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EFFECT OF FERTILIZATION ON THE GROWTH AND STRUCTURE OF A SCOTS PINE STAND GROWING ON AN OMBROTROPHIC BOG

Lannoituksen vaikutus rämemännikön kasvuun ja rakenteeseen

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NPK fertilization increased volume growth by 6.3 m^3 ha^{-1} and PK fertilization by 4.3 m^3 ha^{-1} within six years after nutrient application. The results indicate that dominant and co-dominant trees respond to fertilization better than suppressed ones, and that the trees close to the ditches benefit almost as much from fertilization as those in the middle of the strip. NPK fertilization also increased the mortality of the intermediate trees.

Keywords: bog, drainage, increment, *Pinus sylvestris*, tree class

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INTRODUCTION

The effect of fertilization on the tree stand depends on factors such as the age and density of the stand, and on the fertility and water regime of the site. Many fertilization experiments have been carried out in pine stands on peat soils. Phosphorus and potassium are the growth limiting nutrients on most drained peatlands (e. g. Paavilainen 1979a). On ombrotrophic sites nitrogen is also essential to obtain a growth increase (e. g. Meshechok 1968, Brække 1977, 1983, Paavilainen 1977, 1979a). The effect of nitrogen fertilization lasts for nearly ten years, and that of PK fertilization up to 15 years (e.g. Paavilainen 1972, 1977, 1979b, Paavilainen and Simpanen 1975, Heikurainen and Laine 1985). The growth response is at its greatest after 3 to 5 years of treatment (Paavilainen 1972, Paavilainen and Simpanen 1975, Karsisto 1976).

Vigourous stem growth presupposes that the crowns of the trees have good light conditions. Different tree classes are affected by fertilization in different ways (Tamm 1966, Viro 1967, Fahlroth 1969, Gustavssen 1976, Kukkola 1978). Suppressed trees are not able to compete for nutrients and light with the trees in dominant tree classes. In dense stands, a shortage of light limits the growth of most trees. Thinning before fertilization thus guarantees the best results (Brix and Ebell 1969, Jonsson and Möller 1977, Haapanen et al. 1979, Saramäki and Silander 1982). On peat soils, effective drainage also improves the response to fertilization (Huikari and Paarlahti 1967, Heikurainen and

Veijola 1971, Heikurainen and Laine 1976).

The aim of this report is to describe the short-term growth responses after PK and NPK fertilization of Scots pines in different tree classes and at different distances from the ditches on a drained ombrotrophic pine bog. This study is part of a Nordic project the main objectives of which are to evaluate the amount, distribution and circulation of mineral nutrients after the drainage and fertilization of ombrotrophic pine bogs in different climatic conditions.

MATERIAL AND METHODS

Study site

The material was collected from an experimental field in northern Karelia (65 km SE of Joensuu 62°14' N; 29°50' E, 81 m a. s. l.). The site was drained in 1967 with a 50 m ditch spacing. Climatic data are given by Finér and Brække (1991). The depth of the groundwater table was monitored during 1984–1987 (Table 1). The site has a 1–3 metre-thick, nutrient-poor peat layer (see Brække and Finér 1991). The naturally regenerated Scots pine (*Pinus sylvestris* L.) stand growing on the experimental field is about 85 years old. The site is a low-shrub pine bog according to the classification of Heikurainen and Pakarinen (1982, see also Finér and Brække 1991).

The field experiment was started in June 1984, and fertilization carried out at the beginning of June, 1985. A 3 x 3 Latin square design was used with a plot size of 1 500 m^2. The buffer zone between the plots on the strips was ten meters. The treatments were as follows: 1) unfertilized (0), 2) PK(MgB), 3) NPK(MgB). The

Table 1. Groundwater level (cm) during June–September, 1984–1987.The values are average distances to the water table measured from the soil surface.

Taulukko 1. Pohjaveden pinnan taso (cm) kesä–syyskuussa vuosina 1984–1987. Arvot ovat etäisyyksiä mitattuna maanpinnasta pohjavesipintaan.

Year *Vuosi*	Treatment *Käsittely*	Distance from ditch *Etäisyys ojasta*					
		12.5 m			25m		
		$\bar{x}$	max	min	$\bar{x}$	max	min
1984	0	47	68	20	49	69	19
	PK	49	72	20	45	67	19
	NPK	51	73	21	44	64	19
1985	0	33	48	23	33	50	21
	PK	31	47	20	30	47	22
	NPK	32	49	22	30	45	20
1986	0	38	58	18	39	59	16
	PK	41	63	19	39	59	18
	NPK	41	62	18	37	56	15
1987	0	26	40	18	25	40	17
	PK	26	41	18	26	39	18
	NPK	27	43	18	24	37	16

amounts of elements (kg ha^{-1}) applied were: N 150, P 53, K 100, Ca 135, Mg 25, S 28, Cl 95, B 2.4. The fertilizers were given as ammonium nitrate, raw phosphate, potassium chloride, magnesium sulphate and sodium borate.

