



Photo.1 Initial Rend zina-like soil
(Kikai Island, No.1)



Photo.2 Rend zina-like soil
(Kikai Island, No.2)

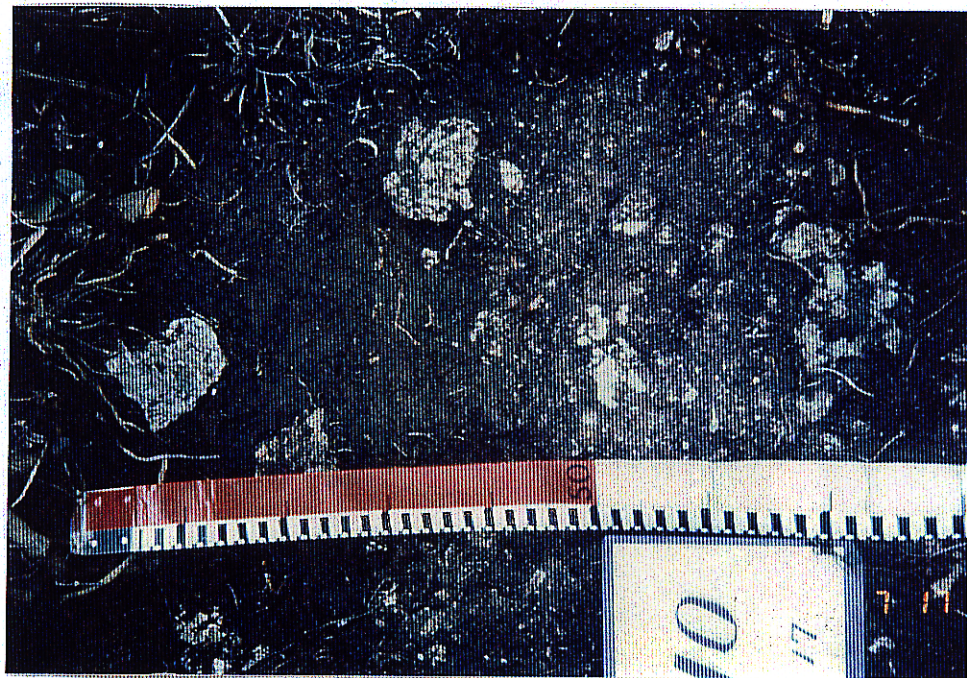


Photo.3 Brown Rend zina-like soil
(Kikai Island, No.3)



Photo.4 Terra fusca-like soil
(Kikai Island, No.4)



Photo.5 Terra rossa-like soil
(Kikai Island, No.5)



Photo.6 Terra rossa-like / Red-Yellow soil
(Kikai Island, No.6)



Photo.7 Red soil
(Minami-Daito Island, No.7)



Photo.8 Yellow soil
(Minami-Daito Island, No.8)



Photo.9 Southward view from pleistocene terrace II (Kikai Island)



Photo.10 Westward view from Hinomaruyama (Minami-Daito Island)

Appendix 1 Physico-chemical properties of the soils of Kikai and Minami-Daito Islands.

