Economic Impact of Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco) production in the Czech Republic

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ABSTRACT: The article addresses the issues of Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco) production in the Czech Republic (CR). Our analysis shows that the tree species can occupy 149,616–163,713 ha in the CR (with respect to ecological limits set by the Czech legislation). The potential economic effect expressed by the gross yield of forest production might be higher by 27–30 million EUR·yr^{-1}. The results of the analysis support the forest owners' interest to extend Douglas-fir production in the CR, similarly like it has been extended systematically in all European countries where natural conditions allow.

Keywords: forest production cost; forest production efficiency; gross yield of forest production; production value; yield of forest production

Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco) is considered one of the most important tree species in the timber trade worldwide. It was introduced into Europe from North America more than 150 years ago and today it represents also the most significant species, widely planted in the last century (Podrázský et al. 2013b). Among European countries, it was used in forestry practice especially in Germany, France, Italy, and also in almost all countries in the temperate forest zone (Schmid et al. 2014). In Germany and France, for instance, Douglas-fir is grown on more than 300 thousands ha and its share is going to increase gradually to 5% of the forest land, since in western European markets it is priced higher than Norway spruce – by 25% on average (Burgbacher, Greve 1996). In Germany, the public have already accepted Douglas-fir as a naturalized species in many cases (Kantor, Mareš 2008). This tree species is also considered to be a naturalized neophyte in the flora of the Czech Republic (Danihelka 2012). Douglas-fir was introduced into the Czech forestry practice at the approximately same time but to a lesser extent – though with obvious success at some places. It is grown on ca 5,600 ha, which represents roughly 0.22% of the forest land area (Podrázský et al. 2013a).

The production potential of Douglas-fir is carefully surveyed in the CR to be utilized appropriately (Martiník 2003; Kantor 2007, 2008; Mareš 2009; Martiník, Podrázský et al. 2009; Urban et al. 2009; Hart et al. 2010; Kantor et al. 2001a,b, 2010; Tauchman et al. 2010). All above cited papers unanimously confirm the production dominance of Douglas-fir over all native species and most introduced species. Podrázský et al. (2013a) presented forestry statistics proving that Douglas-fir might be outperformed only by grand fir – on suitable sites.

The soil-forming function of Douglas-fir has also been widely analysed; the negative influence of Douglas-fir on the pedochemical structure of humus forms and mineral horizons was ruled out, even in the case of less advisable monocultures (Podrázský et al. 2002, 2009; Podrázský, Remeš 2008; Menšík et al. 2009; Kupka et al. 2013).

Douglas-fir, compared to Norway spruce, is more drought-resistant (Urban et al. 2009; Nadezhdina

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et al. 2014). Therefore, this tree species might help to substitute Norway spruce at lower altitudes, while not only compensating but even substantially raising the production function of forest stands (Podrázský et al. 2013a). Douglas-fir and its production in the CR and in Europe, though, require further extensive and exhaustive research (Schmidt et al. 2014). Possible environmental risks have not been ruled out nor quantified yet, though preliminary results indicate that native phytocoenoses are influenced less than in the case of Norway spruce (Augusto et al. 2003; Podrázský et al. 2011). Douglas-fir can replace – at least partly – the native species, suffering on specific sites (Vacek, Podrázský 1994; Vacek et al. 2009). Forestry practice also lacks substantial information on economic aspects of Douglas-fir growing and its various uses, despite positive experience of many Douglas-fir producers and traders. Preliminary studies on a comparison of individual tree species stands imply considerable potential benefits of Douglas-fir growing and expansion in the Czech Republic (Podrázský et al. 2013b).

The present study aims to analyse an economic impact of the potential extended Douglas-fir production in the Czech Republic. Potential extension is based on the typological system of silviculture in the Czech Republic that has long kept to the principle of sustainability of forest management. Based on these ecologic limits, optimum economic silvicultural and felling operations and forest production costs were calculated, as well as potential yields from both tending and regeneration felling. Thirdly, the economic potential is analysed in two variants. The first variant excludes Douglas-fir from the forest stands; the other variant includes an ecologically tolerable share of Douglas-fir in the target management. The synthetic top criterion of economic potential valuation is the gross yield of the forest production.