Field measurements

All the trees on the sample plots were numbered, mapped and a cross painted at breast height in late June 1984. The breast height diameter from two opposite directions (mm), height (dm) and crown length (dm) were measured. The trees were classified into different tree classes as follows: 1) dominant, 2) co-dominant, 3) intermediate, 4) suppressed 5) emergent 6) undergrowth. The breast-height diameters and height were remeasured in August 1987 and in early spring, 1991. The breast height diameters were measured at exactly the same points on all occasions. Dead and badly damaged trees were harvested during the course of the experiment.

Calculations

The over-bark stem volume of the trees was calculated by means of volume equations based on breast height diameter and height (Laasasenaho 1982). The increment in diameter, height, and stem volume with bark were determined as the difference

Table 2. Tree stand characteristics of all the trees before fertilization (1984) and dead or badly damaged trees during the experimental period and the F-values of treatments, (standard deviation and significance of F-value in parentheses), (d = arithmetic mean diameter (over bark), h = arithmetic mean height, g = over bark basal area, v = over bark stem volume, n = number of trees).

Taulukko 2. Puustotunnukset ennen lannoitusta (1984) koealoilla laskettuna erikseen kaikille ja tutkimusjaksolla kuolleille ja pahoin vioittuneille puille sekä käsittelyn F-arvot, (keskihajonta ja F-arvon merkitsevyys suluissa), (d = aritmeettinen kuorellinen keskiläpimitta, h = aritmeettinen keskipituus, g = kuorellinen pohjapinta-ala, v = kuorellinen runkopuun tilavuus, n = puiden lukumäärä).

Treatment *Käsittely*	d cm		h m		g m^{2}ha^{-1}		v m^{3}ha^{-1}		n Stems ha^{-1} *Runkoa ha^{-1}*	
				All trees in 1984 — *Kaikki puut 1984*						
0	8.7	(0.16)	8.9	(0.12)	15.4	(0.52)	80.9	(4.5)	2364	(103)
PK	8.7	(0.44)	8.8	(0.56)	15.3	(0.68)	80.3	(7.4)	2310	(230)
NPK	8.8	(0.22)	8.9	(0.40)	15.6	(1.18)	82.4	(9.9)	2335	(91)
F-value *F-arvo*	0.06	(0.95)	0.26	(0.79)	1.05	(0.49)	0.32	(0.76)	0.14	(0.88)
				1984–1991 dead and badly damaged trees *1984–1991 kuolleet ja pahoin vioittuneet puut*						
0	6.1	(0.20)	6.8	(0.32)	0.8	(0.22)	3.9	(0.8)	302	(166)
PK	6.2	(0.21)	6.9	(0.22)	1.0	(0.43)	4.8	(2.2)	317	(123)
NPK	6.1	(0.20)	7.1	(0.32)	1.8	(0.44)	8.1	(2.5)	563	(112)
F-value *F-arvo*	0.12	(0.89)	0.59	(0.63)	27.75	(0.04)	13.58	(0.07)	60.12	(0.02)

between the values measured in 1991, 1987 and 1984.

The differences between treatments were tested with the F-test after analysis of variance. The tests were done using the MANOVA procedure of the SPSS-X statistical package (SPSS-X...1983).

RESULTS AND DISCUSSION

Tree stand growth

The volume of the tree stand (Table 2) was almost the same (93 m^3 ha^{-1}), while the increment (Table 3) was 2–3 m^3 ha^{-1} $year^{-1}$ and number of stems per hectare 400–800 higher than those usually recorded on drained pine bogs of the same site type and development class in South Finland (see Keltikangas et al. 1986, Hökkä and Laine 1988). The stem size frequency distribution was typical of drained low-shrub pine bogs and did not differ very much from that on mineral sites of similar fertility (Fig. 1, see Ilvessalo 1920, Hökkä and Laine 1988).

Fertilization increased the diameter and volume increment of the tree stand during the study period. The effect of NPK fertilization on the diameter growth was sig-

Table 3. Tree stand growth (excluding badly damaged and dead trees) during 1984–1987, 1988–1990 and 1984–1990 on the control, PK and NPK fertilized plots and the F-values of treatments, (standard deviation and significance of F-values in parentheses), (i_d = arithmetic mean diameter increment, i_h = arithmetic mean height increment, i_v = over-bark stemwood volume increment).

