

Financial results of poplar line plantations

National Poplar Commission Working group "Economics"

In January 1969 the working group "Poplar Economics" of the National Poplar Commission of the Netherlands published a report on the financial results of widely spaced poplar stands ("Populier", volume 8, nr. 1, January 1969).

The second project of the working group concerned a calculation of the financial results of poplar line plantings, based on estimates of costs and yield. A preliminary analysis indicated the necessity of separating roadside plantings and plantations along cultivated lands in the calculations. Because of their great variation in growth conditions and cultural methods roadside plantings were kept out of these. On account hereof, they apply only to row plantations along agricultural land, especially grassland.

To do this research the working group "Poplar Economics" was formed with the following members:
 ir. H. A. van der Meiden, chairman (Stichting Industrie-Hout)
 ir. M. Bol (Forest Research Station "de Dorschkamp")
 ir. C. P. van Goor (Forest Research Station "de Dorschkamp")
 ir. W. E. Meijerink (Royal Netherlands Land Development and Reclamation Society)
 ir. A. J. van der Poel (State Forest Service, IJsselmeerpolders Development Authority)
 ir. E. P. L. Hessels, secretary (IJsselmeerpolders Development Authority).

The results can be summarized as follows:

1 The calculations are based on poplar row plantations of 20 trees with 5 meter spacing. They concern plantations both on sandy and on clay soil, established with 1 year old as well as with 2 year old planting material, in all cases with rotations of 20, 25 and 30 years, for different growth classes and varying timber prices.

2 The profit to be obtained is calculated in two ways, firstly by the balance per ha, secondly by the internal rate of interest. The working group prefers the latter method. An interest of 2% is applied in the calculation of total profit and discounted annual profit; the reason for application of this low rate is due to the fact that forest products and also products of line plantations are exempted from income tax in the Netherlands.

3 In the calculations of the balance only drainage taxes and land taxes, but no land values were included as costs. If required, the discounted annual profits can be varied with a certain amount depending on the development of the land value. As this is not possible with the internal rate of interest, varying land rents were included.

4 Table 1 gives a survey of the average of variable and fixed costs in plantations bordering grassland. The expenditure made to protect the trees against damage by cattle is remarkably high (tables 1, 2 and 9).

5 The yield data are based on measurements, carried out at about 60 line plantations. The Forest Research Station (P. J. Faber) made some preliminary "yield tables". There was a remarkable difference in the proportion diameter/height between 'Gelrica' on the one hand and other cultivars ('Robusta', 'Heidemij' and 'Marilandica') on the other which is the reason why they were separated. Both are divided into three growth classes (table 3).

6 The revenues are determined with prices of f 50, f 55 and f 60 per m³ for standing timber. These prices concern only the part of the stem up to a minimum diameter of 25 cm; no net revenue is calculated for the rest of the stem (table 4).

7 The exploitation estimates generally show a surplus (tables 5 and 6). The internal rates of interest are mentioned in tables 7 and 8. The profits are exempted from income tax.

8 Even a small increase of the timber production has a large positive effect on the profit (table 10).

9 The highest internal rate of interest, and thus the maximum return on the capital invested is obtained – with short rotations in cases of very good growth ('Gelrica' 1: 20 years at most),
 – with a longer rotation (20 to 30 years) in other cases (table 7 paragraph 1).

10 It is much cheaper to use 1-year-old plants (table 1). With the same rotation the use of 2-year-old plants must lead to a higher production in order to give a profit comparable to that of the use of 1-year-old plants; this compensating increase in production must be, depending on the rotation, from 0,8-0,10 m³ per tree on sand and from 0,13 to 0,16 m³ per tree on clay. The higher costs of 2-year-old plants could be

compensated also by a shorter rotation but with the same yield, thus with a higher annual increment; this shortening should be from 1 to 1,5 year on sandy soils and from 2 to 4 years on clay soils the poorer the growth the shorter the rotation. If the use of 2-year-old plants does not lead to a higher production, the use of 1-year-old plants gives a higher profit, which can be considerable, especially with shorter rotations and in the case of poorer growth (table 12).

