and longer rotation cycles.

Forecasts on wood supply from forest plantations were developed for three different scenarios (scenario 1 – baseline; scenario 2 – optimistic; scenario 3 – theoretical maximum). The three scenarios were based on presumed average growth rates in the plantation areas, MAI for different plantation tree species, and regional default coefficients that were based on the difference between the theoretically possible annual allowable cut from plantations in each region and the existing data on the actually realized cut (the global average of the coefficient being 0.40). While the three scenarios are similar in their assumptions on the growing stock and productivity of existing plantations, they display a high variance in their assumptions on the productivity of new plantation areas and on the future rotation periods of plantations.

In summary, the study estimates the production of industrial roundwood from forest plantations at 520 million m³ in 2012, which, by comparison with FAOSTAT figures, corresponds to 31.4 percent of the total global industrial roundwood production of that year (1.657 billion m³). It predicts that the production level may by 2050 increase to about 1.082 billion m³ under the baseline scenario, to 1.491 billion m³ in the optimistic scenario, and may even reach 1.988 billion m³ in the maximum yield scenario (see Table 6). The production increase in all three scenarios is predicted to be driven mainly by a projected growth in plantation area supported by productivity gains due to improved clonal technology, fertilization, better silviculture and management, and improvements in harvesting and recovery techniques.

Table 6: Estimates of industrial roundwood production from forest plantations in 2012 and 2050 (FSC/Indufor)

	2012 estimate (million m³)	2050 estimate (million m³)
Scenario 1	520	1 082
Scenario 2	520	1 491
Scenario 3	520	1 988

Source: FSC/Indufor, 2012.

3.6 Synthesis of previous assessments

The previous assessments of industrial roundwood production in terms of scope mainly relate to forest plantations, except for the studies by Carle/Holmgren (2008) and Penna (2010), which include SNPFs. The assessments are based on a varying number of scenario definitions, on assumptions about the development of forest plantation areas, and on different growth and yield models. Consequently, they have produced different results ranging from about 500 million to 800 million m³ of industrial roundwood originating from forest plantations (see Table 7). In summary, they indicate that forest plantations have been providing between one third and half of the global industrial roundwood production during the past decade.

Table 7: Summary of projections made in previous assessments

Study	Estimates on the global production of industrial roundwood from forest plantations (1 000 m³)		
	2005	2010	2012
ABARE/Pöyry (1999)	Approx. 710 ¹	Approx. 797 ¹	Approx. 804 ¹
FAO/Brown (2000)	-	Approx. 504 ²	-
Penna (2010) based on Carle/Holmgren (2008)	736	698–742 ³	-
FSC/Indufor (2012)	-	-	520

1) Figures extrapolated between 2000 and 2020.

2) Mean value of scenarios 1 to 3 multiplied by total industrial roundwood production of 2010 (1.577 billion m³)

3) Penna, 2010, p. 67–68. Range of scenarios 1 to 3 minus fuelwood and harvesting loss.

4 Methodology

4.1 Distinction of natural forests and planted forests/plantations

In **tropical and subtropical regions**, the distinction between natural forests and planted forests or forest plantations is straightforward, as most plantations are based on single, non-native species stands, even age classes, short rotations and intensive management. Consequently, the origin of industrial roundwood and the proportion originating from natural forests and plantations can, in many cases, be fairly easily determined as plantation species are often accounted for separately in the available country reports.

In some tropical countries, e.g. the Philippines, Sri Lanka, Thailand, and Vietnam, temporary or permanent logging bans have been imposed in natural forests following periods of heavy deforestation and overlogging. These bans have often made forest plantations besides wood imports the only legal sources of industrial roundwood for local wood processing industries. In some cases, e.g. Thailand, the production of industrial roundwood from plantations had to be estimated from the national output of wood products in relation to roundwood imports, as no other data were found.

In **temperate and boreal regions**, native species may be grown in planted forests and plantations on long rotations and in mixed-species and mixed-age plantings. Natural forests and planted forests may often be so similar that they are indistinguishable. Consequently, most national forestry agencies in temperate countries do not collect separate data on the industrial roundwood originating from natural or planted forests. In fact, most countries, with very few exceptions, find it difficult to identify the origin of the produced timber and to report accordingly.

For this report, the industrial roundwood production originating from intensively managed plantations of native and introduced species has been reported from the temperate regions of the United States of America, Australia and southwestern France, from coniferous plantations introduced in the UK and Denmark, and from poplar and willow plantations cultivated in 13 member countries of the International Poplar Commission (2012).

4.2 Major industrial roundwood producing countries

Throughout the data retrieval process, the depth and level of analysis applied in each country have largely been dependent on the significance of each country for global industrial roundwood production. Thus, large producers have been prioritized and evaluated more closely than smaller producers. In the reference year 2012, 32 countries combined supplied more than 90 percent of the global industrial roundwood production from natural and planted forests (see Table 8). A clear priority in terms of data analysis was assigned to these countries to estimate the global industrial roundwood production originating from planted forests.

4.3 Applied methodological steps

The assessment of the industrial roundwood production from planted forests faced a number of challenges that had already cropped up in previous studies. A major problem encountered was that in most countries the origin of industrial roundwood production is not recorded according to forest type (e.g. natural forest, planted forest or forest plantation). In general, industrial roundwood production is reported and presented as an aggregate volume from all types of forests. In some countries, at least, the production volume originating from coniferous forests is distinguished from that originating from hardwoods. Further, consistent time-series data were lacking in the consulted JFSQ and other statistical sources for most countries.