Sample name (terrace surface, altitude)		T-C		O-C	I-C	CaCO ₃	T-N	C/N ratio	CaCO ₃	pH	ΔpH Y1	Particle size dir.		Texture	Silt/Clay ratio	Exch. CEC*	1M NH ₄ OAc soluble cations				Degree**	CEC	ECEC***							
Horizon	Depth	CN- Kosaka&Iseki		code	method	g kg ⁻¹	code	(1)	(2)	Kosaka&Iseki	%	%	Sand	Silt	Clay	Al*	Ca	Mg	K	Na	sum of base	saturation %	cmol(±)kg ⁻¹ clay							
cm																														
Kikai Island																														
No.1 Initial Rendzina-like soil (Holocene II, 10m.a.s.l.)																														
Ah1	0-15	144.9	145.4	129.4	16.0	133.5	12.2	11.9	10.6	13.3	26.5	7.9	7.0	0.9	1.5	52.4	16.8	30.9	SC or LiC	0.54	0.2	38.5	63.9	5.0	1.0	0.7	70.6	183.6	124.6	229.2
Ah2	15-30	118.7	110.1	83.7	26.4	219.7	7.9	15.1	10.6	22.0	41.1	7.9	6.4	1.5	0.6	61.6	16.1	22.3	SCL	0.72	0.1	22.9	52.7	2.7	0.5	0.5	56.4	246.3	102.7	253.1
No.2 Rendzina-like soil (Pleistocene V, 27m.a.s.l.)																														
Ah1	0-9	33.1	32.7	31.8	0.8	7.1	2.9	11.4	11.0	0.7	1.8	7.4	6.8	0.6	tr.	28.7	29.7	41.6	LiC	0.71	-	24.2	23.0	3.8	0.5	0.3	27.6	114.0	58.2	66.3
Ah2	9-23	22.6	22.9	22.7	0.2	1.7	2.0	11.3	11.3	0.2	2.1	7.5	6.7	0.8	tr.	25.1	21.3	53.7	HC	0.40	-	13.0	23.4	3.9	0.3	0.4	27.9	214.9	24.2	52.0
A3	23-32	20.4	21.2	20.8	0.5	3.9	1.9	10.7	10.9	0.4	2.1	7.6	7.1	0.5	nd	31.4	35.2	33.3	LiC	1.06	-	13.0	25.4	3.7	0.2	0.5	29.7	228.8	39.0	89.3
No.3 Brown Rendzina-like soil (Pleistocene IV, 35m.a.s.l.)																														
Ah1	0-12	42.3	49.5	48.8	0.7	5.7	4.4	9.6	11.1	0.6	2.7	7.5	6.7	0.8	tr.	11.1	23.0	65.9	HC	0.35	-	19.1	34.0	6.8	0.8	0.8	42.4	221.7	29.0	64.3
Ah2	12-30	15.8	19.1	18.5	0.6	5.1	1.7	9.3	10.9	0.5	2.2	7.5	6.6	0.9	tr.	12.8	12.7	74.5	HC	0.17	-	13.6	26.3	5.0	0.3	1.1	32.8	241.0	18.3	44.0
Bw	30-50	17.7	22.2	20.6	1.6	13.3	2.0	8.9	10.3	1.3	3.3	7.6	6.8	0.8	nd	6.2	13.8	80.0	HC	0.17	-	15.3	37.3	4.5	0.3	1.6	43.6	284.7	19.1	54.5
No.4 Terra fusca-like soil (Pleistocene III, 85m.a.s.l.)																														