MATERIAL AND METHODS

The effect of potential expansion of Douglas-fir in the CR was calculated on the following grounds:

– In case that the legislative norm (Amendment 5 to Regulation No. 84/1996) allows growing Douglas-fir as a soil-improving species, it is limited only by an obligatory verdict of environmentalists. It usually allows for a maximum of 15% of introduced tree species in a production forest.
– In case that Douglas-fir is considered as admixed (Amendment 4 to Regulation No. 84/1996), the appropriate share of Douglas-fir is up to 7%.
– In case that Douglas-fir growing is presented as appropriate (e.g. Poleno, Vacek 2009) but the legislation does not include it as fundamental or as soil-improving tree species, Regulation No. 139/2004 of Ministry of Agriculture recommends the use of Douglas-fir up to 5% of the forest stand.

Input data for economic potential calculation.

Results of the Project of Czech National Agency for Agricultural Research "Differentiation of intensities and management practices in relation to forest biodiversity and economic sustainability of forestry", coordinated by Faculty of Forestry and Wood Sciences, are fundamental information input for the calculation of economic potential. The calculation is based on the following prerequisites:

(1) ecological limits given by the type system of the CR and its legislation. The analysis takes account especially of recommended species composition, share of soil-improving species, rotation period and target management (Norway spruce, Scots pine, oak and European beech);
(2) proposal of optimum economic measures of silvicultural and felling operations;
(3) calculation of forest production potential yield was based on yield tables (Yield and mensurational tables of the principal tree species of the Czech Republic, Yield and mensurational tables of tree species of the Czech Republic);
(4) sorting was based on tables for N quality – healthy, undamaged, straight stems (Pařez 1987a,b);
(5) considering main collections in each girth class (6+ to 1), currently traded in the CR and evaluated in market prices published by the Czech Statistical Office for the year 2012;
(6) calculation of direct costs of silvicultural and felling operations is based on performance standards (Nouza, Nouzová 2003); prerequisites: to include an average and uniform 15% surcharge to the basic norm; to consider unilinear wage tariff of CZK 65.00/Nh in silvicultural operations and CZK 80.00/Nh in felling operations (estimated national average; it might vary in regions); to include uniform social and health insurance (34% to wage costs); to include uniform reimbursement (39% to wage costs);
(7) the basic spatial unit for evaluation was a group of forest habitat types (GFHT) – Fig. 2;
(8) the principal synthetic indicator of evaluation effect was gross yield of forest production (GPFP) defined as the difference between yields and full standard costs.

Table 1. Sample calculation of economic parameters for GFHT 6B, target management: Norway spruce, rotation period: 120 years

Stand age (yr)	MRI	TMI	Costs of operations*		Total costs*	Felling yields*		TMVI*	AGYFP*
	(m³·ha⁻¹)		silvicultural	felling		improvement	regeneration		
50	7.38	9.34	177	245	422	91	454	545	123
55	7.34	9.12	161	241	402	83	466	549	147
60	7.31	9.45	147	243	390	105	483	588	198
65	7.23	9.20	136	238	374	97	473	570	196
70	7.15	9.38	126	238	364	116	477	592	228
75	7.01	9.08	118	231	349	108	474	582	233
80	6.88	9.16	110	229	339	124	471	595	255
85	6.74	8.89	104	223	327	117	462	578	251
90	6.61	8.64	98	218	316	110	459	569	253
95	6.45	8.37	93	212	305	104	447	552	247
100	6.30	8.12	88	206	295	99	440	539	245
105	6.14	7.88	84	200	285	95	432	526	242
110	5.99	7.65	80	195	275	90	422	512	237
115	5.83	7.42	77	190	266	86	412	498	231
120	5.69	7.21	74	185	258	83	402	484	226
125	5.46	6.92	71	177	248	79	386	465	217
130	5.25	6.66	68	170	238	76	371	447	209
135	5.06	6.41	65	164	230	74	357	431	201
140	4.88	6.18	63	158	221	71	344	415	194
145	4.71	5.97	61	153	214	68	332	401	187
150	4.55	5.77	59	148	207	66	321	387	181
155	4.41	5.58	57	143	200	64	311	375	175
160	4.27	5.41	55	138	194	62	301	363	170

*in EUR/ha/yr, GFHT – group of forest habitat types, MRI – mean rotation increment, TMI – total mean increment, TMVI – total mean value increment, AGYFP – annual gross yield of forest production

For an example of the calculation of the above-mentioned economic parameters for GFHT 6B (Table 1).

Table 2 presents the tree species share without Douglas-fir (variant I), for which the calculation was prepared in the framework of the above-mentioned project; and considered a change in the tree species composition in favour of Douglas-fir (variant II).