Table 8: Major producers of industrial roundwood in 2012 (32 priority countries)

Countries	Industrial roundwood production in 2012 (m ³)	Share (%)	Accumulated share (%)	Planted forest area 2010 (1 000 ha)
1. USA	320 729 000	19.06	19.06	25 363
2. Canada	151 151 106	8.98	28.04	8 963
3. Brazil	146 804 000	8.72	36.76	7 418
4. China	144 035 300	8.56	45.32	77 157
5. Russian Federation	136 375 000	8.10	53.42	16 991
6. Sweden	63 000 000	3.74	57.17	3 613
7. Indonesia	62 605 500	3.72	60.89	3 549
8. India	45 957 000	2.73	63.62	10 211
9. Finland	44 614 134	2.65	66.27	5 904
10. Germany	42 862 602	2.55	68.81	5 283
11. Chile	39 133 600	2.33	71.14	2 384
12. Poland	32 001 443	1.90	73.04	8 889
13. France	29 806 136	1.77	74.81	1 633
14. New Zealand	27 469 368	1.63	76.44	1 812
15. Australia	23 759 000	1.41	77.86	1 903
16. Japan	18 479 000	1.10	78.95	10 326
17. Malaysia	17 823 000	1.06	80.01	1 807
18. Turkey	17 701 000	1.05	81.06	3 418
19. South Africa	15 906 387	0.95	82.01	1 763
20. Thailand	14 600 000	0.87	82.88	3 986
21. Czech Republic	13 467 000	0.80	83.68	2 635
22. Austria	12 831 218	0.76	84.44	n.a.
23. Spain	11 626 795	0.69	85.13	2 680
24. Latvia	11 356 587	0.67	85.80	628
25. Romania	10 935 713	0.65	86.45	1 446
26. Argentina	10 068 000	0.60	87.05	1 394
27. Portugal	9 671 236	0.57	87.63	849
28. Nigeria	9 418 000	0.56	88.19	382
29. United Kingdom	8 787 547	0.52	88.71	2 219
30. Norway	8 787 408	0.52	89.23	1 475
31. Belarus	8 072 600	0.48	89.71	1 857
32. Uruguay	7 937 394	0.47	90.18	978

Source: FAOSTAT and FRA, 2010.

In view of these challenges, the following methodological steps were applied in this study for each particular country to develop an acceptable and consistent dataset for assessing the global industrial roundwood production from forest plantations and from the planted component of SNPFs:

1. **JFSQ.** The data reported in the JFSQ for most countries did not provide a complete and consistent time series for the observed period 2000–2012. Hence, this study makes no attempt to estimate future global trends in wood supply from plantations under different scenarios, but produces a one-year assessment for the reference year 2012, for which many countries had reported data. In cases when no data had been reported for that year, data reported for previous years were used to extrapolate the trend and estimate the figure for 2012.

2. **Additional sources.** Analysis and evaluation of additional statistical reports, previous resource assessments (e.g. country reports for FRA, 2010), scientific literature, and other statistical online data (e.g. inventory data) provided by statistical bureaus and forestry agencies.
3. **A survey** carried out in 24 selected countries³ with significant areas of planted forest and/or significant production of industrial roundwood, for which no or only fragmentary data were available. A one-page questionnaire was sent to the national correspondents for FRA 2015 or other national forestry experts. The response rate was satisfactory at 67 percent. However, only eight countries (33 percent) were able to determine the origin of the industrial roundwood production as being from natural or planted forests.
4. **Model calculations** were applied in 12 temperate countries, which are included in the list of the 32 priority countries (Table 8), and for which no or only partial data could be made available through steps 1–3. In these 12 countries, a simple model calculation had to be applied to account for the considerable volume estimated to originate from SNPFs. This model calculation is based on the area of planted forests, a conservative average MAI of 4 m³/ha/yr, and an average recovery rate of 80 percent (20 percent harvesting loss), which resulted in an average production of 3.2 m³/ha/yr of industrial roundwood from planted forests in each country. Subsequently, reported figures on the industrial roundwood production from plantations were deducted from the calculated volume to avoid double counting. In the Russian Federation, the production of industrial roundwood from planted forests was found to be negligible and was excluded from the model calculations.
5. **Trend analysis.** Time-series data on the industrial roundwood production from plantations could be estimated for only 17 countries by extrapolating the available dataset reported in the JFSQ to cover as far as possible the period 2000–2012 (see Annex 7.2).

³ Austria, Belarus, Canada, Czech Republic, Estonia, Finland, France, Germany, Ghana, India, Indonesia, Japan, Latvia, Malaysia, Republic of Korea, Romania, Russian Federation, Poland, Portugal, Slovakia, Sweden, Thailand, Turkey, Ukraine.

5 Results

5.1 Industrial roundwood production from plantations

5.1.1 Country level

Data on the industrial roundwood production in forest plantations in the reference year 2012 have been obtained from 78 countries across five continents (see Figure 1 and Table 9). They include almost all of the 32 priority countries listed in Table 8 except for Austria, Belarus, Czech Republic, Finland, Japan, Latvia, and the Russian Federation, for which no information on wood production in forest plantations was available. The sources consulted for the assessment of industrial roundwood production data in each of the 78 countries are documented in the country-specific reference list in Chapter 6.2.

