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Joint FAO/UNECE Working Party on Forest Economics and Statistics

FOOD AND AGRICULTURE ORGANIZATION

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Guidance on Work Area 3: Forest Sector Outlook Studies

AGENDA ITEM 2.3 – FOREST PRODUCT CONVERSION FACTORS

Note by the secretariat

Summary

This document provides an overview of a report on *Forest Products Conversion Factors for the UNECE Region,* (ECE/TIM/DP/49). In addition, this document summarizes the median ratios from *Forest Products Conversion Factors for the UNECE Region* and compares them with the Joint Forest Sector Questionnaire conversion factors currently in use by the product item code.

The Working Party is invited to compare and provide guidance on what, if any, changes should be made to the existing JFSQ conversion factors, and to provide a critical review of the data and supporting text of *Forest Products Conversion Factors for the UNECE Region*. The secretariat would also like guidance for future work on conversion factors. Note that conversion factors are linked with work on data harmonization (agenda item 6.5).

I. Background

1. The origins of this work lie in a workshop, "National Wood Energy Resource Balances", held in Geneva on 31 March and 1 April 2008. A background paper, *Conversion Factors: A Necessity for an Accurate Estimation of Wood Consumption by Industries*[1] (Thivolle-Cazat, 2008) highlighted the varied approaches to estimating roundwood consumption based on the outputs of wood products, as well as the challenge to convert these varied data into harmonized international units, which may then be compared directly. The issue of apparently inaccurate conversion factors was brought up during the work on the European Forest Sector Outlook Study (2005), and with a new outlook study commencing in 2009, it was considered important to gather new and hopefully more accurate conversion factors.

2. A task force of experts from countries and trade associations was formed in June of 2008. The Task Force reviewed the current problems with existing conversion factors and finalized the units and definitions as well as the desired factors and balances of the various forest products. A questionnaire was developed and reviewed by the Task Force members, and in November of 2008, it was sent out to the Joint Forest Sector Questionnaire correspondents as well as task force members. In some cases we were referred to, or independently, found a national expert.

3. At the 2009 meeting of the Joint UNECE/FAO Working Party on Forest Economics and Statistics, it was reported[2] that only five countries and one trade association had completed the questionnaire, since then, the Timber Section has received conversion factors from another 11 countries, giving a total of 16 countries[3].

4. Drafting of *Forest Products Conversion Factors for the UNECE Region* started in August 2009 and a draft version was sent out to all of the correspondents for comment and revision in late 2009. The final manuscript is currently in the printing process and should be out in April 2010.

II. Discussion and Results

5. The *Report* contains 934 submitted ratios representing 185 different products and subcategories of products. The decision to break many of the product categories into subcategories was helpful in explaining why there were significant differences in some of the conversion factors for a major product (e.g. coniferous sawnwood), while the conversion factors for products in a subcategory (e.g. green and rough coniferous sawnwood) appeared more logical and pointed out differences in data harmonization. In all instances where data appeared to be incorrect, out of the normal range, or when contradictions were found with other conversion factors, the issue was noted and sent to the correspondents for review and possible revision.

6. In addition to containing tables with national conversion factors, the *Report* contains substantial explanatory text to assist the reader with understanding the drivers of conversion factors (why they differ) and to give them a basic understanding of the methodology and procedures behind the measurement units for the various forest products.

7. The data contained in the *Report* gives a strong indication that many of the conversion factors, are being used in the UNECE/FAO studies, are in need of revision. The conversion factors in table 1 (below) show the factors which have been in use (under the heading "FAO and UNECE Statistical Yearbooks") and the factors as found from the conversion factor questionnaire (under the heading "Results from UNECE/FAO 2010 Conversion Factors Questionnaire").

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[1] Available at: www.unece.org/timber/workshops/2008/wood-balance/docs/ConversionFactor_v8.pdf

[2] Available at: http://timber.unece.org/fileadmin/DAM/meetings/forest-products-conversion-factors.pdf

[3] Austria, Canada, Czech Republic, Finland, France, Germany, Ireland, Lithuania, Netherlands, Norway, Slovakia, Spain, Sweden, Switzerland, United Kingdom, United States of America, and the Confederation of European Paper Industries.

