



NIBIO

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Applications of harvester data for efficiency and economy

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Background

- Ongoing optimisation of efficiency in harvesting
- Varying roundwood prices:
 - How small or large trees should be harvested?
- It's a matter of speed....
- Data
 - Spruce trees, middle Norway
 - Komatsu 911.5 with c93 head



Stems

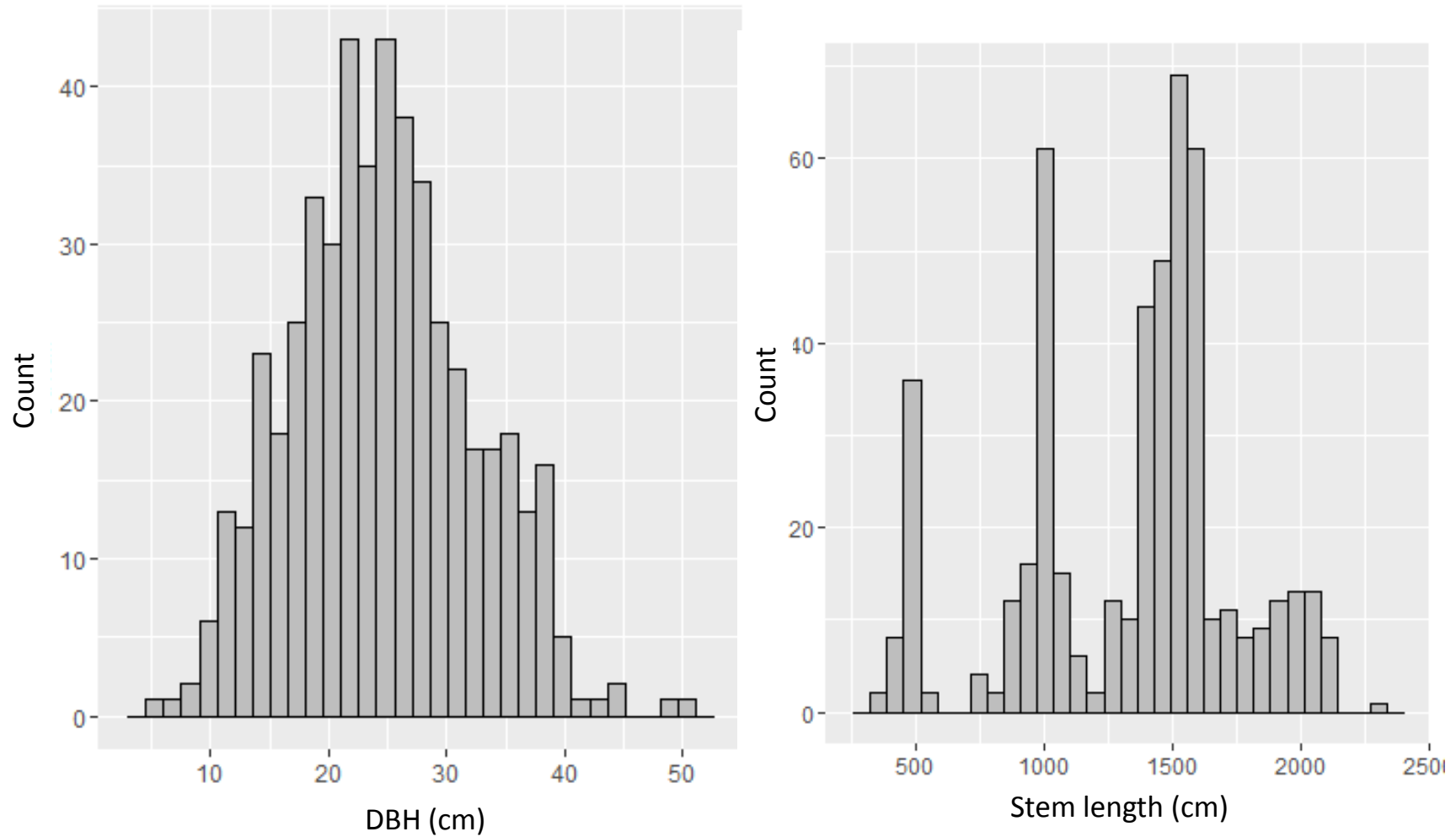


Figure 1. Diameter (left panel) and height (right panel) distribution for stems in the time study. N=496.