11 In order to compare the results in this report to those in former calculations, the labour costs are based on f 7 per productive man hour. Besides a calculation was made with labour costs based on f 10 per productive man hour (table 13 and 14; the

latter must be compared to table 7).

12 The fixed costs for land and management are much lower with line plantations than with stands. But the first require much higher costs for cleaning the felling site, while the protection against cattle is very expensive for plantings bordering grassland (table 16). In general the costs per tree in line plantations along grassland are somewhat higher than those for trees in poplar forest. An example: After 25 years line plantations on sandy soils, established with 1 year old plants, must produce from 0,11 to 0,13 m³ per tree more than stands, if the higher costs are to be compensated. This is not much considering the more rapid growth of poplars in single rows.

Table 1 - Costs of poplar line plantations bordering grassland, based on 20 trees with a spacing of 5 m (guilders per 100 m). Labour costs f 7 per productive man hour.

	costs per 100 m (f)			
	sandy soil		clay soil	
	1 year old plants	2 years old plants	1 year old plants	2 years old plants
variable costs				
establishment				
- lining out	5	5	5	5
- digging of planting pits (by hand)	8	16	15	45
- planting material	8	52	8	52
- heeling, unloading and transport	3	3,50	4	4,50
- planting	10	20	13	39
weed control				
- 1st year	20	20	20	20
- 2nd year	20	20	20	20
fertilization				
- 1st year	5	5	5	5
- 2nd year	5	5	5	5
- 3rd year	5	5	5	5
protection against cattle	128	128	128	128
pruning (incl. pruning of epicormics)				
- 4th year	8	5	8	5
- 7th year	5	5	5	5
- 10th year	15	15	15	15
- 14th year	20	20	20	20
removal of pruned branches				
- 7th year	5	5	5	5
- 10th year	10	10	10	10
- 14th year	20	20	20	20
burning of branches and tops after felling	65	65	65	65
fixed costs				
land taxes	0,06	0,06	0,06	0,06
drainage taxes	0,90	0,90	0,90	0,90

Table 2.1 - Prolongation of costs during 20 years. Rate of interest 2%. (guilders per 100 m).

	costs per 100 m (f)			
	sandy soil		clay soil	
	1 year old plants	2 years old plants	1 year old plants	2 years old plants
variable costs				
establishment				
- lining out	7,5	7,5	7,5	7,5
- digging of planting pits (by hand)	12	24	22,5	67
- planting material	12	77,5	12	77,5
- heeling, unloading and transport	4,5	5	6	6,5
- planting	15	29,5	19,5	58
weed control				
- 1st year	29,5	29,5	29,5	29,5
- 2nd year	29	29	29	29
fertilization				
- 1st year	7,5	7,5	7,5	7,5
- 2nd year	7,5	7,5	7,5	7,5
- 3rd year	7	7	7	7
protection against cattle	190	190	190	190
pruning (incl. pruning of epicormics)				
- 4th year	11	7	11	7
- 7th year	6,5	6,5	6,5	6,5
- 10th year	18,5	18,5	18,5	18,5
- 14th year	23	23	23	23
removal of pruned branches				
- 7th year	6,5	6,5	6,5	6,5
- 10th year	12,5	12,5	12,5	12,5
- 14th year	23	23	23	23
burning of branches and tops after felling	65	65	65	65
total	487,5	576	504	649
fixed costs				
land taxes	1,5	1,5	1,5	1,5
drainage taxes	22	22	22	22
total costs	511	599,5	527,5	672,5

Table 2.2 - Prolongation of costs during 25 years. Rate of interest 2%. (guilders per 100 m).