Table 1: Comparison of conversion factors JFSQ (FAO Yearbook of Forest Products) with proposed factors

JFSQ codes	Quantity unit	Item	Volume to weight m^3 per MT	Volume to area m^3 per m^2	Roundwood equivalent	m^3 per MT	Volume to area m^3 per m^2	Roundwood equivalent	Note
		FAO and UNECE Statistical Yearbooks				Results from UNECE/FAO 2010 Conversion Factors Questionnaire (median ratios)			
1	1000 m^3	Roundwood							
1.1	1000 m^3	Wood fuel, including wood for charcoal	1.38						
1.1.c	1000 m^3	Coniferous	1.60			green=1.07, seasoned=1.77			1
1.1.nc	1000 m^3	Non-coniferous	1.33			green=0.91, seasoned=1.32			2
1.2	1000 m^3	Industrial roundwood (wood in the rough)							
1.2.c	1000 m^3	Coniferous				1.07			3
1.2.nc	1000 m^3	Non-coniferous				0.91			4
1.2.nc.t	1000 m^3	Of which:tropical	1.37			Africa=1.31 Asia=0.956 Latin America= 0.847 World=1.12			5
1.2.1	1000 m^3	Sawlogs and veneer logs							
1.2.1.c	1000 m^3	Coniferous	1.43			1.07			3
1.2.1.nc	1000 m^3	Non-coniferous	1.25			0.91			4
1.2.2	1000 m^3	Pulpwood (round & split)	1.48						
1.2.2.c	1000 m^3	Coniferous	1.54			1.12			6
1.2.2.nc	1000 m^3	Non-coniferous	1.33			0.91			7
1.2.3	1000 m^3	Other industrial roundwood	1.33						
1.2.3.c	1000 m^3	Coniferous	1.43			1.07			3
1.2.3.nc	1000 m^3	Non-coniferous	1.25			0.91			4
2	1000 mt	Wood charcoal	6.00			6.00			8
3	1000 m^3	Wood chips and particles	1.60			c=1.19, nc=1.01, mix=1.13	2.83 m^3 / m^3 solid		9
4	1000 m^3	Wood residues	1.50			green=1.13, seasoned=1.87	4.00 m^3 / m^3 solid		9, 10
5	1000 m^3	Sawnwood			1.6 / 1.82*			c=1.89, nc=1.89	11
5.c	1000 m^3	Coniferous	1.82			green=1.20, seasoned=1.99		rough-green=1.67, rough-dry=1.99, surfaced-dry=2.13	11
5.nc	1000 m^3	Non-coniferous	1.43			green=1.05, seasoned=1.50		rough-green=1.86, rough-dry=2.01, surfaced-dry=2.81	11
5.nc.t	1000 m^3	Of which:tropical							
6	1000 m^3	Wood-based panels			1.6				
6.1	1000 m^3	Veneer sheets	1.33	0.0025	1.9*				
6.1.c	1000 m^3	Coniferous				green=1.19, seasoned=2.11		2.00	11
6.1.nc	1000 m^3	Non-coniferous				green=1.05, seasoned=1.53		2.00	11
6.1.nc.t	1000 m^3	Of which:tropical							
6.2	1000 m^3	Plywood	1.54	0.105	2.3*				
6.2.c	1000 m^3	Coniferous				1.69		2.07	11
6.2.nc	1000 m^3	Non-coniferous				1.54		2.25	11
6.2.nc.t	1000 m^3	Of which:tropical				1.54		1.8	11
6.3	1000 m^3	Particle board (including OSB)	1.54			1.6	.0018	Particle board only =1.5	11
6.3.1	1000 m^3	Of which: OSB				1.3	.0018	1.63	11
6.4	1000 m^3	Fibreboard							
6.4.1	1000 m^3	Hardboard	1.05	0.005		1.1	.0003	1.93	11
6.4.2	1000 m^3	MDF (medium density)	2.00	0.016		1.34	.0016	1.7	11
6.4.3	1000 m^3	Insulating board	4.00	0.025		3.19	.0025	0.71	11
7	1000 mt	Wood pulp			3.37			3.86	11
7.1	1000 mt	Mechanical						2.50	11
7.2	1000 mt	Semi-chemical						2.70	11
7.3	1000 mt	Chemical						4.90	11
7.3.1	1000 mt	Sulphate unbleached						4.63	11
7.3.2	1000 mt	Sulphate bleached						4.50	11
7.3.3	1000 mt	Sulphite unbleached						4.64	11
7.3.4	1000 mt	Sulphite bleached						5.01	11