Logs

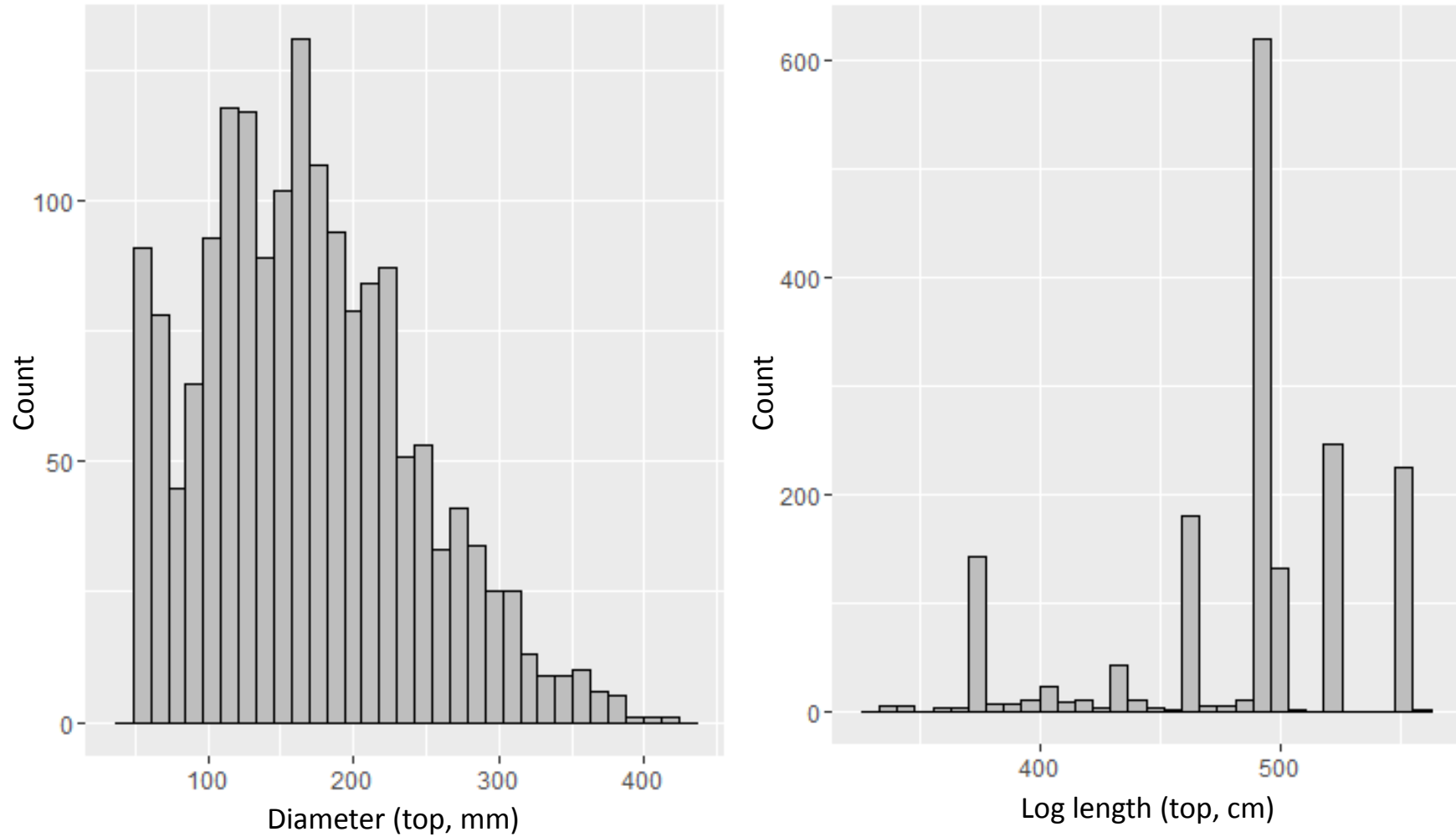
