

Yield response models to phosphorus application: a research synthesis of Finnish field trials to optimize fertilizer use in cereal production on *Agroecosystems*,

Elena Valkama, Risto Uusitalo, Eila Turtola; MTT Agrifood Research Finland, Plant Production/ Soils and Environmental Research, FI-31600, Jokioinen, Finland, elena.valkama@mtt.fi (E. Valkama)

Online Resource 1. Description of the database used for yield response models to P application and the meta-analysis of studies.

N of trial	Sites	Soil type	STP (mg P _{Ac} l ⁻¹ soil) ^a	Organic matter (%)	pH (H ₂ O)	Years	Duration (years)	Cereals, <i>variety</i>	References	Yield		Reference
										control (kg ha ⁻¹)	increase (%)	
<u>Clay soils, low STP (0-6 mg P_{Ac} l⁻¹ soil)</u>												
1	Jokioinen	Silt clay	0.8	2.2	6.0	2005-2007	3	spring barley, <i>Kunnari</i>	6, 10, 100	3970	7, 6, 14, 16	1
2	Mietoinen	Heavy clay	3.0	–	5.2	1962-1965	4	spring wheat, <i>Touko</i> ; oats, <i>Hannes</i>	5	2900	2	2
3	Mietoinen	Heavy clay	5.8	–	5.2	1964-1967	4	spring wheat, <i>Touko</i> ; oats, <i>Hannes</i>	72	3000	1, 6	2
4	Mietoinen	Heavy clay	4.0	3.3	6.5	1977-1994	8	spring wheat, <i>Ruso, Luja, Tapio, Kadett, Tähti</i>	45, 60	3400	8, 7, 12, 11	2, 3
4	Mietoinen	Heavy clay	4.0	3.3	6.5	1979-1991	6	spring barley, <i>Suvi, Eero, Ida, Kustaa</i>	45, 60	3300	10, 6, 17, 19	2, 3
5	Mietoinen	Heavy clay	5.0	3.6	6.2	1980-1988	5	spring wheat, <i>Tähti, Tapio, Luja, Kadett</i>	45, 60	3870	1, 0.8, 3, 6	2, 3
6	Mouhijärvi	Silt clay	5.0	–	6.0	1968-1971	3	spring barley, <i>Pirkka</i>	3	2000	5	2
7	Nakkila	Heavy clay	2.7	–	5.3	1951-1958	4	oats, <i>Kultasade II</i> ; spring barley, <i>Binder</i>	36	3500	8, 13	4
8	Nakkila	Heavy clay	3.0	–	5.9	1953-1958	5	oats, <i>Kultasade II, Tammi, Sisu</i>	36	3400	10, 12	4
9	Nakkila	Heavy clay	3.0	–	5.6	1956-1958	3	oats, <i>Sisu, Eho</i>	36	2800	5, 7	4