A	0-10	58.2	64.1	48.3	15.8	131.7	3.8	15.3	12.7	13.2	16.4	8.0	7.5	0.6	tr.	15.6	37.9	46.5	HC	0.82	-	25.5	53.8	4.8	1.0	0.3	59.8	234.6	54.8	128.7
Bt1	10-33	17.5	18.6	18.5	0.1	0.4	1.8	9.7	10.3	0.0	2.0	7.4	6.4	1.0	0.2	8.3	21.6	70.1	HC	0.31	-	31.2	24.9	3.4	0.4	0.9	29.5	94.7	44.5	42.1
Bt2	33-65	13.2	13.9	13.8	0.1	0.7	1.4	9.4	9.8	0.1	2.0	7.1	6.2	0.9	0.4	10.6	14.8	74.6	HC	0.20	0.1	25.8	25.4	2.5	0.2	1.1	29.3	113.5	34.6	39.3
BC	65-80	17.7	19.4	17.6	1.8	15.1	1.8	9.8	9.8	1.5	3.8	8.2	7.4	0.8	0.5	6.6	12.5	80.9	HC	0.15	0.1	35.4	43.8	2.0	0.3	1.2	47.4	133.8	43.8	58.6
No.5 Terra rossa-like soil (Pleistocene II, 186m.a.s.l.)																														
A	0-12	49.6	50.2	50.1	0.0	0.4	4.4	11.3	11.4	0.0	1.3	6.1	5.2	0.9	2.2	14.6	28.7	56.7	HC	0.51	0.1	25.5	15.9	4.2	0.7	0.5	21.2	83.2	45.0	37.5
Bt1	12-25	14.8	15.1	14.7	0.4	3.1	1.4	10.6	10.5	0.3	0.9	5.5	4.0	1.6	5.6	11.3	11.4	77.3	HC	0.15	1.0	23.8	9.5	3.6	0.4	0.9	14.3	60.3	30.8	19.8
Bt2	25-46	10.5	10.6	10.3	0.2	2.0	1.1	9.5	9.4	0.2	1.0	5.5	4.0	1.4	3.6	11.5	12.7	75.8	HC	0.17	0.6	17.1	11.6	2.7	0.4	0.9	15.5	90.8	22.6	21.3
Bt3	46-58	10.8	11.3	11.2	0.1	1.1	1.1	9.8	10.1	0.1	1.1	5.7	4.4	1.3	0.3	14.2	14.5	71.3	HC	0.20	-	21.2	14.4	2.0	0.3	0.8	17.5	82.3	29.7	24.5
BC1	58-72	10.8	11.3	11.2	0.1	0.5	1.1	9.8	10.2	0.0	1.3	6.5	4.9	1.6	0.2	14.0	18.6	67.4	HC	0.28	0.0	22.8	16.9	1.6	0.2	0.8	19.6	85.9	33.8	29.1
BC2	72-85	19.1	21.3	21.0	0.3	2.5	1.3	14.7	16.1	0.2	2.0	7.5	6.7	0.8	nd	6.4	12.0	81.8	HC	0.15	0.1	36.2	29.7	1.8	0.7	1.3	33.4	92.3	44.3	40.9
No.6 Terra rossa-like Red-Yellow soil (Pleistocene I, 200m.a.s.l.)																														
A	0-10	43.3	45.2	45.0	0.2	1.5	3.3	13.1	13.6	0.1	1.6	6.9	6.7	0.2	0.4	10.4	22.7	66.9	HC	0.34	0.0	29.6	18.2	4.0	1.0	1.0	24.1	81.4	44.2	36.0
AB	10-28	27.4	25.6	25.5	0.1	0.8	2.2	12.5	11.6	0.1	1.3	7.0	6.8	0.2	0.5	9.8	21.4	68.8	HC	0.31	0.0	22.2	14.2	1.8	0.3	1.4	17.6	79.5	32.3	25.7