RESULTS

Three variants of the gross yield of forest production were analysed:

– limit values of the gross yield of forest production for the total forest stand area in the Czech Republic, i.e. 2,630,579 ha (ad 1),
– limit values of the gross yield of forest production for selected groups of forest habitat types where Douglas-fir growing is possible, i.e. 1,795,390 ha. Limit gross yield was calculated without Douglas -fir in the second composition (ad 2),
– limit values of the gross yield of forest production for selected groups of forest habitat types where Douglas-fir growing is possible, i.e. 1,795,390 ha, including Douglas-fir (ad 3).

(1) Summarisation of data on the respective groups of forest habitat types and their land areas within the CR (without Douglas-fir – see the project "Differentiation of intensities and management practices in relation to forest biodiversity and economic sustainability of forestry") enables us to calculate the overall economic effect of forests in the CR, expressed by the criterion of the gross yield of forest production, evident in Fig. 1. The comparison of minimum and maximum production potential shows an enormous influence of target management. In given natural conditions, the target composition represents the optimum value of potential production, with respect to the forest ecosystem sustainability (ecological stability, or possibly – tolerable destabilisation); it is optimum in these conditions. In the framework of the project, four types of target management were calculated

Table 2. Change in tree species composition

GFHT	TM	Variant I				Variant II		
		species	composition (%)	species	composition (%)	species	YC	composition (%)
5M	EB	LA	–5			DG	5	5
6M	EB	LA	–5	EB	–10	DG	7	15
6M	NS	LA	–5	NS	–10	DG	7	15
3K	SP	LA	–5			DG	5	5
3K	EB	LA	–5			DG	5	5
4K	NS	LA	–5	NS	–10	DG	5	15
4K	EB	EB	–5			DG	5	5
5K	EB	LA	–5	EB	–10	DG	5	15
5K	NS	LA	–5	NS	–10	DG	5	15
6K	EB	LA	–5	EB	–10	DG	5	15
6K	NS	LA	–5	NS	–10	DG	5	15
3I	SP	LA	–5			DG	5	5
3I	NS	LA	–5	NS	–10	DG	5	15
3I	EB	LA	–5			DG	5	5
4I	EB	EB	–5			DG	5	5
4I	NS	LA	–5	NS	–10	DG	5	15
5I	EB	EB	–15			DG	5	15
5I	NS	LA	–5	NS	–10	DG	5	15
6I	EB	EB	15			DG	5	15
6I	NS	LA	–5	NS	–10	DG	5	15
3N	SP	SP	–5			DG	7	5
3N	NS	LA	–5	NS	–10	DG	7	15
3N	EB	LA	–5			DG	7	5
4N	SP	SP	–5			DG	7	5
4N	NS	LA	–5	NS	–10	DG	7	15
4N	EB	LA	–5			DG	7	5
5N	NS	LA	–5	NS	–10	DG	5	15
5N	EB	LA	–5	EB	–10	DG	5	15
6N	NS	LA	–5	NS	–10	DG	5	15
6N	EB	LA	–5	EB	–10	DG	5	15
5S	NS	NS	–5			DG	3	5
5S	EB	NS	–5			DG	3	5
6S	NS	NS	–5			DG	3	5
6S	EB	NS	–5			DG	3	5
5F	NS	NS	–10	EB	–5	DG	3	15
5F	EB	EB	–5			DG	3	5
6F	NS	NS	–10	EB	–5	DG	3	15
6F	EB	EB	–5			DG	3	5
5B	NS	NS	–7			DG	3	7
6B	EB	NS	–7			DG	3	7
6B	NS	NS	–7			DG	3	7
5D	EB	NS	–7			DG	1	7
5D	NS	NS	–7			DG	1	7
6D	EB	NS	–7			DG	3	7
6D	NS	NS	–7			DG	3	7
5A	NS	NS	–10	EB	–5	DG	5	15
5A	EB	EB	–5			DG	5	5
6A	NS	NS	–10	EB	–5	DG	3	15