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10	Nakkila	Heavy clay	1.3	–	5.1	1964-1965	2	oats, <i>Kultasade II</i> ; spring wheat, <i>Ari</i>	36, 54	2800	16, 21	4
11	Pori	Heavy clay	1.5	–	5.3	1961-1968	8	oats, <i>Hannes</i> ; spring wheat, <i>Touko</i>	36	2400	17	4
12	Ylistaro	Silt clay	5.9	–	5.7	2001-2005	5	spring barley, <i>Erkki</i> , <i>Prestige</i>	8, 13, 15, 25, 35	3800	1, 6, 7, 3, 2	5
<u>Clay soils, medium STP (6-12 mg P_{Ac} l⁻¹ soil)</u>												
13	Kokemäki	Loam clay	10.0	14	5.7	1981-1988	4	oats, <i>Puhti</i>	15, 30, 45, 60	3470	-2, -3, -2, -2	2, 3
13	Kokemäki	Loam clay	10.0	14	5.7	1978-1987	6	spring barley, <i>Birgitta</i> , <i>Suvi</i> , <i>Kustaa</i>	15, 30, 45, 60	3200	1, 3, -0.6, 4.7	2, 3
14	Kotkaniemi	Loam clay	6.4	–	6.3	2001-2007	5	spring barley, <i>Erkki</i> , <i>Prestige</i>	8, 13, 15, 25, 35	4700	1, 1, 17, 4, 17	5
<u>Clay soils, high STP (12-40 mg P_{Ac} l⁻¹ soil)</u>												
15	Jokioinen	Loam clay	40.0	4.7	6.6	1980-1989	5	spring barley, <i>Pomo</i>	15, 30, 45, 60	4200	0, 2, 2, -1	2, 3
16	Mietoinen	Loam clay	14.0	3.7	5.8	1978-1989	5	winter rye, <i>Voima</i>	15, 30, 45, 60	2300	7, 10, 12, 9	2, 3
16	Mietoinen	Loam clay	14.0	3.7	5.8	1980-1988	4	winter wheat, <i>Vakka</i> , <i>Aura</i> , <i>Ilves</i>	15, 30, 45, 60	3400	1, 0.5, 3, 0.5	3
17	Mietoinen	Fine sand clay	20.5	–	6.4	2001-2005	5	spring barley, <i>Erkki</i> , <i>Prestige</i>	8, 13, 15, 25, 35	4300	1, -3, -7, -4, 8	5
<u>Coarse-textured mineral soils, low STP (0-10 mg P_{Ac} l⁻¹ soil)</u>												
18	Anjalan- koski	Silt	7.0	17	6.0	1977-1988	10	spring barley, <i>Pomo</i> , <i>Arra</i>	15, 30, 45, 60	2100	16, 25, 27, 31	3
19	Kälviä	Fine sand	5.3	–	5.4	1966, 1970	2	oats; spring barley, <i>Tammi</i>	36, 54	2800	9, 10	4
20	Mietoinen	Fine sand	8.0	2.9	5.7	1977-1991	6	spring barley, <i>Karri</i> , <i>Suvi</i> , <i>Eero</i> , <i>Ida</i>	15, 30, 45, 60	3800	5, 6, 14, 11	2, 3
21	Mikkeli	Fine sand	4.8	–	5.9	1963-1967	4	spring wheat, <i>Apu</i> ; spring barley, <i>Otra</i> ; oats, <i>Pendek</i>	36	1850	21	2

22	Mikkeli	Fine sand	8.5	8	5.8	1978-1986	5	spring barley, <i>Eero, Etu</i>	15, 30, 45, 60	2600	18, 28, 31, 30	2, 3
23	Mouhijärvi	Silt	6.0	–	5.2	1969-1971	3	oats, <i>Nip</i>	18, 36, 72	2000	4, 8, 10	2
24	Pälkäne	Loam	3.7	4	5.6	1978-1987	4	spring barley, <i>Pomo, Otra, Silja</i>	15, 30, 45, 60	3300	8, 8, 6, 9	2, 3
24	Pälkäne	Loam	3.7	4	5.6	1979-1989	4	oats, <i>Puhti, Heikka</i>	15, 30, 45, 60	4000	8, 9, 8, 8	2, 3
24	Pälkäne	Loam	3.7	4	5.6	1984-1990	3	spring wheat, <i>Luja, Tähti, Tapio</i>	15, 30, 45, 60	3250	10, 8, 8, 10	2, 3
25	Tohmajärvi	Finer fine sand	4.0	6.1	5.6	1983-1987	4	spring barley, <i>Arra, Veli</i>	15, 30, 45, 60	2400	16, 20, 22, 14	3
25	Tohmajärvi	Finer fine sand	4.0	6.1	5.6	1977-1988	8	oats, <i>Tiitus, Veli</i>	15, 30, 45, 60	3400	10, 19, 18, 21	3
26	Toholampi	Fine sand	5.0	5.1	5.4	1977-1986	7	spring barley, <i>Otra, Arra</i>	15, 30, 45, 60	2600	21, 27, 29, 31	2, 3
27	Viitoja	Fine sand	5.5	–	5.3	1969-1971	3	spring barley, <i>Otra</i>	36, 72	1800	21, 40	2
28	Ylistaro	Loam	6.0	12	5.4	1977-1985	9	oats, <i>Tiitus, Veli</i>	15, 30, 45, 60	4200	0.5, 4, 2, 4	3
<u>Coarse-textured mineral soils, medium STP (10-18 mg P_{Ac} l⁻¹ soil)</u>												
29	Maaninka	Fine sand	15.0	2.8	6.1	1977-1993	16	spring barley, <i>Vigdis, Eero, Pohto</i>	15, 30, 45, 60	3700	5, 6, 8, 6	2, 3
30	Maaninka	Silt	12.1	–	6.2	2001-2007	6	spring barley, <i>Erkki, Prestige</i>	6, 8, 10, 13, 15, 20, 25, 35	5000	-6, -1, -3, -6, 2, -7, 0.5, 11	5
31	Pihtipudas	Fine sand moraine	14.7	–	–	1970-1972	3	oats, <i>Pendek</i> ; spring barley, <i>Pomo</i>	14, 27, 41	3100	10, 10, 15	4
<u>Coarse-textured mineral soils, high STP (18-50 mg P_{Ac} l⁻¹ soil)</u>												
32	Laukaa	Silt	30.0	4.6	6.2	1977-1985	3	oats, <i>Tiitus, Veli</i>	15, 30, 45, 60	2800	0, 2, 1, 2	2, 3
32	Laukaa	Silt	30.0	4.6	6.2	1978-1987	8	spring barley, <i>Otra, Pomo, Arra</i>	15, 30, 45, 60	2600	4, 6, 6, 7	2, 3
33	Pälkäne	Loam	21.9	–	6.1	2001-2005	5	spring barley, <i>Erkki, Prestige</i>	8, 13, 15, 25, 35	4900	-1, 2.5, 6, -1, 3	5