JFSQ codes	Quantity unit	Item	Volume to weight m^3 per MT	Volume to area m^3 per m^2	Roundwood equivalent	m^3 per MT	Volume to area m^3 per m^2	Roundwood equivalent	Note
7.4	1000 mt	Dissolving grades						5.65	11
8	1000 mt	Other pulp							
8.1	1000 mt	Pulp from fibres other than wood							
8.2	1000 mt	Recovered fibre pulp							
9	1000 mt	Recovered paper				1.28 mt in per mt out			11
10	1000 mt	Paper and paperboard			3.37			3.6	11
10.1	1000 mt	Graphic papers							
10.1.1	1000 mt	Newsprint						2.80	11
10.1.2	1000 mt	Uncoated mechanical						3.50	11
10.1.3	1000 mt	Uncoated woodfree							
10.1.4	1000 mt	Coated papers						3.95	11
10.2	1000 mt	Sanitary and household papers						4.90	11
10.3	1000 mt	Packaging materials						3.25	11
10.3.1	1000 mt	Case materials						4.20	11
10.3.2	1000 mt	Folding boxboard						4.00	11
10.3.3	1000 mt	Wrapping papers						4.10	11
10.3.4	1000 mt	Other papers mainly for packaging						4.00	11
10.4	1000 mt	Other paper and paperboard n.e.s						3.48	11
	Unit		m^3/unit			m^3/unit			
	1000 board feet (sawlogs)		4.53			See note 12			12
	1000 board feet (sawnwood)		2.36			nc=2.36, c=1.70			13
	1000 square feet (1/8 inch thickness)		0.295						
	cord		3.625			2.43 solid			14
	cord (pulpwood)		2.55			2.43 solid			14
	cord (wood fuel)		2.12			2.43 solid			14
	cubic foot		0.02832						
	cubic foot (stacked)		0.01841						
	cunit		2.83						
	fathom		6.1164						
	hoppus cubic foot		0.0222						
	hoppus super(ficial) foot		0.00185						
	hoppus ton (50 hoppus cubic feet)		1.11						
	Petrograd Standard		4.672						
	stere		1			0.67 solid			14
	stere (pulpwood)		0.72			0.67 solid			14
	stere (wood fuel)		0.65			0.67 solid			14

1: Based on 935 kg/m^3 green, specific gravity of .42, 20% moisture (mcd), and 89% wood + 11% bark. Source: Conversion factors Questionnaire, 2010.

2: Based on 1093 kg/m^3 green, specific gravity of .55, 20% moisture (mcd), and 87% wood + 13% bark. . Source: Conversion factors Questionnaire, 2010.

3: Based on 935 kg/m^3. Source: Conversion factors Questionnaire, 2010.

4: Based on 1093 kg/m^3. Source: Conversion factors Questionnaire, 2010.

5: Based on weighted averages by species. Sources: ITTO , Annual Review and Assessment of the World Timber Situation, 2007; Fonseca, 2005.

6: Based on 891 kg/m^3. Source: Conversion factors Questionnaire, 2010.

7: Based on 1093 kg/m^3. Source: Conversion factors Questionnaire, 2010.

8 : Unchanged. Source: Conversion factors Questionnaire, 2010.

9: Mix assumes about 65% conifer and 35% non-conifer. Source: Conversion factors Questionnaire, 2010.

10: Assumes a basic density of 466 kg/m^3 for seasoned and 15% mcd.; wood residues assumed to be planer shavings. Source: Conversion factors Questionnaire, 2010; Hartman et al, 1981.

11: Source: Conversion factors Questionnaire, 2010.

12: Oregon, Washington, Alaska (west of the Cascades), southeast & central US (Doyle softwood): = 6.3;
Other Western US, Great Lakes, southeast (Doyle & Scribner hardwood), eastern Canada = 5.7;
Northeast US (International ¼" log rule region) = 5.0 .
Source: estimated by Matt Fonseca (UNECE/FAO Timber Section) based on personal experience (should be confirmed with USFS and Canadian Ministry of Forestry).

13: Non-conifer (nc) assumes nominal and actual measure are same; conifer (c) assumes that actual is 72% of nominal measure.

14: Based on assumed 67% solid wood content of stacked roundwood and assumes no differentiation between pulpwood and wood fuel.

Abbreviations used in table: c = coniferous, nc = non-coniferous, mt = metric ton

III. Conclusions and next steps

8. It is hoped that *Forest Product Conversion Factors for the UNECE Region*, will provide the Working Party, the Team of Specialists on Forest Sector Outlook and other interested people with a useful tool for accomplishing their tasks and analysis. Unlike past reports, explanatory information was included as a reference and aid for those in need of a better understanding of the determiners of conversion factors. Prospects for future work and use of conversion factors should improve when people understand the drivers and variables. ***The Working Party's feedback on the format, explanatory text, and structure of the Report, would be useful for any future work on conversion factors.***

9. This is the first update of conversion factors since 1987 and many of the conversion factors from past inquires have changed significantly. ***The Working Party is invited to comment on whether revisions should be made to the "standard conversion factors" used by the UNECE/FAO and possibly in the FAO Yearbook of Forest Products.***

10. Many of the Task Force members and correspondents struggled to get conversion factors, and some, despite their best efforts, were unable to fill in the questionnaire. It is clearly not an easy task and many countries did not have resources to allocate to this project. In addition, the Task Force underestimated the time it would take to gather the data. Prior to 1987, the UNECE/FAO reported on conversion factor approximately every four years. It would seem logical that regularizing this process would make for more current factors, but it might also make the task easier by introducing predictability thereby giving correspondents more time to amass the information. ***The Working Party is invited provide guidance on whether the UNECE/FAO Timber Section should make conversion factor inquiry and reporting a scheduled task (for example, every four years).***

11. Finally, conversion factors are inextricably linked to units and definitions. Anything done to harmonize units affects conversion factors, and while the issues of data harmonization and conversion factors have been presented in two separate background papers, they are in fact connected.