GFHT	TM	Variant I				Variant II		
		species	composition (%)	species	composition (%)	species	YC	composition (%)
6A	EB	EB	–5			DG	3	5
2S	OA	LA	–5	OA	–2	DG	5	7
3S	EB	NS	–7			DG	5	7
3S	NS	NS	–7			DG	5	7
4S	EB	NS	–7			DG	3	7
4S	NS	NS	–7			DG	3	7
1H	OA	LA	–7			DG	5	7
2H	OA	LA	–7			DG	3	7
3H	EB	EB	–7			DG	3	7
3H	NS	NS	–7			DG	3	7
4H	EB	NS	–7			DG	3	7
4H	NS	NS	–7			DG	3	7
5H	EB	NS	–7			DG	3	7
5H	NS	NS	–7			DG	3	7
6H	EB	NS	–7			DG	3	7
6H	NS	NS	–7			DG	3	7
1B	OA	OA	–7			DG	3	7
2B	OA	OA	–7			DG	3	7
3B	EB	EB	–7			DG	3	7
3B	NS	LA	–5	NS	–2	DG	3	7
4B	EB	EB	–7			DG	3	7
4B	NS	LA	–5	NS	–2	DG	3	7
1D	OA	OA	–7			DG	3	7
2D	OA	OA	–7			DG	3	7
3D	EB	NS	–7			DG	3	7
3D	NS	NS	–7			DG	3	7
4D	EB	NS	–7			DG	3	7
4D	NS	NS	–7			DG	3	7
2W	OA	LA	–7			DG	5	7
1V	OA	OA	–7			DG	3	7
2V	OA	OA	–7			DG	3	7
1O	OA	LA	–7			DG	5	7
2O	OA	LA	–7			DG	5	7
2K	SP	SP	–5			DG	5	5
2K	OA	OA	–5			DG	5	5
2I	SP	LA	–5			DG	5	5
2I	OA	LA	–5			DG	5	5
2M	SP	SP	–5			DG	7	5
3M	SP	SP	–5			DG	7	5
4M	SP	SP	–5			DG	7	5

GFHT – group of forest habitat types, TM – target management, YC – yield class, SP – Scots pine, EB – European beech, DG – Douglas-fir, FI – fir, OA – oak, NS – Norway spruce, LA – larch

– Norway spruce, Scots pine, oak and European beech. Some groups of forest habitat types allow only one target management, while the owners of the majority of GFHT can choose among two or three variants of target management.

When comparing the limit variants of target management, we have to stress the following aspects:

– synthetic criterion used for the comparison is the annual gross yield of forest production,
– gross yield of forest production is calculated as a potential, i.e. for healthy and undamaged forest stands,
– both variants strictly observe ecological limits set by Czech legislation,

Fig. 1. Annual gross yield of forest production (EUR/ha/yr), without Douglas-fir, by GFHT and of target management in an ecological network of the typological system of the CR

GROUP OF FOREST HABITAT TYPES																									
Line	transitional			extreme			exposed			acid			nutritious				gleyed				waterlogged			alluvial	
faz	W	C	X	Z	Y	J	A	F	N	M	K	I	S	B	H	D	V	O	P	Q	T	G	R	L	U
9 dwarf pine	m. i. A m. i. B																								
8 spruce	m. i. C m. i. D			NS 33	NS 46		NS 100	NS 119	NS 119	NS 90	NS 105		NS 105				NS120			NS 107	NS 82	NS 178	NS 82		
7 beech-spruce	m. i. E			NS 39	NS 46			NS 151	NS 111	NS 84	NS 116		NS 126	NS 127			NS 196	NS 156	NS 146	NS 119	NS 130	NS 185	NS 130		
6 spruce-beech					NS 42		NS 167 EB 51	NS 172 EB 70	NS 117 EB 32	EB 25 NS 85	EB 88 NS 124	EB 42 NS 125	NS 198 EB 72	EB 96 NS 226	EB 80 NS 202	EB 96 NS 226	EB 86 NS 223	NS 170	NS 115	NS 104		NS 187	NS 187		
5 fir-beech	NS 175 EB 62	EB 61			NS 35	EB 23	NS 207 EB 54	NS 172 EB 73	NS 126 EB 36	EB 23	EB 47 NS 126	EB 47 NS 126	NS 204 EB 91	NS 226	EB 91 NS 117	EB 96 NS 226	EB 86 NS 224	NS 171	NS 145	NS 106 SP 78		NS 209	NS 107		NS 190
4 beech	EB 62	EB 43 SP 48			SP 26		NS 191 EB 52	NS 179 EB 67	SP 86 NS 132 EB 39	SP 18 OA 19	NS 130 EB 50	EB 50 NS 130	EB 75 NS 158	EB 91 NS 211	EB 91 NS 211	EB 76 NS 237	NS 235 EB 86 OA 157	NS 197 OA 158	NS 139 OA 49	SP 29		NS 209	NS 198		
3 oak-beech	EB 70	EB 50 SP 33			SP 22	EB 0,4	NS 167 EB 47	NS 148 EB 62	SP 43 NS 130 EB 34	SP 10 OA 12	SP 32 EB 96	SP 29 NS 130 EB 97	EB 80 NS 156	EB 91 NS 211	EB 91 NS 212	EB 81 NS 177	NS 233 EB 86 OA 156	NS 154 EB 66 OA 186				NS 195		AL 94	NS 260
2 beech-oak	OA 46	SP 25 OA 31		OA 14			OA 79		SP 28 OA 31	SP 10 OA 12	SP 25 OA 27	SP 33 OA 37	SP 75 OA 54	OA 100	OA 141	OA 64	OA 86	OA 117	SP 44	SP 29				OA 179	
1 oak		SP 22 OA 19	OA 17	OA 14		OA 19	OA 31		SP 22 OA 23	SP 49	SP 8 OA 15	SP 25 OA 28	SP 41 OA 97	OA 72	OA 48	OA 64	OA 86	OA 101	SP 51	SP 29				OA 146	OA 172
0 pine		SP 57		SP 10	SP 14				SP 37	SP 9	SP 30							SP 92	SP 93	SP 17	SP 78	SP 93	SP 25		