Figure 1: Availability of data by country for estimating industrial roundwood production in forest plantations

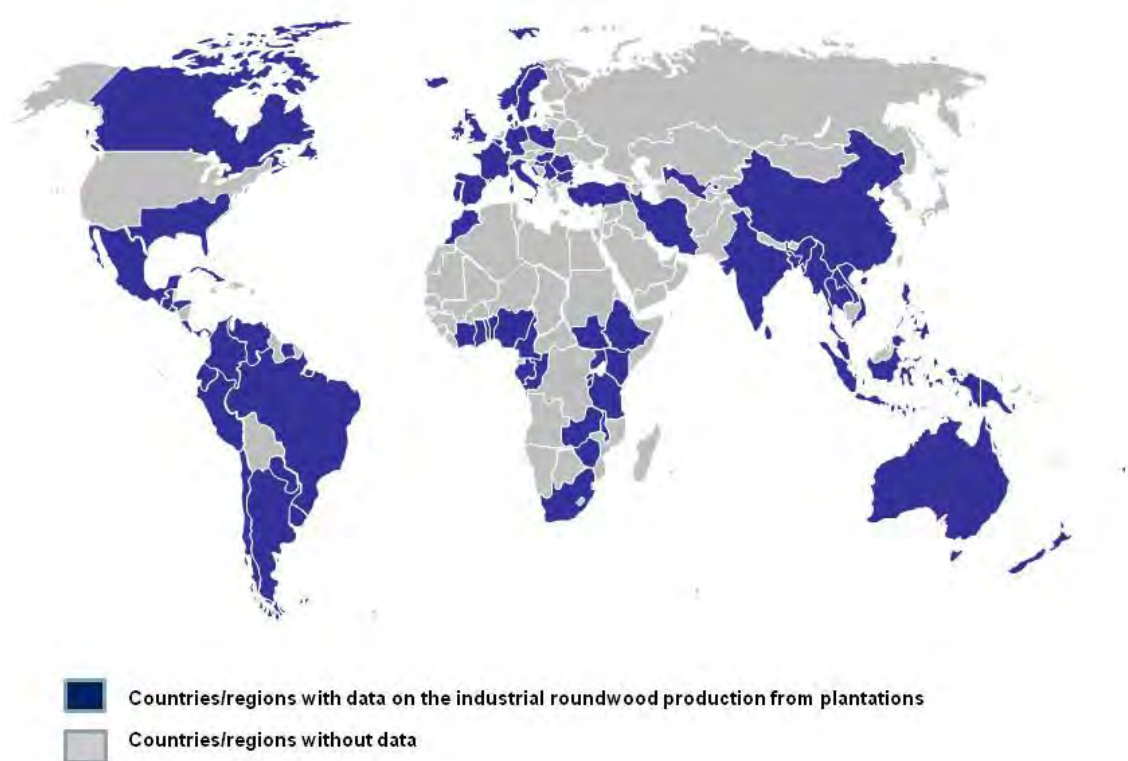


Table 9: Industrial roundwood production in plantations in 2012 by country (ranked by production volume)

Country	Industrial roundwood production from plantations (m ³)	Country	Industrial roundwood production from plantations (m ³)	Country	Industrial roundwood production from plantations (m ³)
1. Brazil	131 878 975	27. Tanzania, UR	1 034 765	53. Bulgaria	225 447
2. USA	101 934 282	28. Swaziland	1 000 000	54. Norway	219 685
3. China	64 239 744	29. Denmark	1 000 000	55. Gabon	213 250
4. India	43 059 944	30. Poland	950 601	56. Bangladesh	210 000
5. Chile	38 350 928	31. Myanmar	920 440	57. Ethiopia	150 000
6. New Zealand	27 453 946	32. Costa Rica	827 297	58. Panama	176 200
7. Australia	19 210 883	33. Venezuela	708 510	59. Côte d'Ivoire	130 000
8. South Africa	15 906 387	34. Colombia	700 000	60. Croatia	118 384
9. Thailand	14 600 000	35. Zambia	662 500	61. Ghana	105 286
10. Indonesia	12 530 000	36. Italy	656 800	62. Papua N. Guinea	100 000
11. Argentina	9 983 181	37. Peru	603 483	63. Sri Lanka	100 000
12. Portugal	9 564 947	38. Paraguay	558 902	64. Romania	81 341
13. France	9 300 000	39. Mexico	450 000	65. Togo	66 400
14. Uruguay	7 937 394	40. Morocco	448 000	66. Benin	62 000
15. Spain	6 000 000	41. Rwanda	432 000	67. El Salvador	54 259
16. UK	5 686 958	42. Iran, I.R.	420 000	68. Canada	43 050
17. Malaysia	3 813 445	43. Congo	385 548	69. Belgium	32 930
18. Philippines	3 791 559	44. Serbia	375 049	70. South Sudan	12 857
19. Vietnam	3 700 000	45. Fiji	375 000	71. Germany	10 000
20. Turkey	3 500 000	46. Uganda	349 000	72. Trinidad/Tobago	10 000
21. Nigeria	3 300 000	47. Cuba	315 200	73. Uzbekistan	8 000
22. Hungary	2 906 000	48. Malawi	260 000	74. Guatemala	5 405
23. Ireland	2 375 654	49. Zimbabwe	259 200	75. Honduras	4 314
24. Ecuador	2 200 000	50. Solomon Islands	250 000	76. Lao PDRs	3 316
25. Sweden	1 150 000	51. Burundi	247 282	77. Suriname	2 000
26. Kenya	1 037 700	52. Cameroon	236 000	78. Iceland	2 000
TOTAL				561 983 629	

Note on sources:

Numbers in italics (red): JFS questionnaires or country notes.