	costs per 100 m (f)			
	sandy soil		clay soil	
	1 year old plants	2 years old plants	1 year old plants	2 years old plants
variable costs				
establishment				
- lining out	8	8	8	8
- digging of planting pits (by hand)	13	26	24,5	74
- planting material	13	85,5	13	85,5
- heeling, unloading and transport	5	5,5	6,5	7,5
- planting	16,5	33	21,5	64
weed control				
- 1st year	33	33	33	33
- 2nd year	32	32	32	32
fertilization				
- 1st year	8	8	8	8
- 2nd year	8	8	8	8
- 3rd year	8	8	8	8
protection against cattle	210	210	210	210
pruning (incl. pruning of epicormics)				
- 4th year	12,5	7,5	12,5	7,5
- 7th year	7,5	7,5	7,5	7,5
- 10th year	20,5	20,5	20,5	20,5
- 14th year	25,5	25,5	25,5	25,5
removal of pruned branches				
- 7th year	7,5	7,5	7,5	7,5
- 10th year	13,5	13,5	13,5	13,5
- 14th year	25,5	25,5	25,5	25,5
burning of branches and tops after felling	65	65	65	65
total	532	629,5	550	710,5
fixed costs				
land taxes	2	2	2	2
drainage taxes	29	29	29	29
total	563	660,5	581	741,5

Table 2.3 - Prolongation of costs during 30 years. Rate of interest 2%. (guilders per 100 m).

	costs per 100 m (f)			
	sandy soil		clay soil	
	1 year old plants	2 years old plants	1 year old plants	2 years old plants
variable costs				
establishment				
- lining out	9	9	9	9
- digging of planting pits (by hand)	14,5	29	27	81,5
- planting material	14,5	94	14,5	94
- heeling, unloading and transport	5,5	6,5	7	8
- planting	18	36	23,5	70,5
weed control				
- 1st year	36	36	36	36
- 2nd year	35,5	35,5	35,5	35,5
fertilization				
- 1st year	9	9	9	9
- 2nd year	9	9	9	9
- 3rd year	8,5	8,5	8,5	8,5
protection against cattle	232	232	232	232
pruning (incl. pruning of epicormics)				
- 4th year	13,5	8,5	13,5	8,5
- 7th year	8	8	8	8
- 10th year	22,5	22,5	22,5	22,5
- 14th year	28	28	28	28
removal of pruned branches				
- 7th year	8	8	8	8
- 10th year	15	15	15	15
- 14th year	28	28	28	28
burning of branches and tops after felling	65	65	65	65
total	579,5	687,5	599	776
fixed costs				
land taxes	2,5	2,5	2,5	2,5
drainage taxes	36,5	36,5	36,5	36,5
total costs	618,5	726,5	638	815

Table 3 - Yield of poplar per km line planting.

yield class	age	diameter (cm)	height (m)	volume (m ³)	volume ¹⁾ (m ³)	1 cc (m ³ /km ² /year)	1 cc	
							stemwood with 25 cm topdia- meter	Ve ¹⁾ (m ³)
I	20	44,5	26	1,665	300	15,6	266	13,3
	25	30	28,5	2,310	416	16,6	381	15,2
	30	53	30	2,739	493	16,4	461	15,3
II	20	39	23	1,125	203	10,2	166	8,4
	25	44	25,5	1,594	287	11,5	253	10,1
	30	47	27	1,929	347	11,6	314	10,5
III	20	34,5	20,5	0,782	141	7,1	104	5,2
	25	39	23	1,125	203	8,1	168	6,7
	30	41	24	1,299	234	7,8	200	6,7
I	20	51	26	2,159	389	19,5	360	18,0
	25	37,5	28,5	3,014	543	21,7	516	20,6
	30	61	30	3,576	644	21,5	618	20,6
II	20	45	23	1,480	266	13,3	238	11,9
	25	51	25,5	2,112	380	15,2	352	14,1
	30	54	27	2,513	452	15,1	425	14,2
III	20	39	20,5	0,989	178	8,9	146	7,3
	25	45	23	1,480	266	10,6	238	9,5
	30	47	24	1,687	304	10,1	274	9,1

Note 1) Volume stemwood with 7 cm topdiameter after reduction with 10% to account for losses.

2) Reduction factor in order to calculate the volume of wood with a top diameter of 25 cm.

