Appendix 1: Coordinates of soil sampling points/sites

No.	Serial number	Forestry. Main research site	Sampling point coordinates	Layer (horizon)	Layer (horizon) designation
1	N.T-7.1	Novonezhinskoye	52.506031, 64.070035	1st layer	A0;A1
2	N.T-7.2			2nd layer	A
3	N.T-7.3			3rd layer	B
4	N.T-7.4			4th layer	C
5	N.T-8.1		52.505632, 64.069678	1st layer	A0;A1
6	N.T-8.2			2nd layer	A
7	N.T-8.3			3rd layer	Б
8	N.T-8.4			4th layer	C
9	N.T-9.1		52.50559, 64.069405	1st layer	A0;A1
10	N.T-9.2			2nd layer	A
11	N.T-9.3			3rd layer	Б
12	N.T-9.4			4th layer	C
13	K.T-4.1	Kalininskoye	52.410227, 64.205437	1st layer	A0;A1
14	K.T-4.2			2nd layer	A
15	K.T-4.3			3rd layer	Б
16	K.T-4.4			4th layer	C
17	K.T-5.1		52.4101, 64.205383	1st layer	A0;A1
18	K.T-5.2			2nd layer	A
19	K.T-5.3			3rd layer	Б
20	K.T-5.4			4th layer	C
21	K.T-6.1		52.409959, 64.205692	1st layer	A0;A1
22	K.T-6.2			2nd layer	A
23	K.T-6.3			3rd layer	Б
24	K.T-6.4			4th layer	C
25	K.T-1.1		52.409356, 64.208874	1st layer	A0;A1
26	K.T-1.2			2nd layer	A
27	K.T-1.3			3rd layer	Б
28	K.T-1.4			4th layer	C
29	K.T-2.1		52.409355, 64.209018	1st layer	A0;A1
30	K.T-2.2			2nd layer	A
31	K.T-2.3			3rd layer	Б
32	K.T-2.4			4th layer	C
33	K.T-3.1		52.409356, 64.208874	1st layer	A0;A1
34	K.T-3.2			2nd layer	A
35	K.T-3.3			3rd layer	Б
36	K.T-3.4			4th layer	C

Appendix 2: Indicators of agrochemical composition quality and total forms of elements in soils