Taulukko 3. Puuston kasvu (ilman pahoin vioittuneita ja kuolleita puita) vuosina 1984–1987, 1988–1990 ja 1984–1990 lannoittamattomilla, PK- ja NPK-lannoitetuilla koealoilla sekä käsittelyn F-arvot, (keskihajonta ja F-arvon merkitsevyys suluissa), (i_d = aritmeettisen keskiläpimitan kasvu, i_h = aritmeettisen keskipituuden kasvu, i_v = kuorellinen runkopuun tilavuuskasvu).

Treatment *Käsittely*	i_d cm		i_h m		i_v m^3ha^{-1}	
			1984–1987			
0	0.66	(0.08)	0.88	(0.02)	18.2	(1.2)
PK	0.69	(0.10)	0.93	(0.05)	18.7	(0.5)
NPK	0.83	(0.11)	0.96	(0.11)	20.2	(1.6)
F-value *F-arvo*	55.50	(0.02)	0.49	(0.67)	1.82	(0.35)
			1988–1990			
0	0.65	(0.06)	0.76	(0.15)	21.2	(2.5)
PK	0.79	(0.07)	0.86	(0.11)	24.9	(1.9)
NPK	0.85	(0.06)	0.94	(0.03)	25.4	(0.2)
F-value *F-arvo*	320.17	(0.00)	4.15	(0.19)	27.85	(0.04)
			1984–1990			
0	1.31	(0.14)	1.64	(0.17)	39.3	(3.7)
PK	1.48	(0.17)	1.79	(0.08)	43.6	(2.3)
NPK	1.68	(0.17)	1.90	(0.11)	45.6	(1.6)
F-value *F-arvo*	151.23	(0.01)	2.25	(0.31)	8.76	(0.10)

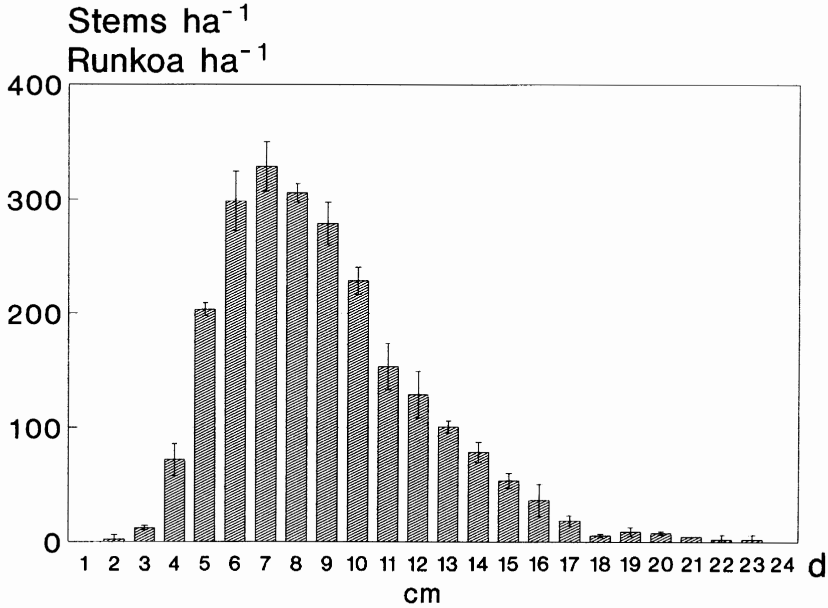


Fig. 1. The mean diameter distribution of all the trees in 1984.

Kuva 1. Keskimääräinen kaikkien puiden runkolukusarja käsittelyillä (n=3) vuonna 1984.

nificantly greater than that of PK fertilization ($p \leq 0.05$). The volume growth increased 6.3 m^3 ha^{-1} (16%) on the NPK and 4.3 m^3 ha^{-1} (11%) on the PK fertilized plots during the six-year study period. The better response to NPK fertilization was consistent with earlier studies in which nitrogen together with phosphorus and potassium, has been found to limit growth on low-shrub pine bogs (Paavilainen 1977, 1979a, 1984). The diameter growth increment in pine stands on peatlands is usually highest during the third and fourth year after fertilization, and that of height growth a few years later (Paavilainen 1972, Paavilainen and Simpanen 1975, Karsisto 1976).

