

How to harvest more or better forest products?

The economic effect of reduced regeneration investments on forest stand value – exemplified for European beech

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Traditional wood production of high quality

Even-aged natural regeneration of beech

Costs (€/ha)	Consu	mption	Costs		Age from seed (yrs)						
	Num -ber	Unit	€	Unit	0	1 - 9	10 - 19	20-29	Total €/ha		
Preparation spraying	1	h/ha	134,4	€/h	134,4				134,4		
Cleaning	3	h/ha	62,7	€/h	188,2				188,2		
Soil preparation	7	h/ha	55,7	€/h	389,8				389,8		
Fence	400	m/ha	3,4	€/m	1371,0				1371,0		
Fence maintenance	1	h/ha	21,5	€/h		107,5			107,5		
Fence removal	8	h/ha	40,3	€/h			322,6		322,6		
Pre-commercial thinning	30	h/ha	17,0	€/h			510,8		510,8		
Pre-commercial thinning	25	h/ha	17,2	€/h				860,2	860,2		
Total					2083,3	107,5	833,3	860,2	3884,4		









Traditional wood production of high quality

Cash flow (beech, site index 1) (Forest rent criterion)

Age	OS(0)*	OS(5)	OS(15)	OS(20)	TH(25)*	TH(35)	TH(45)	TH(55)	TH(65)	TH(75)	TH(85)
€/ha	2238,7	6090,7	13690,6	4103,7	41,0	1765,7	1920,7	1928,7	1878,7	2115,1	2483,1

Average annual cash flow (AACF) = 425 €/(ha yr)

Expectation value (EV), r=2% (Soil rent criterion (EV))

Age	OS(0)	OS(5)	OS(15)	OS(20)	TH(25)	TH(35)	TH(45)	TH(55)	TH(65)	TH(75)	TH(85)
€/ha	28328,6	26995,8	22350,1	15066,7	14349,0	16583,4	18178,6	20024,6	22295,0	24974,8	27913,4

Expectation value (EV) (yr 0), r=1% = 49,400 €/ha







*OS = over storey removal, TH = thinning



Reduced regeneration investment

Costs (€/ha)	Consu	mption	costs		Age from seed (yrs)					
	Number	Unit	€	Unit	0	1 - 9	10 - 19	20-29	Total €/ha	
Plants (ash, sycamore)	300		0,4		121,0				121,0	
Planting	300		0,3		80,6				80,6	
Fence	52	m/ha	3,4		174,7				174,7	
Regeneration tending						403,2			403,2	
Total					376,3	403,2			779,6	







Assumptions: Forest rent (AACF) and soil rent criteria (EV)

Reduced regeneration investment No degradation of logs Real property tax included No incentives No income tax

No inheritance duty

Average annual cash flow (AACF): $460 \notin /(ha yr)$ Expectation value (EV) (yr 0) (before regeneration harvest): r=2%: 32,600 \notin/ha r=1%: 55,200 \notin/ha









Assumptions: Forest rent (AACF) and soil rent criteria (EV) "Chess board model": Equal relative reduction of investment and economic yield

Reduced regeneration investment by (1.0 - 780 €/ha/3,880 €/ha) = 80% Reduced economic yield by 80% (except first over-storey removal)

AACF (1st generation): 344 € /(ha yr), (2nd generation): 70 €/(ha yr) (Loss: 81 €/(ha yr), 19%; 355 €(ha yr), 84%) Expectation value (EV) (yr 0) (before regeneration harvest):

r=2%: 25,200 €/ha (loss = 7,400€/ha, 23%)

r=1%: 30,900 €/ha (loss: 24,300 €/ha, 44%)



FOREST & LANDSCAPE







Assumptions: Soil rent criterion (2%) Equal expectation value at yr 0 Economic break even point Reduced cash flow from over-storey (2nd generation)

Standard regeneration 3,880 €/ha Low regeneration investment 780 €/ha

Standard EV(2%) 28,300 €/ha Low investment EV(2%) 32,600 €/ha Equal EV (2%), 28,300 €/ha with reduced cash flow from over-storey = 26,500 €/ha (2nd generation) ≈ 90% AACF (2nd generation) = 166 €/(ha yr)







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Assumptions: Soil rent criterion (1%) Equal expectation value at yr 0 Economic break even point Reduced cash flow from over-storey

Standard regeneration 3,880 €/ha Low regeneration investment 780 €/ha

Standard EV(1%) 49,400 €/ha Low investment EV(1%) 55,200 €/ha Equal EV (1%), 49,400 €/ha with reduced cash flow from over-storey = 9,400 €/ha (2nd generation) \approx 32% AACF (2nd generation) = 355 €/(ha yr)



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Assumptions: Forest rent criterion Economic break even point Reduced cash flow from over-storey

Standard regeneration 3,880 €/ha Low regeneration investment 780 €/ha

Standard AACF: 425 €/(ha yr) Low investment AACF: 460 €/(ha yr) Equal AACF, 425 €/(ha yr) with reduced cash flow from over-storey = $3,100 €/ha \approx 10\%$







Assumptions: Forest rent and soil rent criteria A logs converted to B logs – in 2nd generation (10% A logs at 40-50 cm DBH)

Low regeneration investment 780 €/ha

EV(yr 0) with standard assortment distribution and stumpage prices: r=2%: 32,600 \in /ha r=1%: 55,200 \in /ha AACF: 460 \in /(ha yr) EV(yr 0) with A logs converted to B logs: r=2%: 31,900 \in /ha (loss = 2%) r=1%: 52,900 \in /ha (loss = 4%) AACF: 417 \in /(ha yr) (loss = 9%) (2nd generation)









Effect of low regeneration investment on EV and AACF









Effect of reduced economic yield by 80% on EV and AACF









Necessary change of cash flow from over-storey to reach break even/ Possible reduction of cash flow from over-storey without economic loss















Climate change, environmental values & socio-economic evaluation

Strong or weak regeneration/high or low regeneration investment

- Climate
- change
- issues
- Environmental
- values

- Socioeconomic
- evaluation

- 1. Health (adaptation/mitigation)
- 2. CO₂ sequestration (global warming)
- 3. Energy from wood
- tal 4. Species diversity
 - 5. Biodiversity
 - 6. Habitat protection/conservation
 - 7. Water production
 - 8. Recreation
 - 9. Landscape
 - 10. Hunting
 - 11. Avalanche/soil erosion protection
 - 12. Business-economic value













Conclusions

- Regeneration intensity is higher in countries with a forest rent foundation than in countries with a soil rent foundation
- The value of forests is higher in forest rent countries than in soil rent countries
- Traditional (in contrast with the trend following the financial crisis) high regeneration investments are preferred when the goal is to harvest more and better forest products in the future European forests







Thank you for your attention!







More information

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