Appendix 2.1: Mobile forms of the main agrochemical quality indicators

No.	D	Moisture	pH	Humus	Potassium	Nitrates	Phosphorus	Sulfates	Chlorides	Bicarbonates	Calcium	Cadmium	Lead	Chromium	Manganese	Copper	Zinc	Iron
	g/L	%		%	mg/kg			mmol per 100 g				µg/kg	mg/kg	µg/kg	mg/kg			
1	248	47.47	7.38	1.34	66.00	4.30	4.00	11.05	0.50	0.10	13.50	127.90	1.11	77.92	9.88	1.02	0.10	61.40
2	983	11.79	7.60	1.37	87.00	25.10	16.00	10.73	0.45	0.08	7.75		0.11		6.56			57.80
3	1 184	6.03	7.88	1.52	118.00	29.50	10.00	36.43	0.525	0.08	8.25							
4	1 267	5.44	7.44					11.24	0.425	0.1	12.75	14.52	0.07	90.20	4.87	0.81	0.10	50.26
5	176	53.97	6.42	1.06	48.00	6.80	3.00	12.55	0.5	0.09	9.625	109.90	0.49	73.20	43.72	0.99	1.19	42.28
6	527	10.54	6.73	0.99	44.00	9.60	6.00	20.587	0.475	0.09	2.75		0.17		5.99			
7	971	7.68	6.88	0.78	37.00	10.20	5.00	19.19	0.48	0.09	5.88							20.90
8	1 048	4.42	6.92					17.12	0.43	0.08	3.88	12.17	0.06	37.80	4.02	0.61	0.28	36.52
9	206	28.17	5.73	1.95	304.00	16.20	22.00	17.76	0.55	0.23	27.00	114.90	0.46	93.89	67.80	1.56	5.55	32.50
10	920	10.75	7.43	1.36	288.00	47.90	11.00	47.92	0.50	0.11	3.13		0.13		27.10			34.30
11	1 040	7.28	7.02	1.21	165.00	7.60	4.00	33.40	0.50	0.09	7.88							32.50
12	1 152	4.37	6.47					26.63	0.48	0.01	9.75	15.10	0.07	54.05	8.89	0.72	0.20	19.30
13	826	5.71	5.34	0.63	71.00	4.70	7.00	13.58	1.00	0.05	8.13	68.00	0.20	50.76	7.63	0.71	3.00	73.70
14	1 024	3.24	6.10	0.95	68.00	4.90	6.00	13.43	1.25	0.11	12.63		0.05		3.41			79.90
15	1 024	3.01	5.60	0.55	41.00	10.00	2.00	18.66	1.15	0.10	6.75							71.70
16	1 265	2.17	6.20					6.21	0.75	0.10	7.50	9.90	0.05	59.41	2.94	0.54	0.23	86.00
17	581	5.86	6.45	0.63	71.00	4.70	7.00	21.06	0.45	0.10	8.25	86.23	0.24	90.54	15.50	2.55	1.53	95.20
18	1 058	2.03	6.90	0.95	68.00	4.90	6.00	24.29	0.46	0.40	13.38		0.11		16.53			78.10
19	1 403	3.19	7.24	0.55	41.00	10.00	2.00	24.94	0.40	0.43	7.75							21.30
20	1 414	1.52	7.12					26.41	0.45	0.50	10.88	30.30	0.11	232.2	29.07	1.32	0.16	40.03
21	694	8.41	7.39	0.87	94.00	13.50	9.00	22.45	0.58	0.18	5.88	82.40	0.20	57.62	24.77	0.59	0.87	43.95
22	1 093	6.88	8.91	0.20	99.00	2.80	10.00	25.69	0.53	0.80	7.38		0.13		33.62			17.50
23	1 283	5.41	7.86	0.55	96.00	10.00	14.00	23.93	0.48	1.15	11.00							
24	1 398	3.23	8.21					34.79	0.48	0.45	6.25	31.42	0.18	90.54	37.64	0.25	0.25	15.30
25	692	9.78	7.50	0.693	78.1	5.17	7.7	20.99	0.50	0.53	4.38	92.23	0.16	90.50	44.89	0.37	5.67	52.75
26	1 157	3.60	7.36	1.045	74.8	5.39	6.6	21.64	0.45	0.15	9.13		0.08		16.66			45.53
27	1 297	3.12	7.58	0.605	45.1	11	2.2	26.80	0.65	0.15	12.00							31.50
28	1 293	1.65	7.48					27.10	0.38	0.14	14.38	13.11	0.06	54.09	7.42	0.85	0.38	33.30
29	978	14.95	7.46	0.8265	89.3	12.82	8.55	25.30	0.73	0.60	8.00	76.38	0.20	232.2	65.72	0.27	4.01	92.77
30	1 024	3.39	7.58	0.19	94.05	2.66	9.5	18.83	0.58	0.16	13.00		0.06		19.47			73.00
31	1 024	7.21	7.20	0.5225	91.2	9.5	13.3	23.37	0.60	0.25	14.25							63.20
32	1 451	3.51	7.08					26.65	0.58	0.03	14.75	16.40	0.06	57.62	9.81	0.33	0.31	54.16
33	813	14.37	8.52	0.6615	74.55	4.935	7.35	24.96	0.80	0.55	1.38	134.20	0.17	120.1	58.00	0.45	8.59	62.59
34	1 269	5.55	7.87	0.9975	71.4	5.145	6.3	18.81	0.88	0.05	10.00		0.05		22.55			66.50
35	1 245	7.25	6.50	0.5775	43.05	10.5	2.1	23.95	0.90	0.05	13.38							43.60
36	1 282	3.74	6.99					24.72	0.85	0.08	13.75	22.51	0.06	63.79	13.02	0.29	0.48	37.30

Notes. D — density of the dry form of the soil sample. No. — according to Appendix 1, Table 1. pH — pH value of the aqueous extract. Humus value includes the content of all organic forms, including fallen decomposing plant material. Empty cells mean that measurements were not carried out or that the values were close to zero and insignificant for the study.