During the study period more trees suffered from damage on the NPK plots than on those with the other treatments (Table 2). In most cases the damaged trees were the smallest ones, irrespective of the treatment, and suffered mainly from snow breakage. Fertilization is known to increase the needle biomass (e. g. Miller and Miller 1976), and the crowns cannot carry the increasing mass of snow during winter. An increase in competition for light as a result of greater needle biomass could also increase self-thinning mortality on the fertilized plots. A minor Scleroderris canker (*Gremmeniella abietina* (Lagerb.) Morelet) epidemic damaged the trees, but the effect of fertilization on the frequency of canker damage was not studied. NPK fertilization with and without micronutrients has been found to increase Scleroderris canker damage on ombrotrophic pine bogs (Mannerkoski and Miyazawa 1983, Vasander and Lindholm 1985, Pätilä and Uotila 1990, see also Kaunisto 1989).

Growth in different tree classes

The very few emergent and undergrowth trees were excluded from the study. The dominant trees were approximately 4 m higher and 6 cm thicker, and had almost the same crown ratio (height of crown/height of whole tree) as the suppressed trees (Fig. 2). Although only 40% of the trees were dominant, their share of the total volume of the stand was 70%. Less than 10% of the dominant and co-dominant trees died or were badly damaged on the unfertilized plots during the study period. The corresponding percentage for the intermediate and suppressed trees was higher, 44 and 73 respectively.

The diameter growth of the dominant trees increased by 15–21% and that of the co-dominant trees by 17–22% after fertilization (Fig. 3, Table 4). There were no significant differences between the fertilizer treatments ($p > 0.05$). The diameter growth of the other tree classes was not

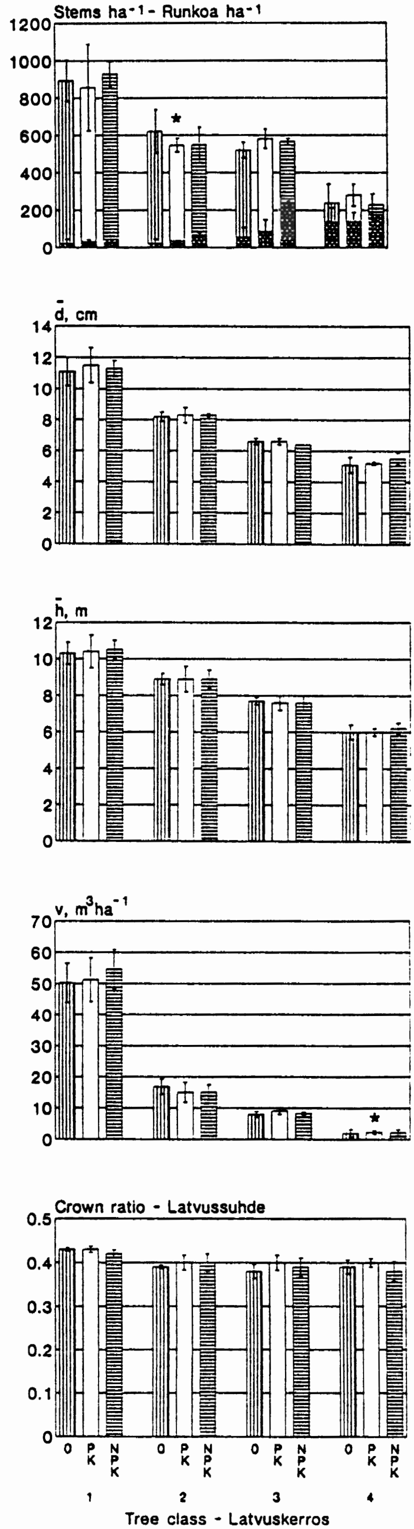


Fig. 2. Stem number, mean diameter (d), mean height (h), volume (v) and mean crown ratio of all trees in different classes before fertilization, 1 — dominant, 2 — co-dominant, 3 — intermediate, 4 — suppressed. The lower part of the column in the uppermost subfigure indicates the number of trees that died or became badly damaged during the study period. The treatments are presented in all subfigures in the same way as in the lowermost subfigure. SD is indicated on the columns by lines. Values marked with * differ significantly according to variance analysis, $p < 0.05$.

Kuva 2. Kaikkien puiden runkoluku, keskiläpimitta (d), keskipituus (h), tilavuus (v) ja keskimääräinen latvussuhde eri latvuskerroksissa ennen käsittelyjä, 1 — päävaltapuu, 2 — lisävaltapuu, 3 — välipuu, 4 — aluspuu. Ylimmän osakuvan pylväiden alaosassa on esitetty tutkimusjaksolla kuolleiden tai pahoin vahingoittuneiden puiden runkoluku. Eri käsittelyt on esitetty alimman osakuvan tavoin kaikissa osakuvissa. Keskihajonta esitetty janoin. Tähdillä merkityt eroavat merkitsevästi toisistaan varianssianalyysin perusteella, p < 0.05.

affected. The height growth of the suppressed trees on the fertilized plot was higher than on the controls during 1988–1990. The significant volume growth increase of the suppressed trees after PK fertilization was probably artificial as the volume was significantly higher on the PK fertilized plots already before nutrient application. The mortality of the intermediate trees increased significantly after NPK fertilization.