Bt1	28-68	8.8	9.3	9.2	0.1	1.0	1.0	8.8	9.2	0.1	0.9	5.6	4.0	1.7	6.9	7.3	7.2	85.5	HC	0.08	1.3	18.6	8.2	2.6	0.4	1.1	12.4	66.4	21.8	16.0
Bt2	68-90	6.8	7.7	7.1	0.6	5.0	0.8	8.5	8.9	0.5	1.1	5.4	4.1	1.2	2.0	7.2	13.1	79.7	HC	0.16	0.3	21.7	11.3	2.5	0.3	1.1	15.3	70.4	27.2	19.6
Minami-Daito Island																														
No.7 Red soil (Hague, 45m.a.s.l.)																														
A	0-14	43.0	40.7	39.8	0.9	7.3	3.8	11.3	10.5	0.7	2.3	7.3	7.0	0.3	1.9	1.9	34.1	64.0	HC	0.53	0.0	20.2	22.2	10.5	1.7	4.8	39.1	193.6	31.6	61.2
BA	14-26	22.4	22.0	21.5	0.4	3.7	2.2	10.2	9.8	0.4	1.0	6.6	5.9	0.7	1.8	0.5	10.1	89.4	HC	0.11	0.3	13.9	7.5	6.1	1.3	4.9	19.8	142.9	15.5	22.6
Bt1	26-50	14.3	14.4	13.9	0.5	4.3	1.6	8.9	8.7	0.4	0.6	5.2	4.8	0.4	0.8	2.9	8.0	89.0	HC	0.09	0.1	10.2	3.7	3.9	0.8	4.6	12.9	127.1	11.4	14.6
Bt2g	50-95	6.5	6.2	6.1	0.0	0.3	1.1	5.9	5.6	0.0	0.3	4.3	3.7	0.6	17.9	0.7	6.4	92.9	HC	0.07	4.0	8.2	1.5	1.7	0.6	3.1	6.9	85.0	8.8	11.8
Bt3g	95-140+	6.2	7.2	6.1	1.1	9.1	1.3	4.8	4.7	0.9	1.0	6.0	5.8	0.2	0.6	0.2	1.3	98.5	HC	0.01	0.1	10.6	4.7	6.5	0.5	3.8	15.5	145.8	10.8	15.8
No.8 Yellow soil (Hague, 45-50m.a.s.l.)																														
A	0-10	31.5	30.4	29.5	0.8	7.0	2.8	11.3	10.5	0.7	0.9	6.5	5.5	1.0	0.9	1.1	24.7	74.2	HC	0.33	0.1	15.3	5.9	7.0	1.1	1.4	15.4	100.7	20.6	20.9
AB	10-17	16.9	19.4	18.1	1.3	10.8	2.1	8.0	8.6	1.1	0.7	6.4	5.3	1.1	0.6	0.6	12.1	87.3	HC	0.14	0.1	12.5	4.4	5.8	1.0	1.4	12.5	100.2	14.3	14.4
Bt1	17-45	9.7	9.5	9.0	0.5	4.3	1.3	7.5	6.9	0.4	0.2	4.7	3.9	0.9	13.9	0.1	10.9	89.0	HC	0.12	2.9	9.2	1.2	2.1	0.4	0.9	4.5	49.4	10.3	8.3
Bt2	45-67	7.7	7.3	7.0	0.3	2.8	1.2	6.4	5.8	0.3	0.1	4.7	3.9	0.8	19.4	1.8	1.3	96.9	HC	0.01	4.0	7.7	0.6	1.2	0.5	0.7	3.0	39.1	7.9	7.3
Bt3	67-110	6.4	6.4	6.3	0.1	0.8	1.1	5.8	5.7	0.1	0.1	4.6	3.9	0.7	18.9	1.9	0.5	97.6	HC	0.01	3.9	7.6	0.8	1.6	0.2	0.9	3.4	45.1	7.7	7.5
lower 100-110+		5.6	5.5	5.4	0.1	0.7	1.1	5.1	4.9	0.1	0.1	4.6	3.9	0.7	17.3	0.5	1.7	97.8	HC	0.02	3.5	7.4	1.0	1.8	0.1	1.2	4.1	54.7	7.6	7.7