Appendix 2.2: Content of gross forms of the main elements in soil samples

No	SiO2	Al2O3	TiO2	Fe	Ca	Mg	K	Mn	P2O5	S	Cr	Co	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Mo	Cd	Nb	Pb
	%	%	%	%	%	%	%	%	%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1	28.81	2.98	0.20	0.93	0.65	0.19	0.24	0.12	0.57	0.13		13.55	6.25	6.32	36.94	4.76	19.81	69.83	4.80	77.05	0.64	25.67	4.07	17.51
2	78.41	2.94	0.30	0.56	0.34		0.34	0.04	0.58	0.04		13.07					21.43	48.74	5.36	174.80	0.73		4.07	8.58
4	83.02	2.58	0.29	0.49	0.21	0.22	0.34	0.03	0.56	0.03		16.20				4.17	20.94	44.19	5.08	206.88			5.60	
5	27.57	2.08	0.16	0.65	0.88	0.09	0.21	0.06	0.51	0.15		21.29	8.33			3.57	16.07	82.38	3.81	78.70	0.46	26.96	3.05	13.39
6	68.19	2.81	0.27	0.71	0.66		0.32	0.05	0.59	0.06		18.60	8.63			2.98	24.84	82.93	6.35	180.34			4.58	9.27
8	69.92	4.33	0.41	0.60	0.74	0.11	0.40	0.04	0.62	0.04	32.47	4.96	6.55	7.08		2.98	24.35	76.38	5.50	209.57			4.58	6.70
9	48.68	2.76	0.23	0.85	0.99	0.08	0.27	0.07	0.57	0.09		24.04	7.14			4.56	21.10	82.93	5.64	116.33	0.73		4.07	13.73
10	77.49	3.18	0.32	0.62	0.42		0.35	0.04	0.58	0.03		8.37		7.84			23.86	63.29	6.35	209.57	0.55		4.07	9.79
12	79.56	3.77	0.37	0.60	0.39	0.14	0.43	0.03	0.59	0.02	22.87	5.60					25.32	60.56	6.77	231.16	0.64		4.58	6.70
13	77.91	3.07	0.26	0.59	0.32	0.37	0.41	0.03	0.54	0.04		14.50					25.33	60.02	6.21	145.43	0.73		5.09	9.96
14	74.35	4.35	0.38	0.39	0.28		0.50	0.02	0.58	0.03	0.00	4.75					23.38	50.19	5.08	165.05	1.10			6.18
16	72.33	3.98	0.43	0.35	0.24	0.39	0.50	0.02	0.60	0.02	0.01	3.53					23.38	49.65	4.23	186.64	0.55			7.21
17	72.87	3.43	0.24	0.70	0.45	0.31	0.39	0.04	0.58	0.04		12.96					24.35	77.47	5.50	97.59	0.73			14.94
18	74.56	3.72	0.28	0.59	0.92		0.50	0.04	0.59	0.04		6.69	5.06		12.36		26.30	139.67	5.92	132.67	0.92		4.58	6.70
20	61.31	3.45	0.43	0.37	1.31	0.11	0.37	0.03	0.63	0.02					11.37		20.78	119.66	3.81	137.02	0.55		4.07	8.24
21	70.90	3.12	0.24	0.71	0.63	0.09	0.40	0.04	0.60	0.04		11.06	4.76		15.34		25.81	106.93	5.50	115.13	0.64		4.58	12.36
22	78.36	2.68	0.24	0.53	0.89		0.40	0.04	0.58	0.02		13.46	5.65				25.32	156.58	4.23	144.36	1.01		4.58	8.24
24	62.95	3.03	0.35	0.27	1.51	0.08	0.41	0.02	0.56	0.02	23.17	0.00	4.17		9.38		18.02	135.85	3.81	129.97	0.64			
25	77.79	3.03	0.22	0.76	0.54	0.15	0.34	0.05	0.67	0.03		11.40	5.95	8.60	23.02		20.94	49.10	4.23	122.78	0.83			13.91
26	81.48	3.48	0.24	0.69	0.28		0.39	0.03	0.60	0.02	0.00	11.91					21.92	39.83	5.50	130.87	0.73		6.11	9.27
28	71.69	4.96	0.45	0.58	0.20	0.18	0.48	0.02	0.59	0.02		4.88		7.08			20.94	38.19	4.66	146.16			5.09	6.18
29	77.88	3.64	0.20	0.88	0.95	0.14	0.36	0.09	0.71	0.03		10.31	7.14		37.08		22.40	61.10	5.92	107.04	0.92		4.58	17.00
30	73.50	4.74	0.33	0.69	0.33		0.55	0.04	0.63	0.02		5.30	5.65	9.10	13.64		26.30	45.83	3.81	108.83	0.55			7.21
32	86.72	2.86	0.23	0.52	0.18	0.16	0.38	0.02	0.62	0.02	0.00	14.18	7.14				19.48	38.19	5.08	129.97	0.69		5.09	7.21
33	71.78	3.54	0.26	0.94	1.11	0.09	0.36	0.20	0.69	0.03		9.63	7.14	0.00	47.31		25.81	82.38	7.19	129.52	0.78		4.58	17.51
34	82.56	2.81	0.24	0.56	0.36		0.37	0.06	0.62	0.02		7.53					19.97	44.74	5.08	125.47	0.60		6.11	
36	86.56	2.60	0.22	0.53	0.20	0.12	0.35	0.03	0.65	0.02		14.93					18.51	38.19	4.66	137.62	0.69		5.09	