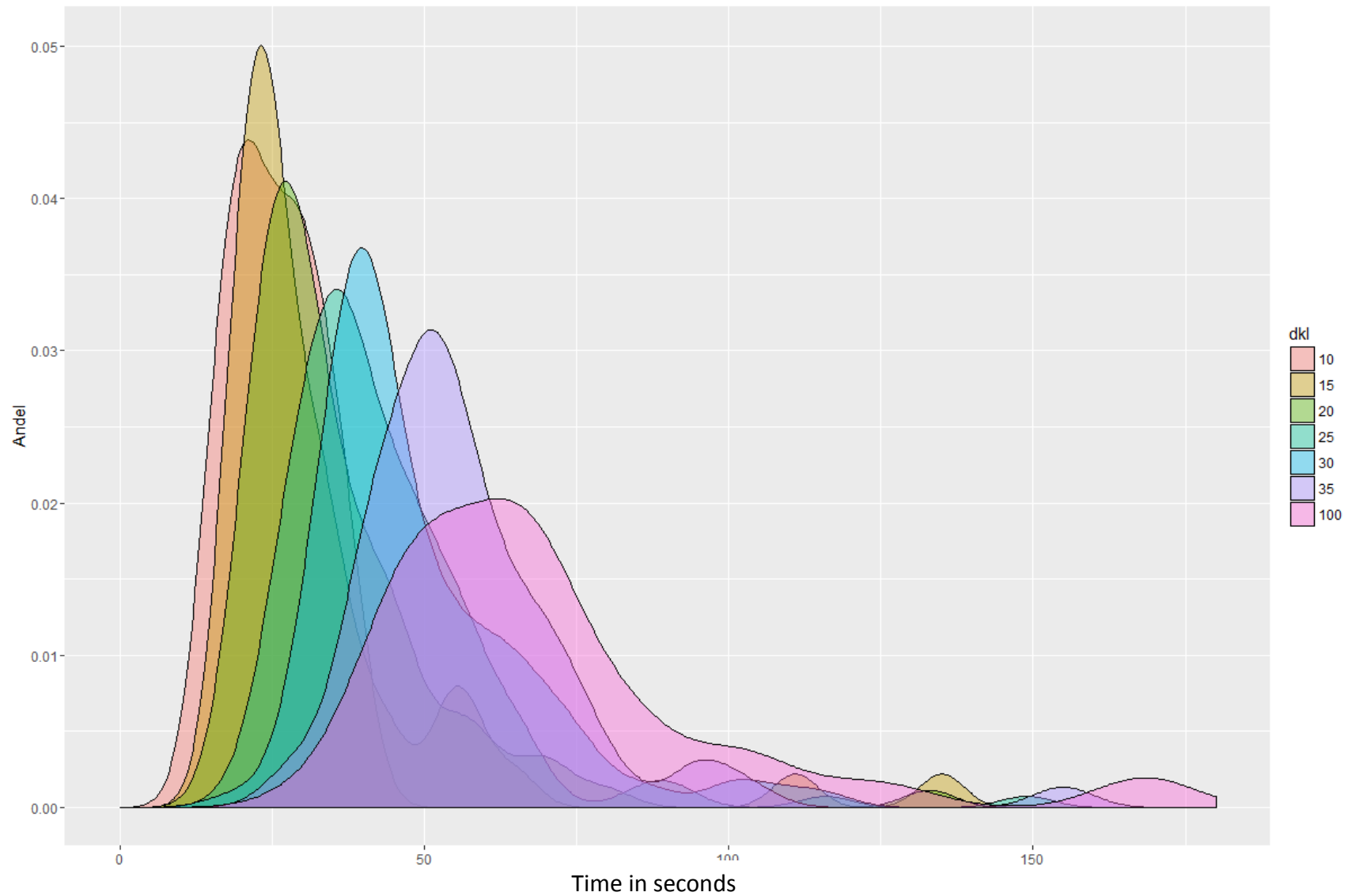