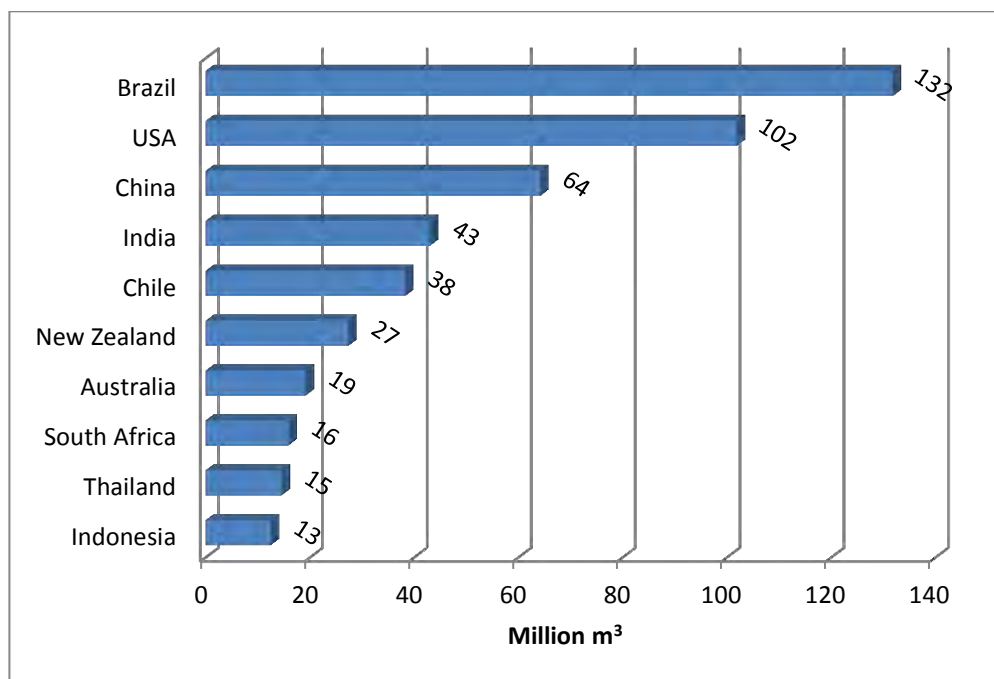
Numbers in non-italics (black): statistical reports in literature (see Chapter 7.2 for country-specific references).

Numbers in bold (blue): extrapolated to 2012 based on data from previous years.

The top 10 producers of industrial roundwood from plantations (see Table 9) are displayed in a bar-chart in Figure 2. In 2012, these 10 countries together produced 83 percent of the global industrial roundwood production from plantations, totalling about 469 million m³.

Brazil and the United States of America, the two largest producers, together produced about 43 percent of the global industrial roundwood from plantations (~234 million m³) in 2012. The total industrial roundwood production reported from **Brazil** in 2012 for all types of forest was 146.8 million m³, making it the third-largest wood producer in the world (FAOSTAT). The 131.9 million m³ originating from plantations made up 90 percent of the total wood supply in Brazil; consequently, only about 10 percent appeared to originate from natural forests. The **United States of America** was the biggest producer of industrial roundwood (320.7 million m³), if all types of forests are accounted for. Plantations growing mainly in the southeastern states (the ‘southern pine belt’) supplied about 32 percent of this volume, at 101.9 million m³.

Figure 2: The world's top 10 producers of industrial roundwood from plantations in 2012



China was found to be the third-largest producer of industrial roundwood from plantations in 2012. FAOSTAT in that year reported a total industrial roundwood production of 144 035 300 m³ from all types of forests. Based on Chinese forest inventory reports for 2008 and 2013 and Chinese statistical reports, it can be assumed that the volume of timber harvested from forest plantation in 2012 accounted for about 45 percent of the total annual timber harvest. Based on these assumptions, the industrial roundwood production from plantations was estimated at 64.2 million m³. The Chinese State Forestry Administration (SFA) estimates that by 2020 the domestic supply of commercial timber from plantations will increase to 80 percent of the national production due to large-scale plantation establishment programmes that have been in place since the 1990s (SFA, 2009).

India was found to be the fourth-largest producer of industrial roundwood from plantations in 2012. FAOSTAT reported a total industrial roundwood production of 45 957 000 m³ from all types of forests in India. A significant share of this volume, about 43 million m³, is presumed to originate from private plantations, farm forestry plantations and trees outside forests, as for forests under public ownership a number of policies are in place to phase out the supply of wood for wood-based industries (FRA, 2010; MOEFF, 2006a).

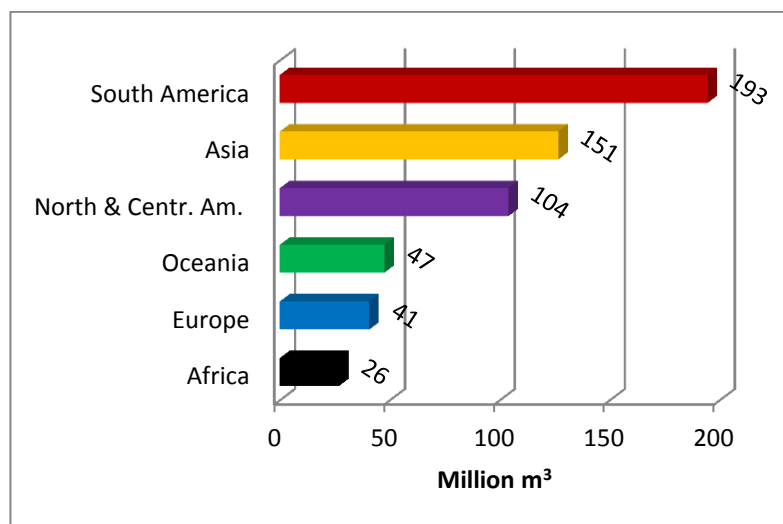
Chile is reported in FAOSTAT to be the 11th-largest industrial roundwood producer in 2012, with a total production of 39,133,600 m³. Based on national statistical reports from Chile (CONAF, 2013), it has been assumed that 98 percent of this production volume originated from plantations, which corresponds to 38.3 million m³ industrial roundwood from plantations for that year.