In Norway spruce (Gustavssen 1976, Kukkola 1978) and Scots pine (Tamm 1966) stands on mineral soil sites, trees in all classes have increased their growth within 5–11 years after N and NPK fertilization; small trees relatively more than larger trees, and larger trees in absolute terms more than smaller trees. Large spruces and pines have responded more rapidly to nitrogen addition than smaller ones (Shimansky and Pobedov 1976, Kukkola 1978, see also Viro 1967). The high density of the studied plots probably resulted in severe competition for light, and the intermediate and suppressed trees were less able to benefit from the improved nutritional status.

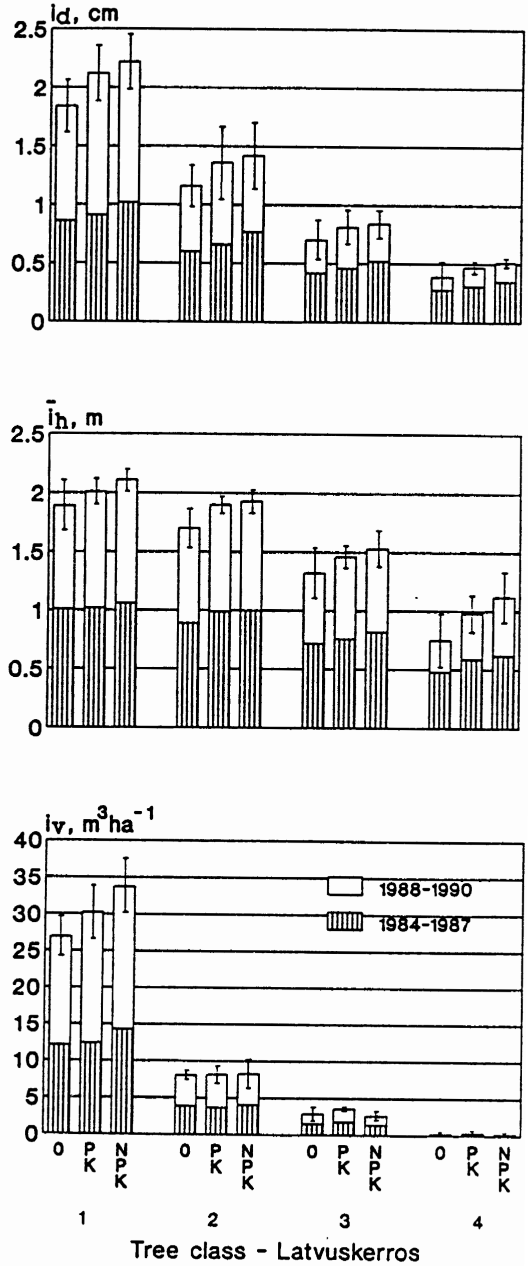


Fig. 3. The increment in mean diameter (i_d), mean height (i_h) and stand volume (i_v) in different classes during the experimental period (excluding dead and badly damaged trees). For numbers see fig. 2. The lower part of the column indicates the period 1984–1987 and the upper part the period 1988–1990. SD for the whole six-year period is indicated on the columns by lines. The treatments are presented in all subfigures in the same way as in the lowermost subfigure.

Kuva 3. Puiden keskiläpimitan (i_d), keskipituuden (i_h) ja kokonaistilavuuden (i_v) kasvu eri latvuskerroksissa tutkimusjakson aikana (ilman kuolleita ja pahoin vioittuneita puita). Numerot ks. kuva 2. Pylväiden alaosassa esitetään jakson 1984–1987 ja yläosassa jakson 1988–1990 kasvut. Keskihajonta koko kuuden vuoden tutkimusjaksolle esitetty janoin. Eri käsittelyt on esitetty kaikissa osakuvissa alimman osakuvan tavoin.

Table 4. The F-values (F) of the variance analyses and their significance (p) for variables i_d, i_h, i_v (see Table 3) in different tree classes and distances from the ditches in 1984–1987, 1988–1990 and 1984–1990.

Taulukko 4. Varianssianalyysien F-arvot (F) ja niiden merkitsevyys (p). Selittävinä muuttujina i_d, i_h ja i_v (ks. taulukko 3) eri latvuskerroksissa ja etäisyyksillä ojasta vuosina 1984–1987, 1988–1990 ja 1984–1990.