Appendix 3: Gamma-radionuclide activity in soil layers

No.	40K	226Ra	232Th	Cs137	Cs134
1	245.00			80.10	
2	185.00			20.30	
3	196.00			11.80	
4	196.00			11.50	
5	251.00			29.70	
6	186.00			41.90	
7	209.00			18.40	
8	202.00			13.90	
9	256.00			65.80	
10	206.00			28.40	
11	200.00			17.50	
12	203.00			13.10	
13	237.00			58.30	
14	246.00			12.40	
15	204.00			40.30	
16	211.00			7.03	
17	202.00			36.50	
18	251.00			20.90	
19	190.00			5.61	
20					
21	217.00			46.40	
22	224.00			16.10	
23	198.00			1.36	2.62
24	167.00	2.01	4.88	0.41	
25	173.00			39.30	
26	181.00			30.80	
27	168.00			7.57	2.89
28	185.00			8.03	
29	189.00			61.30	
30	165.00			7.78	
31	167.00			6.54	
32	158.00			1.51	2.58
33	216.00			69.50	
34	166.00			9.75	
35	166.00	1.23	5.42	1.03	
36	186.00			7.48	

Notes. D — density of the dry form of the soil sample. No. — according to Appendix 1, Table 1. Empty cells mean that measurements were not carried out or that the values were close to zero and insignificant for the study.

Appendix 4: Values of correlation coefficients between the contents of soil quality components

Appendix 4.1: Values of correlation coefficients between the contents of indicators of mobile forms of soil quality

	Layer	D	Moisture	pH	Humus	Potassium	Nitrates	Cadmium	Chromium	Manganese
D	0.77									
Moisture	-0.53	-0.79								
pH	0.04	0.30	-0.09							
Humus	-0.21	-0.43	0.44	-0.19						
Potassium	-0.16	-0.24	0.12	-0.03	0.59					
Nitrates	0.17	0.07	-0.02	0.08	0.52	0.61				
Phosphorus	-0.21	-0.19	0.03	0.12	0.38	0.67	0.37			
Sulfates	0.19	0.32	-0.29	0.40	0.08	0.48	0.62			
Chlorides	-0.13	0.05	-0.12	-0.41	-0.20	-0.20	-0.19			
Bicarbonates	-0.12	0.14	-0.07	0.50	-0.37	0.01	-0.18			
Calcium	0.08	-0.04	0.17	-0.28	0.30	0.33	-0.14			
Cadmium	-0.93	-0.87	0.72	0.05	0.46	0.18	-0.15			
Lead	-0.48	-0.73	0.86	-0.10	0.41	0.04	-0.10	0.70		
Chromium	-0.15	0.10	0.01	0.28	-0.08	0.03	0.31	0.18		
Manganese	-0.48	-0.35	0.37	0.25	0.12	0.40	0.07	0.64	0.57	
Copper	-0.28	-0.44	0.19	-0.42	0.24	0.26	-0.07	0.28	0.08	-0.03
Zinc	-0.64	-0.41	0.16	0.14	-0.06	0.32	0.06	0.67	0.27	0.75
Iron	-0.40	-0.19	0.00	-0.29	-0.12	-0.24	-0.25	0.28	0.26	-0.10