Table 4 - Revenue at the end of the rotation (guilders per 100 m).

rotation per m ³	wood price	revenue (f/100 m)					
		Robusta a.o.			Gallica		
		I	II	III	I	II	III
20	f 50,-	1330	830	520	1800	1190	730
25	"	1905	1265	840	2580	1760	1190
30	"	2305	1570	1000	3090	2125	1370
20	f 55,-	1463	913	572	1980	1309	803
25	"	2096	1392	924	2838	1936	1209
30	"	2536	1727	1100	3399	2338	1507
20	f 60,-	1596	996	624	2160	1428	876
25	"	2286	1518	1008	3096	2112	1428
30	"	2766	1884	1200	3708	2550	1644

Table 5.1 - Exploitation estimates for 100 m line plantation (20 trees), wood price f 55/m³. Revenue exempted from income tax.

yield class	rotation	total costs		total profit end rotation (f/100 m)	discounted annual profit (f/100 m)
		prolonged with 2% (f/100 m)	revenue (f/100 m)		
I	20	511	1463	952	39
	25	563	2096	1533	48
	30	619	2536	1917	47
II	20	511	913	402	17
	25	563	1392	829	26
	30	619	1727	1108	27
III	20	511	572	61	3
	25	563	924	361	11
	30	619	1100	481	12
I	20	511	1980	1469	61
	25	563	2838	2275	71
	30	619	3399	2780	69
II	20	511	1309	798	33
	25	563	1936	1373	43
	30	619	2338	1719	42
III	20	511	803	292	12
	25	563	1309	746	23
	30	619	1507	888	22

Table 5.2 - Exploitation estimates for 100 m line plantation (20 trees), wood price f 55/m³. Revenue exempted from income tax.

sandy soil, 2 year old plants				
yield rotation class	total costs prolonged with 2X (f/100 m)	revenue (f/100 m)	total profit end rotation (f/100 m)	discounted annual profit (2X) (f/100 m)
I	20	600	1463	863
	25	661	2096	1435
	30	727	2536	1809
II	20	600	913	313
	25	661	1392	731
	30	727	1727	1000
III	20	600	572	- 28
	25	661	924	263
	30	727	1100	373
I	20	600	1980	1380
	25	661	2838	2177
	30	727	3399	2672
II	20	600	1309	709
	25	661	1936	1275
	30	727	2338	1611
III	20	600	803	203
	25	661	1309	648
	30	727	1507	780

Table 5.3 - Exploitation estimates for 100 m line plantation (20 trees), wood price f 55/m³. Revenue exempted from income tax.

clay soil, 1 year old plants				
yield rotation class	total costs prolonged with 2X (f/100 m)	revenue (f/100 m)	total profit end rotation (f/100 m)	discounted annual profit (2X) (f/100 m)
I	20	528	1463	935
	25	581	2096	1515
	30	638	2536	1898
II	20	528	913	383
	25	581	1392	811
	30	638	1727	1089
III	20	528	572	44
	25	581	924	343
	30	638	1100	462
I	20	528	1980	1452
	25	581	2838	2257
	30	638	3399	2761
II	20	528	1309	781
	25	581	1936	1355
	30	638	2338	1700
III	20	528	803	275
	25	581	1309	728
	30	638	1507	869

Table 5.4 - Exploitation estimates for 100 m line plantation (20 trees), wood price f 50/m³. Revenue exempted from income tax.

clay soil, 2 year old plants				
yield rotation class	total costs prolonged with 2X (f/100 m)	revenue (f/100 m)	total profit end rotation (f/100 m)	discounted annual profit (2X) (f/100 m)
I	20	673	1463	790
	25	742	2096	1354
	30	815	2536	1721
II	20	673	913	240
	25	742	1392	650
	30	815	1727	912
III	20	673	572	-101
	25	742	924	182
	30	815	1100	285
I	20	673	1980	1307
	25	742	2838	2096
	30	815	3399	2584
II	20	673	1309	636
	25	742	1936	1194
	30	815	2338	1523
III	20	673	803	130
	25	742	1309	567
	30	815	1507	692

Table 6.1 - Profit per 100 m of plantation with varying wood prices. Sandy soil, 1 year old plants.