In **New Zealand, Australia and South Africa**, almost all industrial roundwood is extracted from forest plantations. Removals from natural forests in these countries were presumed negligible due to their official protection status.

5.1.2 Regional level

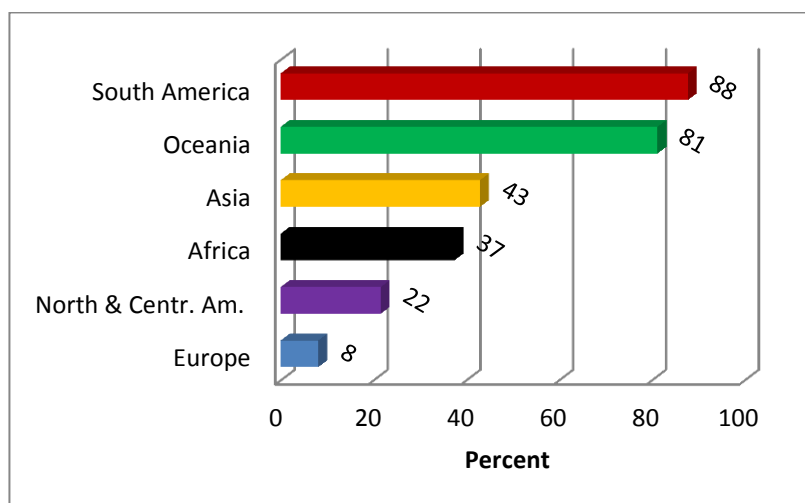
An analysis of the country data by region indicates that the production of industrial roundwood in plantations in 2012 was close to 200 million m³ in South America (193 million m³), followed by Asia (151 million m³) and North and Central America (104 million m³). Oceania, Europe and Africa produced considerably less industrial roundwood in plantations, ranging from 26 million to 47 million m³ (see Figure 3).

Figure 3: Production of industrial roundwood in plantations by regions in 2012



The share of industrial roundwood produced in plantations as compared with that produced in all types of forests is shown in Figure 4 by region. South America and Oceania produced more than 80 percent of their total industrial roundwood in forest plantations, e.g. in eucalyptus and radiata pine plantations. European countries produced the lowest share (8 percent) of its total industrial roundwood in plantations, which may be due to the fact that important roundwood-producing countries do not qualify their forests as plantations. North and Central America also reported a rather low proportion (22 percent) of the regional roundwood production volume as originating from plantations, even though quantitatively the production from plantations was high (see Figure 3). Asia (43 percent) and Africa (37 percent) both produced close to two fifths of their industrial roundwood in plantations; however, the quantity produced in forest plantations in these two regions differed considerably (see Figure 3).

Figure 4: Share (percent) of industrial roundwood originating from plantations by region



5.1.3 Global level

The production volume originating from plantations in 78 countries in the reference year 2012 is estimated at 562 million m³ (see Table 9, total). For comparison, the global industrial roundwood production from all types of forests in the same year amounted to 1.683 billion m³, as reported by FAOSTAT. Hence the industrial roundwood production from plantations represented 33.4 percent, or one third, of the global production of industrial roundwood from all types of forests. All temperate countries included in the analysis produced 331 million m³ (59 percent), while all tropical countries produced 231 million m³ (41 percent).

It should be noted in this context that the production volume of 562 million m³ is certainly a lower-end estimate. It does not include a number of countries that reported a significant planted forest area of more than 100,000 ha (FAO, 2010), and in which forest plantations are very likely to grow, but for which no data could be made available.⁴

On a global level, the results of this study correspond well with those of previous assessments. The most recent study by FSC/Indufor (2012) estimated a global industrial roundwood production of 520 million m³ for 2012, which is 6.5 percent lower than the volume estimated in this study (562 million m³); however, it should be noted in this context that the estimates of both studies vary considerably on country level. The FAO/Brown outlook study (2000) projected a production of 504 million m³ of industrial roundwood from plantations in 2010, which is more than 10 percent lower than the results of this study. On the contrary, the studies by ABARE/Pöyry (1999) and by Penna (2010) estimated a much higher production volume from forest plantations, ranging from about 700 million to 800 million m³ (see Table 7).

5.1.4 Time-series estimates

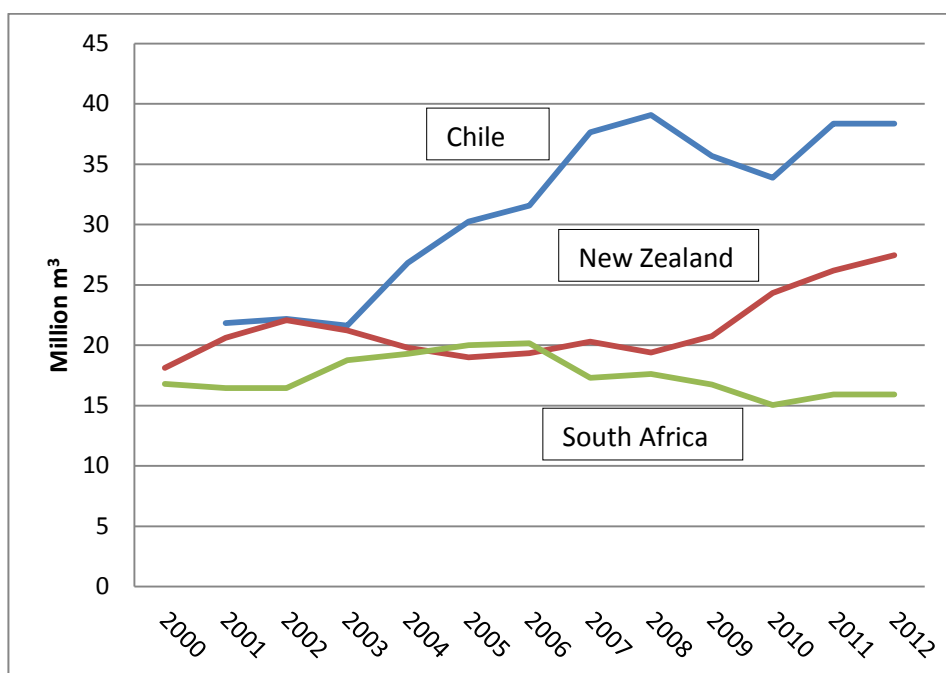
For most countries it was not possible to give accepted and consistent time-series estimates as the available datasets were too fragmented for the observed period 2000–2012. Time-series data on the industrial roundwood production from plantations could only be estimated for 17 countries for which reported data were available for a period of several years. Missing years could be complemented by linear extrapolation between those years for which data were available in order to cover the entire period between 2000 and 2012, or a part thereof. The results are given in Annex 7.2.