34	Ruukki	Fine sand	49.8	–	6.6	2001-2003	3	spring barley, <i>Erkki</i>	8, 13, 15, 25, 35	6000	-5, -4, -5, -7, -1	5
<u>Organic soils, low STP (0-8 mg P_{Ac} l⁻¹ soil)</u>												
35	Lohtaja	Peat	2.8	–	4.7	1961-1966	3	spring barley, <i>Tammi</i>	36, 54	1800	30, 36	4
36	Lohtaja	Mull	2.4	–	6.2	1961-1967	4	spring barley, <i>Pirkka, Otra</i> ; oats, <i>Kyrö</i>	36, 54	2200	14, 15	4
37	Pihtipudas	Peat	2.7	–	5.6	1968-1969	2	spring barley, <i>Pirkka</i>	36, 54	2200	34, 24	4
38	Pälkäne	Mull	1.2	20	5.5	2004-2006	4	spring barley, <i>Kunnari</i>	10, 30, 75	4100	21, 30, 38	1
38	Pälkäne	Mull	1.2	20	5.5	2004-2006	4	oats, <i>Roope</i>	6, 10, 30, 75	4500	7, 11, 16, 12	1
39	Ruukki	Peat	3.6	–	5.6	1958-1965	4	spring barley, <i>Edda II</i> ; oats	18, 36, 54, 72	1400	28, 39, 56, 61	2
40	Tohmajärvi	Peat	5.0	54	4.8	1977-1989	8	oats, <i>Tiitus, Veli</i>	15, 30, 45, 60	3100	13, 11, 14, 13	2, 3
41	Toholampi	Peat	6.0	43	4.8	1981-1989	8	spring barley, <i>Arra</i>	15, 30, 45, 60	2000	23, 30, 38, 40	3
<u>Organic soils, medium STP (8-15 mg P_{Ac} l⁻¹ soil)</u>												
42	Jokioinen	Peat	9.0	39	5.3	1980-1990	6	spring barley, <i>Pomo, Etu, Arra</i>	15, 30, 45, 60	3600	5, 8, 8, 6	2, 3
42	Jokioinen	Peat	9.0	39	5.3	1985-1989	3	oats, <i>Veli</i>	15, 30, 45, 60	4600	1, 5, 4, 3	3
43	Ruukki	Mull	12.0	31	4.7	1977-1993	16	spring barley, <i>Otra, Hja 673, Arra</i>	15, 30, 45, 60	3300	6, 7, 8, 9	2, 3

^a STP in P-unfertilized control at the beginning of experiments

References: 1, Ylivainio and Turtola (2009); 2, unpublished annual reports of the research stations of MTT Agrifood Research Finland; 3, Saarela et al. (1995); 4, unpublished results of experiments (so-called “stationary long-term experiments”) conducted on growers’ fields; 5, Vuorinen and Virkajärvi 2007; Vuorinen et al. 2002, 2003, 2004, 2005, 2006, 2008.