yield rotation class		total profit with wood price			discounted annual profit (2X) with wood price		
		f50/m ³	f55/m ³	f60/m ³	f50/m ³	f55/m ³	f60/m ³
I	20	819	952	1085	34	39	45
	25	1342	1533	1723	42	48	54
	30	1686	1917	2147	42	47	53
II	20	319	402	485	13	17	20
	25	702	829	955	22	26	30
	30	951	1108	1265	23	27	31
III	20	9	61	113	0+	3	5
	25	277	361	445	9	11	14
	30	381	481	581	9	12	14
I	20	1289	1469	1649	53	61	68
	25	2017	2275	2533	63	71	79
	30	2471	2780	3089	61	69	76
II	20	679	798	917	28	33	38
	25	1197	1373	1549	37	43	48
	30	1506	1719	1931	37	42	48
III	20	219	292	364	9	12	15
	25	627	746	865	20	23	27
	30	751	888	1025	19	22	26

Table 6.2 - Profit per 100 m of plantation with varying wood prices. Sandy soil, 2 year old plants.

yield rotation class		total profit with wood price			discounted annual profit (2X) with wood price		
		f50/m ³	f55/m ³	f60/m ³	f50/m ³	f55/m ³	f60/m ³
I	20	730	863	996	30	36	41
	25	1244	1435	1625	39	45	51
	30	1578	1809	2039	39	45	50
II	20	230	313	396	10	13	16
	25	604	731	857	19	23	27
	30	843	1000	1157	21	25	27
III	20	-80	-28	24	(-4)	(-1)	1
	25	179	263	347	6	8	11
	30	273	373	473	7	9	12
I	20	1200	1380	1560	49	57	64
	25	1919	2177	2435	60	68	76
	30	2363	2672	2981	58	66	74
II	20	590	709	828	24	29	34
	25	1099	1275	1451	34	40	45
	30	1398	1611	1823	35	40	45
III	20	130	203	275	5	8	11
	25	529	648	767	17	20	24
	30	643	780	917	16	19	23

Table 7.1 - Internal rate of interest (exempted from income tax) of 100 m of line plantation on sandy soil with varying land rents; wood price f 55 per m³ for standing timber.

yield rotation class	planting material	revenue (f/100 m)	internal rate of interest					
			with land rent/ha/year					
			f70	f100	f130	f160	f190	
I	20	1 year	1463	7,9	7,5	7,1	6,7	6,3
		2 year	1463	6,8	6,5	6,1	5,8	5,3
	25	1 year	2096	7,8	7,5	7,1	6,8	6,5
		2 year	2096	7,0	6,7	6,4	6,1	5,8
	30	1 year	2536	7,1	6,7	6,4	6,1	5,8
		2 year	2536	6,4	6,1	5,8	5,5	5,3
II	20	1 year	913	4,8	4,3	3,8	3,4	2,9
		2 year	913	3,8	3,3	2,9	2,5	2,1
	25	1 year	1392	5,7	5,3	4,9	4,5	4,2
		2 year	1392	4,9	4,6	4,2	3,9	3,5
	30	1 year	1727	5,4	5,1	4,7	4,4	4,1
		2 year	1727	4,8	4,5	4,2	3,9	3,6
III	20	1 year	572	1,6	1,0	0,3	0,1	<0,1
		2 year	572	0,7	0,1	<0,1	<0,1	<0,1
	25	1 year	924	3,6	3,1	2,6	2,2	1,8
		2 year	924	2,8	2,4	2,0	1,6	1,2
	30	1 year	1100	3,5	3,1	2,7	2,3	1,9
		2 year	1100	2,9	2,5	2,2	1,8	1,4
I	20	1 year	1980	9,9	9,5	9,1	8,7	8,4
		2 year	1980	8,7	8,4	8,1	7,8	7,5
	25	1 year	2838	9,3	9,0	8,7	8,4	8,1
		2 year	2838	8,4	8,2	7,9	7,6	7,4
	30	1 year	3399	8,2	7,9	7,7	7,4	7,1
		2 year	3399	7,5	7,3	7,1	6,8	6,6
II	20	1 year	1309	7,2	6,8	6,3	5,9	5,5
		2 year	1309	6,1	5,8	5,4	5,0	4,7
	25	1 year	1936	7,4	7,1	6,7	6,4	6,0
		2 year	1936	6,6	6,3	6,0	5,6	5,3
	30	1 year	2338	6,7	6,4	6,1	5,8	5,5
		2 year	2338	6,1	5,8	5,5	5,2	5,0
III	20	1 year	803	4,0	3,4	2,9	2,4	1,9
		2 year	803	3,0	2,5	2,0	1,6	1,2
	25	1 year	1309	5,4	5,0	4,6	4,2	3,8
		2 year	1309	4,6	4,3	3,9	3,5	3,2
	30	1 year	1507	4,9	4,5	4,1	3,8	3,4
		2 year	1507	4,2	3,9	3,6	3,3	3,0