The time series displayed for three countries in Figure 5 illustrate three trends that can be observed in these 17 countries. In many countries in Latin America and Asia, the industrial roundwood production from plantations had increased considerably since 2000, as shown in Figure 5 for Chile. Brazil, China, Indonesia, Malaysia, Myanmar, Thailand, Uruguay and Vietnam showed similar trend lines. In Argentina, Australia, New Zealand and the United States of America, the industrial roundwood production in plantations had been increasing as well, although at a considerably slower pace (see trend for New Zealand in Figure 5). In European countries (Portugal, Spain, and Turkey) and in South Africa (Figure 5), the trend in industrial roundwood production had basically been stagnant since 2000, with some noticeable ups and downs during this period.

In this context it should be noted that the three identified trend lines and the allocation of countries to them is based on the reported and estimated production of previous years, which are not sufficient to make predictions of future trends. Many countries that have considerably increased their production in the past decade are now expected to stagnate in their production, while others that have historically been expanding their wood production from plantations at a slower rate are now expected to significantly increase their production in the coming years. Qualified predictions on future production trends can only be made after the growth potential and production capacity of existing and newly planted forests have been diligently analysed and evaluated.

⁴ For instance Algeria, Angola, DPR Korea, Georgia, Japan, Kazakhstan, Madagascar, Mongolia, Netherlands, Pakistan, Republic of Korea, Senegal.

Figure 5: Trends in industrial roundwood production from plantations in selected countries



5.2 Industrial roundwood production from the planted component of semi-natural forests (SNPF) in temperate countries

In general, temperate countries only produce a minor share of industrial roundwood in plantations but a considerable volume in SNPFs, both of which are usually reported together in national wood production statistics. Only 5 of the 18 temperate countries⁵ included in the list of 32 priority countries (Table 8) were able to report industrial roundwood production figures for SNPF based on either the proportion of natural and planted forest areas or the allocation of the growing stock to natural and planted species groups. For the remaining 12⁶ temperate countries, a simple model calculation had to be applied to account for the considerable volume originating from SNPF (see Chapter 4.3).

The 18 temperate countries were estimated to produce about 208 million m³ of industrial roundwood in SNPF and 116 million m³ in forest plantations in 2012 (see Table 10). The production estimate of 208 million m³ from SNPF in temperate countries amounted to 37 percent of the global production from plantations (562 million m³). In most countries (e.g. Canada, Germany, Poland and Sweden), the industrial roundwood production from SNPF by far exceeded the production from forest plantations. Only in Spain, the United Kingdom and the United States of America did the production of industrial roundwood in plantations appear to be superior to SNPF.

⁵ Estonia, Germany, Japan, Latvia and Republic of Korea

⁶ Russian Federation excluded as planted forests were assumed to be too young in 2012 for harvesting industrial roundwood

Table 10: Industrial roundwood production originating from plantations and SNPFs in temperate countries

Country	Planted forest area (1 000 ha)	Origin of industrial roundwood production, 2012	
		Plantations (1 000 m ³)	SNPF (1 000 m ³)
1	2	3	4
1. USA	12 363	101 934	39 562
2. Canada	8 963	43	28 639
3. Russian Federation***	16 991	-	-
4. Sweden	3 613	1 150	10 412
5. Finland	5 904	-	18 893
6. Germany	5 283	10	*20 435
7. Poland	8 889	951	27 494
8. Japan	10 326	-	*13 681
9. Czech Republic	2 635	-	**13 467
10. Spain	2 680	6 000	**5 627
11. Latvia	628	-	*2 101
12. Romania	1 446	81	4 546
13. United Kingdom	2 219	5 687	1 414
14. Norway	1 475	220	4 500
15. Belarus	1 857	-	**8 073
16. Ukraine	4 846	-	**7 904
17. Estonia	168	-	*560
18. Republic of Korea	1 823	-	*776
Total	92 109	116 076	208 084

* Figures reported from national correspondents in questionnaire survey.

** Removals reported in FAOSTAT assumed to be 100 percent from planted forests.

*** Planted forests assumed to be too young in 2012 for harvesting industrial roundwood.

Note on sources:

Column 2: FRA, 2010; USA: area of southern plantations (13 million ha) subtracted from total planted forest area, according to FRA, 2010.

Column 3: Equal to Table 9 in each country.

Column 4: Column 2 * 4*0.8 – column 3 (except for USA and *).