*: oven dry basis, (1): T-C (CN coder) / T-N (CN coder), (2): O-C (Kosaka and Iseki method) / T-N (CN coder), HC: heavy clay, LiC: light clay, SC: sandy clay, SCL: sandy clay loam, tr=trace amount, nd=not determined
:(1M NH₄OAc soluble cations) / CEC×100, *: ECEC= sum of bases extracted with 1M NH₄OAc pH 7, plus 1M KCl-extractable Al.

*: oven dry basis, (1): T-C (CN coder) / T-N (CN coder), (2): O-C (Kosaka and Iseki method) / T-N (CN coder), HC: heavy clay, LiC: light clay, SC: sandy clay, SCL: sandy clay loam, tr=trace amount, nd=not determined
 : (1M NH₄OAc soluble cations) / CEC × 100, *: ECEC=sum of bases extracted with 1M NH₄OAc pH 7, plus 1M KCl-extractable Al.

Sample name (terrace surface, altitude)

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Appendix 3 Organic carbon contents and properties of humic acids with 0.5% NaOH and 0.1M S.P.P. from the soils of Kikai and Minami-Daito Islands.

Sample name (terrace surface, altitude)		0.5% NaOH extractable										0.1M sodium pyrophosphate extractable																			
		Horizon	Depth	O-C	Extr.-C	Properties of H.A.			Extr. H.A.	F.A.	Humin	Extr.-C	O-C	PQ	RF	$\Delta \log K$	type	-C	Extr. H.A.	F.A.	Humin	Cp	O-C	Cp	Fe	Alp	Csp	Alp	Cp		
				cm	g kg ⁻¹	%	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	
Kikai Island																															
No.1 Initial Rendzina-like soil (Holocene II, 10m.a.s.l.)																															
	Ab1	0-15	129.4	33	37.4	54	0.722	Rp	42.6	15.9	26.6	86.8	31	56.3	115	0.564	P ₂	39.5	22.2	17.2	89.9	13.6	10.5	0.20	2.38	8.77	0.00	0.08	0.18		
	Ab2	15-30	83.7	29	33.0	53	0.689	P ₂	24.1	8.0	16.1	59.6	28	48.2	130	0.520	P ₂	23.0	11.1	11.9	60.7	9.3	11.1	0.19	2.52	9.43	0.00	0.12	0.28		
No.2 Rendzina-like soil (Pleistocene V, 27m.a.s.l.)																															
	Ab1	0-9	31.8	45	47.8	74	0.736	Rp	14.4	6.9	7.5	17.4	39	63.2	126	0.665	B	12.3	7.8	4.5	19.5	3.9	12.3	0.25	0.27	6.77	0.01	0.03	0.47		
	Ab2	9-23	22.7	36	44.8	111	0.632	P ₂ or B	8.1	3.6	4.5	14.6	34	68.9	176	0.598	B	7.7	5.3	2.4	14.9	2.8	12.6	0.27	0.33	7.04	0.02	0.05	0.67		
	A3	23-32	20.8	31	40.1	95	0.660	P ₂	6.5	2.6	3.9	14.3	34	64.1	181	0.585	A	7.1	4.6	2.6	13.6	2.6	12.3	0.28	0.31	5.97	0.02	0.05	0.63		
No.3 Brown Rendzina-like soil (Pleistocene IV, 35m.a.s.l.)																															
	Ab1	0-12	48.8	58	61.9	62	0.812	Rp	28.5	17.6	10.9	20.3	40	62.3	92	0.753	B	19.5	12.2	7.4	29.3	6.4	13.0	0.34	0.40	7.90	0.01	0.03	0.34		
	Ab2	12-30	18.5	38	36.8	78	0.751	Rp	6.9	2.6	4.4	11.5	34	50.4	123	0.705	B	6.2	3.1	3.1	12.3	2.9	15.7	0.27	0.36	6.06	0.02	0.05	0.57		
	Bw	30-50	20.6	36	30.5	52	0.803	Rp	7.5	2.3	5.2	13.1	31	44.3	97	0.770	B	6.4	2.8	3.6	14.2	3.0	14.5	0.35	0.38	9.24	0.03	0.06	0.84		
No.4 Terra fusca-like soil (Pleistocene III, 85m.a.s.l.)																															
	A	0-10	48.3	40	47.5	47	0.845	Rp	19.4	9.2	10.2	28.9	36	59.6	67	0.774	Rp	17.5	10.4	7.1	30.8	5.5	11.4	0.18	0.25	4.03	0.01	0.02	0.20		
	Bt1	10-33	18.5	41	19.9	31	0.891	Rp	7.6	1.5	6.1	10.9	34	31.6	55	0.735	Rp	6.3	2.0	4.3	12.2	2.1	11.4	0.45	0.62	5.33	0.05	0.13	0.69		