Dependent variable *Selitettävä muuttuja*		Treatment — *Käsittely*					
		1984-1987		1988-1990		1984–1990	
Tree class ***Latvuskerros***		F	p	F	p	F	p
Dominant *Päävaltapuu*	i_d	8.81	0.10	17.96	0.05	13.36	0.06
	i_h	0.10	0.91	1.87	0.35	0.87	0.53
	i_v	3.40	0.23	5.02	0.17	4.95	0.17
Co-dominant *Lisävaltapuu*	i_d	91.08	0.01	20.28	0.05	34.37	0.03
	i_h	1.74	0.37	5.30	0.16	3.94	0.20
	i_v	0.37	0.73	0.22	0.82	0.04	0.96
Intermediate *Välipuu*	i_d	4.28	0.19	0.63	0.61	1.84	0.35
	i_h	3.44	0.23	1.21	0.45	1.97	0.34
	i_v	1.19	0.46	4.05	0.20	2.32	0.30
Suppressed *Aluspuu*	i_d	3.00	0.25	0.21	0.83	1.40	0.42
	i_h	0.96	0.57	21.67	0.04	3.84	0.21
	i_v	15.05	0.06	10.20	0.09	16.87	0.06
Distance from ditch ***Etäisyys ojasta***		F	p	F	p	F	p
0-5 m	i_d	10.49	0.09	7.72	0.12	16.98	0.06
	i_h	1.30	0.44	15.01	0.06	2.31	0.30
	i_v	0.82	0.55	3.72	0.21	1.80	0.36
5-10 m	i_d	31.48	0.03	9.88	0.09	14.50	0.06
	i_h	0.18	0.85	2.31	0.30	1.19	0.46
	i_v	1.71	0.37	1.55	0.39	1.49	0.40
10-15 m	i_d	30.78	0.03	103.30	0.01	60.46	0.02
	i_h	0.55	0.65	6.60	0.13	2.05	0.33
	i_v	0.55	0.65	6.42	0.14	2.46	0.29
15-20 m	i_d	7.54	0.12	15.00	0.06	10.48	0.09
	i_h	1.51	0.40	1.30	0.44	2.56	0.28
	i_v	1.57	0.39	5.67	0.15	2.82	0.26
20-25 m	i_d	132.60	0.01	33.48	0.03	51.16	0.02
	i_h	0.76	0.57	18.63	0.05	3.14	0.24
	i_v	2.27	0.31	2.32	0.30	0.40	0.72

Growth at different distances from the ditches

The distance between each tree and the middle of the ditch was measured, the open ditch area being included in the 0–5 m zone. Thus the number of trees in the middle of the strips was greater than that near the ditches (Fig. 4). Probably as a result of the better light regime and more aerobic conditions in the root zone, the trees near the ditches had grown 1.5–2 cm thicker and 0.8–0.9 m taller, and had a larger crown ratio than those in the middle of the strips. They were also less vulnerable to damage since the mortality increased on the unfertilized plots from 13% to 30% according to increasing distance from the ditch.