5.3 The global industrial roundwood production from planted forests

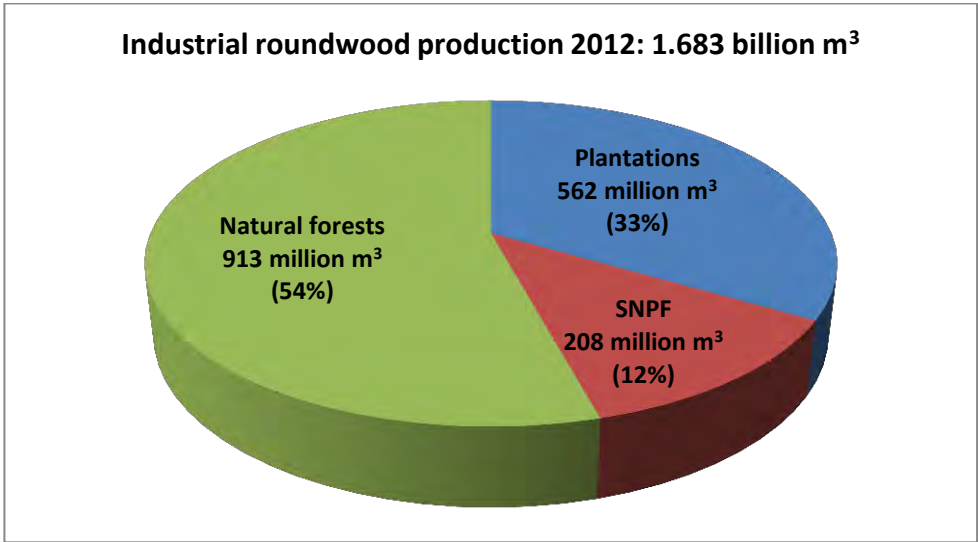
Based on (a) the industrial roundwood production reported by countries in the JFSQ, (b) the results of intensive desk research, (c) the questionnaire survey among FRA correspondents and national forestry experts and (d) the model calculations in 12 temperate countries, estimates on the global industrial roundwood production from planted forests comprising plantations and SNPFs could be ascertained for a total of 82 countries distributed across five continents (the 78 countries in Table 9 and another four countries⁷ that reported additionally on SNPF).

The global industrial roundwood production from planted forests comprising plantations and SNPF is estimated at 770 million m³ for 2012, which is equivalent to 46 percent, or almost half, of the total industrial roundwood production from all types of forests, including natural forests and trees outside forests (1.683 billion m³, according to FAOSTAT). Plantations supplied 562 million m³ (33 percent), while SNPFs are estimated to have produced 208 million m³ (12 percent) in 2012. The industrial roundwood production in natural forests was calculated by subtracting the production in planted forests from the total production according to FAOSTAT. It amounts to 913 million m³, equivalent to 54 percent of the global production for that year (see Figure 6).

⁷ Germany reported on both plantations and SNPF.

These estimates include all major industrial roundwood-producing countries in the world. However, for some countries, incomplete datasets had to be complemented by assumptions and model calculations, in particular when estimating the industrial roundwood production in SNPFs. Consequently, these data should only be used with the appropriate caution.

Figure 6: Assessment of the origin of the global industrial roundwood production in the year 2012



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Austria	Report of FRA national correspondent (survey by questionnaire).
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Belarus	Report of FRA national correspondent (survey by questionnaire).
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Guatemala	JFSQ, data reported for 2010 and 2011.
Honduras	JFSQ, data reported for 2009, 2010 and 2011.
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Iran, Islamic Republic of	<p>FAO. 2012. <i>Improving lives with poplars and willows. Synthesis of country progress reports</i>. 24th Session of the International Poplar Commission, Dehradun, India. Working Paper IPC/12, Rome. Available at www.fao.org/forestry/ipc2012/en/</p>
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Ivory Coast	JFSQ, data reported for 2000 to 2007.
Japan	<p>Ministry of Agriculture, Forestry and Fisheries. Various years. Annual reports on trends in forest and forestry in Japan fiscal year 2009, 2010, 2011, 2012.</p> <p>Report of FRA national correspondent to questionnaire survey.</p>
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Turkey	<p>Coaloa, D. and Nervo, G. 2011. <i>Poplar wood production in Europe on account of market criticalities and agricultural, forestry and energy policy</i>. Tercer Congreso Internacional de Salicáceas en Argentina. Available at www.populus.it/pdf/JS2011_COALOA_NERVO.PDF</p> <p>UNECE/FAO. 2002. Forest products annual market review 2001–2002. Chapter 4: Trade links strengthening as Turkey’s forest sector is modernized. Turkey’s forest products markets. In <i>Timber Bulletin</i>, LV (3). New York and Geneva. Available at www.unece.org/fileadmin/DAM/timber/docs/tb/tim-bull-2002-3-cpmplete-fpamr.pdf</p> <p>Ayan, S. and Sivaciogla, A. 2006. <i>Review of the fast growing forest tree species in Turkey</i>. In Kastamonu University, Faculty of Forestry, <i>Boletín del CIDEU</i>, 2: 57–71, Author contact: sezginay@gazi.edu.tr</p>
Uganda	AFF. 2011. <i>Forest plantations and woodlots in Uganda</i> . Working Paper Series, Volume 1, Issue 17, Table 19. African Forest Forum. Available at www.afforum.org
United Kingdom	<p>UK Forestry Commission. 2013. Data download, timber statistics. Available at: http://www.forestry.gov.uk/forestry/inf-d-8w3lv3.</p> <p>Forest Europe. 2011. <i>State of Europe’s forests 2011, status and trends in sustainable forest management in Europe</i>. Available at: www.foresteurope.org/full_SoEF</p> <p>Moore, J. 2011. <i>Wood properties and uses of Sitka spruce in Britain</i>. Forestry Commission Research Report. Edinburgh, UK, Forestry Commission.</p>
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Zimbabwe	<p>Palmberg-Lerche, C. and Ball, J.B. 1998. <i>Present status of forest plantations in Latin America and the Caribbean and review of related activities in tree improvement</i>. First IUFRO/FAO Latin American Congress: El Manejo Sosten de los Recursos Forestales, Desafío del Siglo XXI. Valdivia, Chile. Available at www.fao.org/forestry/25870-02eafc3754091edb5fd4aa95c23ef26ac.pdf</p> <p>Thornycroft, P. 2011. <i>Eastern Zimbabwe plantations face grim future, voice of America</i>. Available at www.voanews.com/content/eastern-zimbabwe-plantations-face-grim-future---124606334/141409.html</p> <p>The Zimbabwean. 2011. <i>Battle for timber plantations. Chiefs join looting spree</i>. Available at www.thezimbabwean.co/life/environment/57477/battle-for-timber-plantations-chiefs.html</p>