faz – forest altitudinal zone, W–U – category, m.i. A–E – management intensity, NS – Norway spruce target management, SP – Scots pine target management, OA – oak target management, EB – European beech target management, AL – alder target management,

Fig. 2. Groups of forest habitat types and target management overview, with the inclusion of Douglas-fir, and gross yield of forest production increment compared to the variant without Douglas-fir in the tree species composition (EUR/ha/yr)

	GROUP OF FOREST HABITAT TYPES																								
Line	transitional			extreme			exposed			acid			nutritious				gleyed				waterlogged			alluvial	
faz	**W**	**C**	**X**	**Z**	**Y**	**J**	**A**	**F**	**N**	**M**	**K**	**I**	**S**	**B**	**H**	**D**	**V**	**O**	**P**	**Q**	**T**	**G**	**R**	**L**	**U**
9 dwarf pine																									
8 spruce																									
7 beech-spruce																									
6 spruce-beech							NS 23 EB 13	NS 22 EB 10	NS 26 EB 34	EB 33 NS 27	EB 34 NS 26	EB 35 NS 24	NS 5 EB 5	EB 4 NS 5	EB 6 NS 7	EB 4 NS 5									
5 fir-beech							NS 26 EB 11	NS 22 EB 7	NS 24 EB 34	EB 12	EB 34 NS 24	EB 34 NS 24	NS 5 EB 4	NS 5	EB 6 NS 7	EB 7 NS 7									
4 beech									SP 11 NS 24 EB 10	SP 12	NS 25 EB 12	EB 12 NS 25	EB 8 NS 9	EB 19 NS 15	EB 6 NS 7	EB 4 NS 5									
3 oak-beech									SP 11 NS 24 EB 11	SP 12	NS 25 EB 12	SP 12 NS 27 EB 11	EB 6 NS 6	EB 19 NS 15	EB 19 NS 7	EB 6 NS 7									
2 beech-oak	OA 12									SP 12	SP 13 OA 12	SP 13 OA 11	OA 15	OA 13	OA 13	OA 12	OA 10	OA 13							
1 oak														OA 12	OA 12	OA 12	OA 10	OA 13							
0 pine																									

faz – forest altitudinal zone, W–U – category, NS – Norway spruce target management, SP – Scots pine target management, OA – oak target management, EB – European beech target management

Table 3. Limit tree species share in the CR

Species	Minimum variant		Maximum variant	
	share (%)	area (ha)	share (%)	area (ha)
NS	19	509,093	48	1,249,857
SP	17	442,198	6	158,659
EB	37	960,547	20	528,323
OA	21	548,059	16	416,929
LA	5	120,092	7	175,948
FI	1	36,333	3	86,604
AL	0.5	12,129	0.5	12,129

SP – Norway spruce, SP – Scots pine, EB – European beech, OA – oak, LA – larch, FI – fir, AL – alder

– all calculations use current prices of inputs and outputs of forest production.