	Bt2	33-65	13.8	31	16.6	20	1.009	Rp	4.2	0.7	3.5	9.6	32	28.7	43	0.766	Rp	4.4	1.3	3.1	9.4	1.2	8.5	0.25	0.53	5.03	0.05	0.20	1.17		
	BC	65-80	17.6	26	9.6	27	0.912	Rp	4.6	0.4	4.1	13.0	30	33.7	71	0.709	Rp	5.2	1.8	3.5	12.3	1.4	8.1	0.26	0.39	4.66	0.04	0.12	0.89		
No.5 Terra rossa-like soil (Pleistocene II, 186m.a.s.l.)																															
	A	0-12	50.1	62	43.3	69	0.713	Rp ₂	31.1	13.5	17.6	19.0	39	46.9	81	0.708	Rp	19.5	9.2	10.4	30.6	8.4	16.8	2.37	1.24	3.36	0.06	0.07	0.11		
	Bt1	12-25	14.7	48	14.3	36	0.837	Rp	7.1	1.0	6.1	7.6	32	22.8	55	0.719	Rp	4.7	1.1	3.6	10.1	3.4	23.2	1.21	1.62	2.01	0.08	0.21	0.16		
	Bt2	25-46	10.3	54	21.0	34	0.833	Rp	5.5	1.2	4.4	4.8	39	15.6	57	0.696	P ₂	4.0	0.6	3.4	6.3	2.2	21.7	0.47	1.30	2.50	0.05	0.26	0.31		
	Bt3	46-58	11.2	45	12.6	31	0.859	Rp	5.0	0.6	4.4	6.2	38	20.5	58	0.686	P ₂	4.2	0.9	3.3	7.0	2.3	20.8	0.51	0.98	3.13	0.05	0.19	0.37		
	BC1	58-72	11.2	40	16.1	17	1.007	Rp	4.5	0.7	3.8	6.7	37	23.6	55	0.693	P ₂	4.1	1.0	3.2	7.1	1.9	17.0	0.40	0.85	3.95	0.05	0.20	0.56		
	BC2	72-85	21.0	36	19.4	15	1.003	Rp	7.5	1.5	6.0	13.5	32	27.3	42	0.763	Rp	6.7	1.8	4.9	14.2	2.7	12.9	0.41	0.73	5.96	0.03	0.12	0.60		
No.6 Terra rossa-like/Red-Yellow soil (Pleistocene I, 200m.a.s.l.)																															
	A	0-10	45.0	50	38.5	55	0.808	Rp	22.3	8.6	13.7	22.7	34	45.8	67	0.770	Rp	15.4	7.1	8.4	29.6	5.2	11.6	0.89	0.86	4.42	0.04	0.07	0.23		
	AB	10-28	25.5	50	20.2	57	0.743	Rp ₂	12.8	2.6	10.2	12.7	41	25.6	77	0.673	P ₂	10.3	2.6	7.7	15.1	4.5	17.5	1.03	1.20	3.03	0.05	0.12	0.19		
	Bt1	28-68	9.2	37	8.8	33	0.836	Rp	3.3	0.3	3.1	5.8	21	7.7	63	0.673	P ₂	1.9	0.1	1.8	7.2	1.6	17.4	0.58	1.45	1.66	0.08	0.40	0.28		
	Bt2	68-90	7.1	35	6.1	36	0.804	Rp	2.5	0.1	2.3	4.7	16	14.6	66	0.612	P ₂	1.1	0.2	1.0	6.0	1.2	16.8	0.20	1.04	2.28	0.04	0.38	0.52		
Minami-Daito Island																															
No.7 Red soil (Holocene, 45m.a.s.l.)																															
	A	0-14	39.8	43.8	48.5	43	0.909	Rp	17.4	8.5	9.0	22.4	40	57.1	55	0.844	Rp	15.9	9.1	6.8	23.9	5.0	12.6	0.15	0.07	4.66	0.01	0.01	0.25		
	BA	14-26	21.5	39.5	19.5	46	0.785	Rp	8.5	1.7	6.8	13.0	39	30.2	53	0.797	Rp	8.4	2.5	5.9	13.1	3.4	15.6	0.18	0.28	1.63	0.01	0.04	0.13		
	Bt1	26-50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Bt2	50-95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Bt3	95-140+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
No.8 Yellow soil (Holocene, 45-50m.a.s.l.)																															
	A	0-10	29.5	43.4	38.6	67	0.837	Rp	12.8	4.9	7.9	16.7	36	52.2	75	0.781	Rp	10.7	5.6	5.1	18.8	3.6	12.0	0.31	0.24	1.31	0.02	0.03	0.10		
	AB	10-17	18.1	42.4	25.6	60	0.788	Rp	7.7	2.0	5.7	10.4	38	38.2	70	0.765	Rp	6.9	2.6	4.3	11.2	2.8	15.5	0.24	0.24	0.93	0.02	0.04	0.09		
	Bt1	17-45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Bt2	45-67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Bt3	67-110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	lower	100-110+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

*: oven dry basis