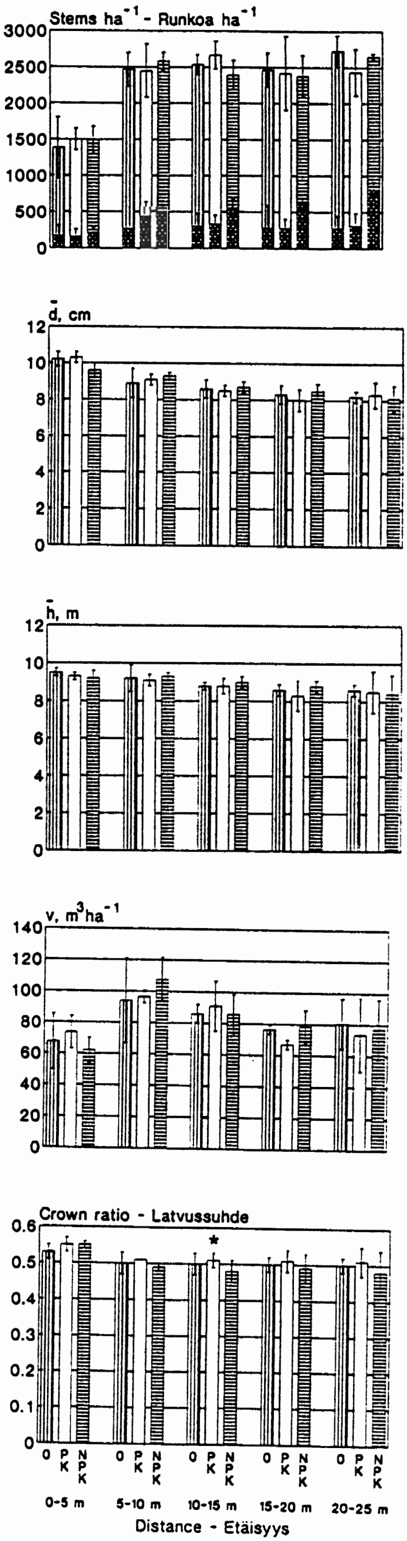
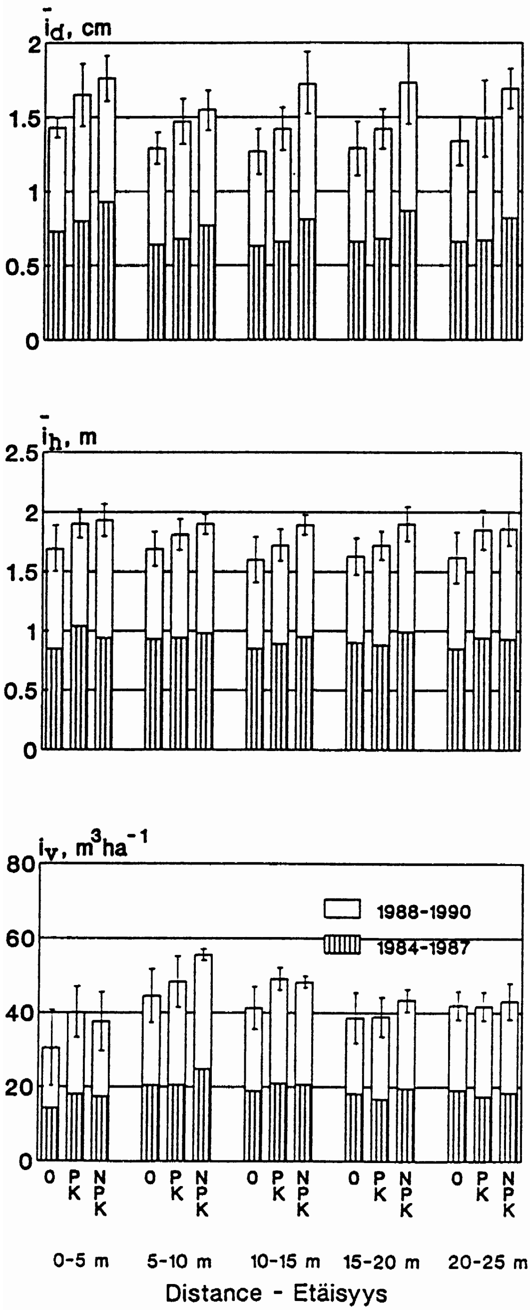


Fig 4. Stem number, mean diameter (d), mean height (h), volume (v) and mean crown ratio of all trees at different distances from the ditches before fertilization. The lower part of the column in the uppermost subfigure indicates the number of trees that died or became badly damaged during the study period. The treatments are presented in all subfigures in the same way as in the lowermost subfigure. SD is indicated on the columns by lines. Values marked with * differ significantly according to variance analysis, $p < 0.05$.

Kuva 4. Kaikkien puiden lukumäärä, keskiläpimitta (d), keskipituus (h), tilavuus (v) ja keskimääräinen latvussuhde eri etäisyyksillä ojasta ennen käsittelyjä. Ylimmän osakuvan pylväiden alaosassa on esitetty tutkimusjaksolla kuolleiden tai pahoin vahingoittuneiden puiden runkoluku. Eri käsittelyt on esitetty alimman osakuvan tavoin kaikissa osakuvissa. Keskihajonta esitetty janoin. Tähdillä merkityt eroavat merkitsevästi toisistaan varianssianalsyysin perusteella, p < 0.05.

The diameter growth of the trees increased after fertilization irrespective of the distance from the ditch (Fig. 5, Table 4). The effect of NPK fertilization was significantly greater in the middle of the strip than that of PK fertilization ($p \leq 0.05$).



The growth increase after PK fertilization was relatively smaller, whereas that of NPK fertilization was slightly greater in the middle of the strips than closer to the ditches. This could result from the faster rate of nitrogen mineralization near the ditches, promoted by the deeper penetration of thermal radiation and the deeper aerobic zone in the soil. Some earlier studies have shown that efficient drainage improves the effect of fertilization (Heikurainen and Veijola 1971, Heikurainen and Laine 1976, see also Huikari and Paarlahti 1967).

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Fig. 5. Increment in mean diameter (i_d), mean height (i_h) and stand volume (i_v) at different distances from the ditches during the experimentation period (excluding dead or badly damaged trees). The lower part of the column represents the period 1984–1987 and the upper part the period 1988–1990. SD for the whole six-year period is indicated on the columns by lines. The treatments are presented in all subfigures in the same way as in the lowermost subfigure.