Table 7.2 - Internal rate of interest (exempted from income tax) of 100 m of line plantation on clay soil with varying land rents; wood price £ 55 per m³ for standing timber.

Yield class	rotation	planting material	revenue (£/100 m)	internal rate of interest (%)				
				with land rent/ha/year				
				£70	£100	£130	£160	£190
I	20	1 year	1463	7,7	7,3	6,9	6,5	6,1
		2 year	1463	6,1	5,8	5,4	5,1	4,8
	25	1 year	2096	7,6	7,3	7,0	6,6	6,3
		2 year	2096	6,4	6,1	5,8	5,6	5,3
	30	1 year	2536	6,9	6,6	6,3	6,0	5,7
		2 year	2536	5,9	5,6	5,4	5,2	4,9
II	20	1 year	913	4,6	4,1	3,7	3,2	2,7
		2 year	913	3,1	2,7	2,3	1,9	1,5
	25	1 year	1392	5,6	5,2	4,8	4,4	4,1
		2 year	1392	4,4	4,1	3,7	3,4	3,1
	30	1 year	1727	5,3	5,0	4,6	4,3	4,0
		2 year	1727	4,3	4,1	3,8	3,5	3,2
III	20	1 year	572	1,4	0,8	0,1	<0,1	<0,1
		2 year	572	0,1	<0,1	<0,1	<0,1	<0,1
	25	1 year	924	3,4	3,0	2,5	2,1	2,6
		2 year	924	2,3	1,9	1,5	1,2	0,8
	30	1 year	1100	3,6	3,0	2,6	2,2	1,8
		2 year	1100	2,5	2,1	1,8	1,4	1,1
I	20	1 year	1980	9,7	9,3	8,9	8,6	8,2
		2 year	1980	8,0	7,7	7,4	7,1	6,8
	25	1 year	2838	9,2	8,9	8,5	8,2	8,0
		2 year	2838	7,9	7,6	7,4	7,1	6,9
	30	1 year	3399	8,1	7,8	7,5	7,3	7,0
		2 year	3399	7,1	6,8	6,6	6,4	6,2
II	20	1 year	1309	7,0	6,6	6,2	5,8	5,4
		2 year	1309	5,4	5,1	4,7	4,4	4,1
	25	1 year	1936	7,2	6,9	6,5	6,2	5,9
		2 year	1936	6,0	5,7	5,4	5,2	4,9
	30	1 year	2338	6,6	6,3	6,0	5,6	5,3
		2 year	2338	5,6	5,3	5,1	4,8	4,6
III	20	1 year	803	3,7	3,2	2,7	2,2	1,8
		2 year	803	2,3	1,9	1,4	1,0	0,5
	25	1 year	1309	5,3	4,9	4,5	4,1	3,7
		2 year	1309	4,1	3,7	3,4	3,1	2,8
	30	1 year	1507	4,7	4,4	4,0	3,7	3,3
		2 year	1507	3,8	3,5	3,2	2,9	2,6

Table 8 - Internal rate of interest of 100 m of 'Gelrica' line plantation on sandy soil with varying land rents; wood price £ 50/m³ standing timber, labour costs £ 7 per productive man-hour.