It is evident that, in compliance of the above mentioned optimum economic measures and other inputs, forest production is profitable in the framework of all groups of forest habitat types. The economic potential might lie within the following limits: minimum production potential (AGYFP) = 201,948,692 EUR·yr^{-1}, maximum production potential (AGYFP) = 331,713,967 EUR·yr^{-1}. Table 3 shows the limit tree species share in the CR.

(2) Overview of groups of forest habitat types where Douglas-fir growing is possible (see the methodology) is shown in Fig. 2. The economic potential in this variant is expressed without Douglas-fir in the stands. The table also shows the increment of gross yield in this variant, compared with the variant without Douglas-fir. Summarization of data on the respective groups of forest habitat types and their land areas within the CR brings us to realize that:

– the area of GFHT where Douglas-fir is able to grow in the CR is 1,795,390 ha,
– the minimum and maximum production potential expressed by the gross yield of forest production, calculated in the same way as the total forest area potential (ad 1), lies within the following limits: minimum production potential (AGYFP) = 124,061,862 EUR·yr^{-1}, maximum production potential (AGYFP) = 240,206,186 EUR·yr^{-1}. The tree species share in GFHT where Douglas-fir is possible to grow in CR (this calculation is done without DG) is shown in Table 4.

Table 4. Tree species share

Species	Minimum variant		Maximum variant	
	share (%)	area (ha)	share (%)	area (ha)
NS	13	229,278	48	854,340
SP	15	264,388	2	39,100
EB	44	801,409	25	447,651
OA	22	394,986	15	260,398
LA	5	85,514	7	133,790
FI	1	19,816	3	60,112

SP – Norway spruce, SP – Scots pine, EB – European beech, OA – oak, LA – larch, FI – fir

(3) Results of the production potential variant analysis that includes Douglas-fir are apparent in the following comparison: minimum production potential (AGYFP) = 153,778,713 EUR·yr^{-1}, maximum production potential (AGYFP) = 266,707,056 EUR·yr^{-1}. The tree species share in GFHT with Douglas-fir is presented in Table 5.

Table 5. Tree species share

Species	Minimum variant		Maximum variant	
	share (%)	area (ha)	share (%)	area (ha)
NS	11	197,493	44	786,221
SP	14	256,275	2	36,307
EB	40.5	725,976	23	419,988
OA	22	390,650	13	237,976
LA	3	55,564	5	87,881
FI	1	19,816	4	63,304
DG	8.5	149,616	9	163,713

SP – Norway spruce, SP – Scots pine, EB – European beech, OA – oak, LA – larch, FI – fir, DG – Douglas-fir

DISCUSSION AND CONCLUSION

The analysis of the issue of Douglas-fir growing in the CR brings the following results:

– Potential area (in compliance with the ecological limits set by our legislation) might range between 149,616 and 163,713 ha, i.e. 5.7–6.2% of forest land in the CR. That implies rather a considerable increase compared to the current 0.22% area of forest land.
– Potential economic effect expressed by the synthetic criterion of the gross yield of forest production might be increased by 27–30 mil. EUR·yr^{-1} (depending on the selected target management), i.e. by 8–15%.

It is necessary to stress, though, that ours was the first study in this field and we still lack some partial results for economic evaluation of all aspects of this species growing. Many issues are still to be tackled by research, among them the following ones (Podrázský et al. 2013b):

– valid yield tables of Douglas-fir are elaborated only for the age up to 70. Therefore it was necessary to extrapolate data for higher age levels;

– Douglas-fir assortment was based on Norway spruce (analogically, larch on Scots pine), which is another simplification caused by insufficient research; it might influence the evaluation of respective species;
– timber stock structuring into respective assortments is also rather general, tabular, and might look substantially different in individual cases; the existing methodology does not allow for assessing optimum sale prices of the stock;
– setting the price of Douglas-fir respective assortments is a particular issue. There is almost no information on selling this species in the CR, therefore, with the help of BURGBACHER's and GREVE's works (1996), roundwood assortments of Douglas-fir were evaluated as Norway spruce, raised by 25%.

These data entitle Douglas-fir to be considered beneficial not only in view of the production volume, which is supported by other authors in different growing conditions on fertile sites of the Křtiny training forest enterprise (KANTOR 2008; KANTOR et al. 2001a,b), on acid sites of the Hůrky training forest district in the Písek District (KANTOR, MAREŠ 2009; KANTOR et al. 2010) and also on lush and acid sites of the CULS forest establishment in Kostelec nad Černými lesy (PODRÁZSKÝ et al. 2009; TAUCHMAN et al. 2010), but even more in view of the value production.

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