Kuva 5. Puiden keskiläpimitan (i_d), keskipituuden (i_h) ja kokonaistilavuuden (i_v) kasvu eri etäisyyksillä ojasta tutkimusjaksolla (ilman kuolleita tai pahoin vioittuneita puita). Pylväiden alaosassa esitetään jakson 1984–1987 ja yläosassa jakson 1988–1990 kasvut. Keskihajonta koko tutkimusjaksolle esitetty janoin. Eri käsittelyt on esitetty kaikissa osakuvissa alimman osakuvan tavoin.

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TIIVISTELMÄ:

LANNOITUKSEN VAIKUTUS RÄMEMÄNNIKÖN KASVUUN JA RAKENTEESEEN

Tutkimuksessa tarkastellaan lannoituksen vaikutusta puuston pituus-, läpimitan- ja tilavuuskasvuun kuutena lannoituksenjälkeisenä vuotena eri latvuskerroksissa ja eri etäisyyksillä ojista. Tutkimuksen aineisto kerättiin kokeelta, joka oli perustettu Pohjois-Karjalaan isovarpuiselle rämemuuttumalle yhteispohjoismaisen "Ravinteiden kierto ja jakaantuminen suoekosysteemissä eri ilmasto-olosuhteissa"-projektin yhteydessä. Puusto mitattiin lannoitusta edeltävänä vuotena ja kolme sekä kuusi vuotta lannoituksen jälkeen. Kokeessa oli kolme käsittelyä ja kolme toistoa. Käsittelyt olivat: lannoittamaton (0), PK(MgB), NPK(MgB) ja käytetyt lannoitemäärät (kg ha^{-1}): N 150, P 53, K 100, Mg 25, B 2,4.

Lannoitus lisäsi läpimitan ja tilavuuden kasvua (taulukko 2). NPK-lannoituksella saatiin kuudessa vuodessa kasvunlisäystä 6,3 m^3 ha^{-1} ja PK lannoituksella vastaavasti 4,3 m^3 ha^{-1}. Lannoitus lisäsi selvemmin valtapuiden ja lisävaltapuiden kuin alempien lasvuskerrosten puiden läpimitankasvua (kuva 3, taulukko 4). NPK-lannoitus lisäsi välipuiden kuolleisuutta. Puun etäisyys ojasta ei vaikuttanut merkittävästi eri tunnuksin mitattuihin lannoitusreaktioihin (kuva 5).

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KIRJA:

MÄRKIEN MAIDEN METSÄT

A.E. Lugo, M. Brinson ja S. Brown (toim.): Forested wetlands. Teossarjassa: Ecosystems of the world. Osa 15. Elsevier, Amsterdam–Oxford–New York–Tokyo. 1990. ISBN 0-444-42812-7 (527 s.) OVH n. 810,-.

Sekä sisällöltään että hinnaltaan arvokkaassa kirjasarjassa on ilmestynyt kolmas suokansalle keskeinen teos. Aikaisemmat olivat soiden ekosysteemejä yleisesti (4A) ja alueellisesti (4B) käsittelevät osat vuodelta 1983.

Johdannossa (Luku 1) tarkastellaan monipuolisesti käsitteitä 'wetland' ja 'forested wetland'. Märät maat ('wetlands') ovat alueita, jotka ovat veden peitossa tai vedellä kyllästettyjä siinä määrin toistuvasti ja pitkäkestoisesti, että niillä luontaisesti tulevat toimeen vain organismit, jotka ovat sopeutuneet vedellä kyllästettyyn tai ilmanvaihdoltaan heikkoon kasvualustaan. Märkien maiden metsiksi ('forested wetlands') taas katsotaan kaikki märät maat, joilla kasvillisuuden pääkomponentti muodostuu puuvartisista kasveista — kasvien koosta riippumatta. Kirjan tulkinta keskeisimmille käsitteille on siten hyvin vapaa ja suhteellinen — absoluuttisia kriteereitä ei pyritä luomaan.

Johdannossa pohdiskellaan myös märkien maiden luokittelun moninaisuutta maailmanlaajuisesti. Kasvisosiologiset lähestymistavat rajoittavat kehitettyjen luokittelujen soveltuvuuden tietyille maantieteellisille alueille. Esimerkkinä esitetään Mooren ja Bellamyn (1974) kuvaamat 60 turvetta muodostavaa kasviyhdyskuntaa ja Heikuraisen (1961) luettelemat yli 70 metsäistä suotyyppiä Suomesta. Luokkien lukuisuus ja alueellisuus vaikeuttavat kasviyhdyskuntapohjaisten luokkien yhdistelyä. Maailmanlaajuisia tarkasteluja varten