Yield class	rotation	planting material	revenue (£/100)	internal rate of interest (%)				
				with land rent/ha/year				
				£70	£100	£130	£160	£190
I	20	1 year	1800	9,3	8,9	8,5	8,1	7,8
		2 year	1800	8,1	7,8	7,5	7,2	6,9
	25	1 year	2580	8,9	8,5	8,2	7,9	7,6
		2 year	2580	8,0	7,7	7,4	7,1	6,9
	30	1 year	3090	7,9	7,5	7,3	7,0	6,7
		2 year	3090	7,2	6,9	6,6	6,4	6,2
II	20	1 year	1190	6,6	6,1	5,7	5,3	4,9
		2 year	1190	5,5	5,1	4,7	4,3	4,0
	25	1 year	1760	6,9	6,6	6,2	5,8	5,5
		2 year	1760	6,1	5,8	5,5	5,2	4,8
	30	1 year	2125	6,3	6,0	5,6	5,3	5,0
		2 year	2125	5,6	5,3	5,1	4,8	4,5
III	20	1 year	730	3,3	2,7	2,2	1,7	1,2
		2 year	730	2,3	1,8	1,3	0,9	0,4
	25	1 year	1190	4,9	4,5	4,1	3,7	3,3
		2 year	1190	4,1	3,8	3,4	3,0	2,7
	30	1 year	1370	4,5	4,1	3,7	3,3	3,0
		2 year	1370	3,8	3,5	3,2	2,8	2,5

Table 9.1 - Different costs in % of the total costs prolonged to the end of the rotation. Sandy soil.

	% of total costs			
	1 year old plants rotation		2 year old plants rotation	
	20	25	30	35
variable costs				
establishment				
- lining out	1,5	1,4	1,5	1,2
- digging of planting pits	2,3	2,3	2,3	3,9
- planting material	0,9	2,3	2,3	12,9
- heeling, etc.	0,9	0,9	0,9	0,9
- planting	3,0	3,0	2,9	5,0
	10,0		9,9	9,9
weed control	11,4		11,5	11,6
fertilization	4,3		4,3	4,3
protection against cattle				
pruning total ¹⁾	37,2		37,3	37,5
4th year	2,2	2,2	2,2	1,1
7th year	2,5	2,7	2,6	2,3
10th year	6,1	6,0	6,1	5,2
14th year	9,0	9,1	9,0	7,7
burning of branches after felling	12,7		11,5	10,5
total	95,4		94,5	93,7
fixed costs				
land taxes	0,3		0,4	0,4
drainage taxes	4,3		5,1	5,9
total	4,6		5,5	6,3

1) Including removal of pruned branches

Table 9.2 - Different costs in % of the total costs prolonged to the end of the rotation. Clay soil, rotation 25 years.

	% of total costs	
	1 year old plants	2 year old plants
	variable costs	
establishment		
- lining out	1,4	1,1
- digging of planting pits	4,2	10,0
- planting material	2,3	11,5
- heeling etc.	1,1	1,0
- planting	3,7	8,6
	12,7	32,2
weed control	11,2	8,8
fertilization	4,1	3,2
protection against cattle	36,1	28,3
pruning total ¹⁾	19,4	14,5
burning of branches after felling	11,2	8,8
total	94,7	95,8
fixed costs		
land taxes	0,3	0,3
drainage taxes	5,0	3,9
total	5,3	4,2

1) Including removal of pruned branches.

Table 10 - The influence of variation of the production on the total profit. Basis for comparison growth class II, rotation 25 years. (Sandy soil, 2 year old plants, wood price £ 55/m³).

Yield class	rotation	change in production as compared to II, 25 years		change in profit as compared to II, 25 years	
		m ³	%	£	%
		I	20	+ 13	+ 5
	25	+ 128	+ 51	+ 704	+ 96
	30	+ 208	+ 82	+ 1078	+ 147
II	20	- 87	- 34	- 418	- 57
	25	0	0	0	0
	30	+ 61	+ 24	+ 269	+ 37
III	20	- 149	- 59	- 739	- 104
	25	- 85	- 34	- 468	- 64
	30	- 53	- 21	- 358	- 49

Table 11 - Influence of change of the wood price with £ 5 per m³ (originally £ 55 per m³) on the total profit.