7 Annexes

7.1 List of contributors by country

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Austria	Mr Johannes Hangler , Deputy Head, Austrian Ministry of Agriculture, Division IV/1, Forest Policy and Forest Information
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Czech Republic	Mr Jaroslav Kubišta , Deputy Chairman, Forest Management Institute.
Denmark	Mr Thomas Nord-Larsen , Senior researcher. Department of Geosciences and Natural Resource Management, 'Skov, natur og biomasse'.
Estonia	Mr Mati Valgepea , Leading specialist of forestry statistics, Department of Forestry Statistics, Estonian Environment Information Centre, Estonian Environment Agency
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Latvia	Ms Lelda Pamovska , Senior Officer, Ministry of Agriculture, Forest Department Forest Resources and Hunting Division
Russian Federation	Mr Boris Moiseev , Leading Researcher, Federal Forestry Agency, Research Institute of Silviculture and Forestry Mechanization
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Thailand	Mr Palle Havmøller , Retired forester and country expert on Thailand
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Argentina	Ms Norma B. Esper , Dirección de Bosques, Programa Nacional de Estadística Forestal, Coordinadora, Argentina
North America	
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7.2 Time series data 2000-2012: industrial roundwood from forest plantations

Note on sources:

Numbers in italics (red): JFS questionnaires or ITTO country notes.

Numbers in non-italics (black): statistical reports in literature and/or online inventory data tools.

Numbers in bold (blue): linear extrapolations based on data from previous and subsequent years.

For reference see also Chapter 7.2.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Argentina	6 882 495	5 550 865	7 906 503	8 513 631	8 335 167	8 759 167	8 506 758	8 410 546	7 875 415	9 189 365	9 981 244	9 983 181	9 983 181
Australia	13 671 899	<i>14 147 360</i>	<i>14 031 360</i>	15 685 540	16 852 480	<i>17 905 760</i>	18 158 731	18 641 364	19 269 602	<i>17 447 378</i>	<i>18 988 045</i>	<i>20 190 920</i>	19 210 883
Brazil						100 766 899	100 766 899	105 131 741	101 261 900	106 911 408	115 741 531	125 852 809	131 878 975
Chile		21 829 700	22 177 170	21 617 210	26 824 070	30 251 970	31 556 150	37 648 660	39 080 440	35 673 960	33 868 800	38 367 000	38 350 928
China									54 538 809	58 397 473	59 952 695	62 223 250	64 239 744
Indonesia	2 974 000	7 023 000	5 802 000	6 362 000	8 406 000	14 888 000	12 771 000	16 337 250	15 224 563	16 780 000	20 910 000	10 880 000	12 530 000
Malaysia			1 800 000	1 781 263	1 762 526	1 725 051	1 659 453	1 928 308	1 862 299	1 778 070	1 915 988	3 519 117	3 813 445
Myanmar			256 847	313 140	324 594	320 538	298 293	281 023	231 274	885 958	884 442	956 700	920 440
New Zealand	18 120 000	<i>20 617 000</i>	<i>22 056 652</i>	21 219 023	19 784 747	19 002 543	19 341 141	20 300 031	19 385 862	20 735 020	24 314 117	26 192 027	27 453 946
Portugal	9 366 635	8 465 340	8 294 283	9 135 314	10 902 865	10 409 962	10 398 262	10 021 532	9 720 556	8 972 349	8 569 000	10 502 503	9 564 947
South Africa	18 959 200	18 553 500	18 566 500	21 159 400	21 776 913	22 564 059	22 764 082	19 511 802	19 867 289	18 887 580	16 988 569	15 906 387	15 906 387
Spain		6 691 517	6 152 347	6 427 967	6 497 691	6 732 990	6 474 741	6 250 263	6 520 413	5 602 032	6 851 057	6 000 000	6 000 000
Thailand				10 656 200	10 656 200	6 030 000	14 308 000	14 350 000	14 400 000	14 450 000	14 500 000	14 550 000	14 600 000
Turkey		3 200 000	3 200 000	3 225 000	3 250 000	3 275 000	3 300 000	3 340 000	3 380 000	3 420 000	3 460 000	3 500 000	3 500 000
USA						83 529 742	86 803 643	90 909 243	93 298 633	99 796 441	101 404 050	103 102 279	101 934 282
Uruguay	1 511 000	1 598 000	1 832 000	2 132 000	3 324 000	3 729 000	4 254 000	5 111 000	7 244 000	6 180 000	9 402 000	8 000 000	7 937 394
Vietnam	1 600 000	1 833 333	2 066 667	2 300 000	2 533 333	2 766 667	3 000 000	3 233 333	3 466 667	3 700 000	3 700 000	3 700 000	3 700 000