Notes. D — density of the dry form of the soil sample. No. and Layer (horizon) — according to Appendix 1, Table 1. pH — pH value of the aqueous extract.

Appendix 4.2: Values of correlation coefficients between the contents of indicators of total forms of soil elements

	Layer	D	SiO2	Al2O3	TiO2	Fe	Ca	Mg	K	Mn	P2O5	S	Cr	Co	Ni	Cu	Zn	Rb
D	0.77																	
SiO2	0.32	0.69																
Al2O3	0.24	0.32	0.21															
TiO2	0.66	0.54	0.17	0.71														
Fe	-0.71	-0.70	-0.29	-0.08	-0.58													
Ca	-0.15	-0.18	-0.46	-0.17	-0.04	0.08												
Mg	0.00	0.09	0.24	0.19	0.15	-0.21	-0.58											
K	0.35	0.60	0.54	0.78	0.62	-0.44	-0.27	0.41										
Mn	-0.52	-0.45	-0.34	-0.12	-0.39	0.73	0.38	-0.31	-0.43									
P2O5	0.01	0.29	0.44	0.29	-0.02	0.32	0.08	-0.25	0.17	0.39								
S	-0.47	-0.84	-0.90	-0.39	-0.45	0.46	0.21	-0.16	-0.69	0.36	-0.47							
Cr	0.53	-0.18	-0.54	0.15	0.43	0.08	0.67	-0.71	-0.30	0.69	-0.02	0.45						
Co	-0.43	-0.63	-0.33	-0.71	-0.72	0.45	0.00	-0.10	-0.76	0.19	-0.25	0.58	-0.51					
Ni	-0.23	-0.48	-0.26	-0.32	-0.41	0.44	-0.21	0.11	-0.62	0.32	0.03	0.46	-0.42	0.71				
Cu	0.28	0.15	0.11	0.18	0.21	-0.63	-0.82	0.61	0.32	-0.91	-0.49	-0.10		-0.23	-0.92			
Zn	-0.67	-0.59	-0.18	-0.14	-0.65	0.84	-0.09	0.39	-0.60	0.93	0.56	0.43		0.63	0.91	-0.91		
Rb	-0.22	-0.02	0.36	0.47	0.22	0.20	-0.07	0.32	0.55	0.08	0.19	-0.34	0.17	-0.26	-0.21	-0.27	0.06	
Sr	-0.11	-0.10	-0.28	-0.19	-0.01	-0.12	0.80	-0.42	-0.03	0.06	-0.19	0.10	0.67	-0.03	-0.49	-0.67	-0.51	0.21
Y	-0.27	-0.18	0.27	0.04	-0.12	0.47	-0.09	0.04	-0.06	0.41	0.18	-0.06	0.22	0.10	0.34	-0.78	0.67	0.54
Zr	0.57	0.43	0.48	0.21	0.59	-0.41	-0.30	0.18	0.29	-0.34	-0.07	-0.44	0.51	-0.29	0.06	0.11	-0.42	0.32
Mo	-0.26	0.05	0.34	0.20	-0.11	0.08	0.04	-0.01	0.25	0.04	0.21	-0.25	-0.34	-0.06	-0.18	-0.45	0.39	0.34
Nb	0.30	0.61	0.69	0.17	0.04	-0.22	-0.57	0.50	0.49	-0.22	0.26	-0.63	-0.79	-0.32	-0.35	-0.13	0.13	0.09
Pb	-0.75	-0.68	-0.45	-0.44	-0.69	0.82	0.43	-0.19	-0.66	0.76	0.24	0.51	-0.36	0.47	0.23	-0.59	0.92	-0.22