yield rotation class	change in total profit			
	in £	in % as compared to the profit at a price of £ 55/m ³		
		1 year old plants		2 year old plants
I Robusta s.o.	20	133	14,0	15,4
	25	191	12,5	13,3
	30	231	12,1	12,8
II	20	83	20,6	26,5
	25	127	15,3	17,4
	30	157	14,2	15,7
III	20	52	85,2	-
	25	84	23,3	31,9
	30	100	20,8	26,8
II	20	180	12,3	13,0
	25	258	11,3	11,9
	30	309	11,1	11,6
III Gelrica	20	119	14,9	16,8
	25	176	12,8	13,8
	30	213	12,4	13,2
I	20	73	25,4	36,9
	25	119	16,0	18,0
	30	137	15,4	17,6

Table 12 - Increase in profit by using 1 year old plants, if the use of 2 year old plants does not lead to an increase of the yield.

rotation class	increase in profit by using 1 year old plants as compared to 2 year old plants (£/100 m)			
	total		discounted annual profit	
	sand	clay	sand	clay
20	89	145	3,70	6,00
25	98	161	3,10	5,00
30	108	177	2,70	4,30

Table 13 - Difference in profit with £ 7 as compared to £ 10 labour costs per productive man hour. (Sandy soil)

rotation class	decrease in profit with £ 10 as compared to £ 7 labour costs (£/100 m)			
	total decrease in profit		discounted annual decrease in profit	
	1 year old plants	2 years old plants	1 year old plants	2 years old plants
20	162	174	6,70	7,20
25	175	189	5,50	5,90
30	191	205	4,70	5,10

Table 14 - Internal rate of interest for 100 m line plantation on sandy soil with varying land rents; wood price £ 55/m³ per standing timber, labour costs £ 10 per productive man hour (see table 7.1).

yield rotation class	planting material	profit (£/100m)	internal rate (%)				
			with land rent/ha/year				
			£ 70	£ 100	£ 130	£ 160	£ 190
I	1 year	1980	8,5	8,1	7,8	7,5	7,2
		1980	7,4	7,1	6,8	6,5	6,3
	25	2838	8,3	8,0	7,7	7,4	7,2
		2838	7,4	7,2	6,9	6,7	6,5
	30	3399	7,4	7,1	6,9	6,6	6,4
		3399	6,7	6,5	6,3	6,1	5,9
II	20	1309	5,7	5,4	5,0	4,6	4,3
		1309	4,7	4,4	4,1	3,7	3,4
	25	1936	6,3	6,0	5,7	5,4	5,1
		1936	5,5	5,2	5,0	4,7	4,4
	30	2338	5,8	5,5	5,3	5,0	4,7
		2338	5,2	5,0	4,7	4,4	4,2
III	20	803	2,4	1,9	1,4	0,9	0,4
		803	1,4	1,0	0,5	0,1	<0,1
	25	1309	4,3	3,9	3,6	3,2	2,9
		1309	3,5	3,2	2,9	2,6	2,3
	30	1507	4,0	3,6	3,3	3,0	2,7
		1507	3,4	3,1	2,8	2,5	2,3

Table 15 - Comparison of expenses for 200 trees in stands (See "Populier" January 1969) and line plantations (1 year old planting material).

	costs (£/ha) without interest			
	sandy soil		clay soil	
	stands	line plantings	stands	line plantings
variable costs				
establishment				
- lining out	50	50	50	50
- digging of planting pits	140	80	140	150
- planting material	80	80	80	80
- heeling, etc.	35	30	35	40
- planting	85	100	240	130
	390	340	545	450
weed control				
- 1st year	200	200	200	200
- 2nd year	200	200	200	200
	400	400	400	400
fertilization				
- 1st year	45	50	45	50
- 2nd year	45	50	45	50
- 3rd year	45	50	45	50
	135	150	135	150
protection against cattle	100	1280	100	1280
pruning				
- 1st year	75	80	75	80
- 4th year	150	50	150	50
- 10th year	150	150	150	150
- 14th year	225	200	225	200
	600	480	600	480
gathering of pruned branches				
- 7th year		50		50
- 10th year		100		100
- 14th year		200		200
	-	350	-	350
removal of branches after felling	250	650	250	650
total	1875	3650	2030	3760
fixed costs				
land taxes	5	0,6	5	0,6
drainage taxes	30	9	30	9
management costs	15	-	15	-
total per year	50	9,6	50	9,6