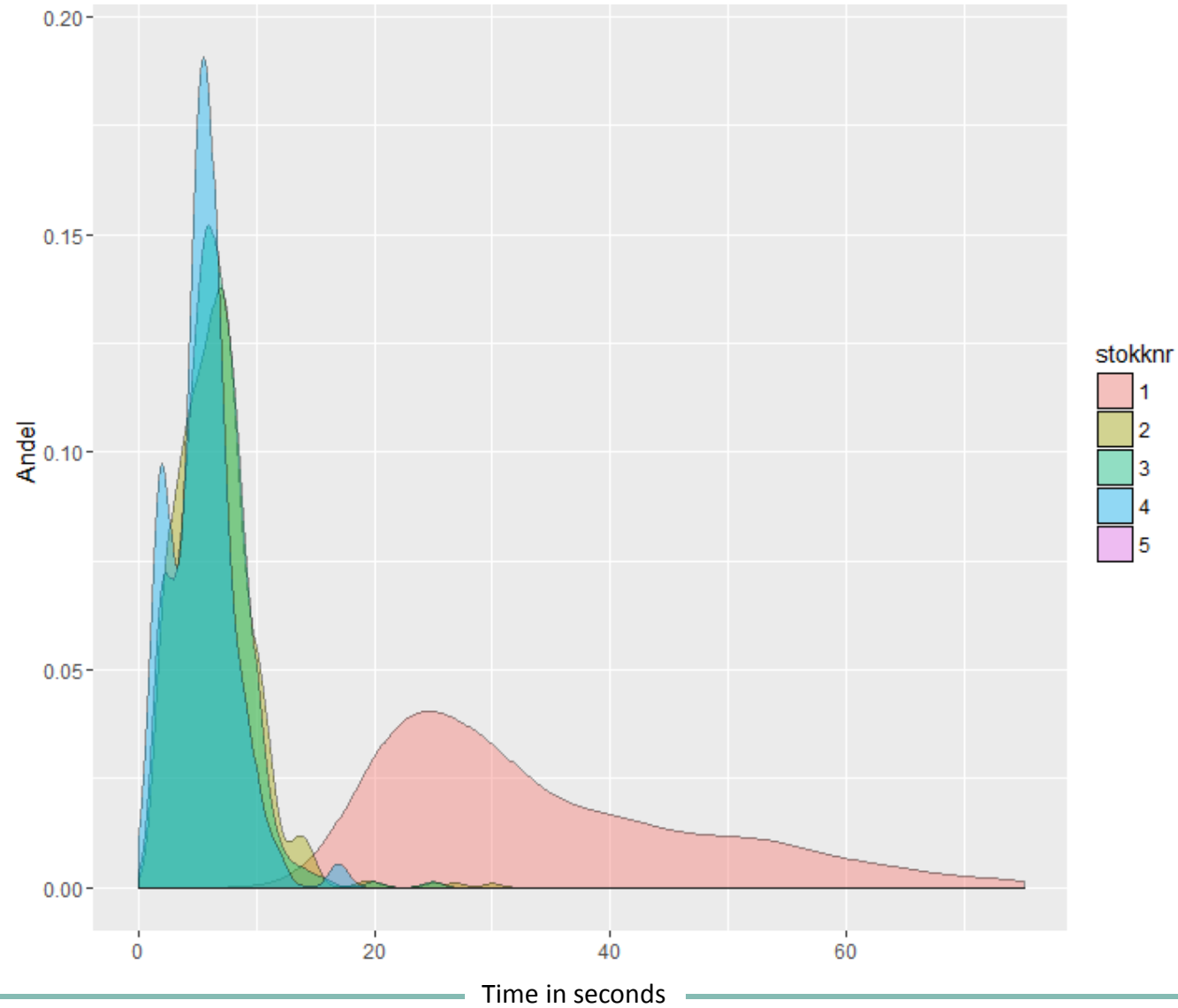
Figure 2. Diameter at top (left panel) and length (right panel) distributions for logs in the time study. N=1697.

Time for trees



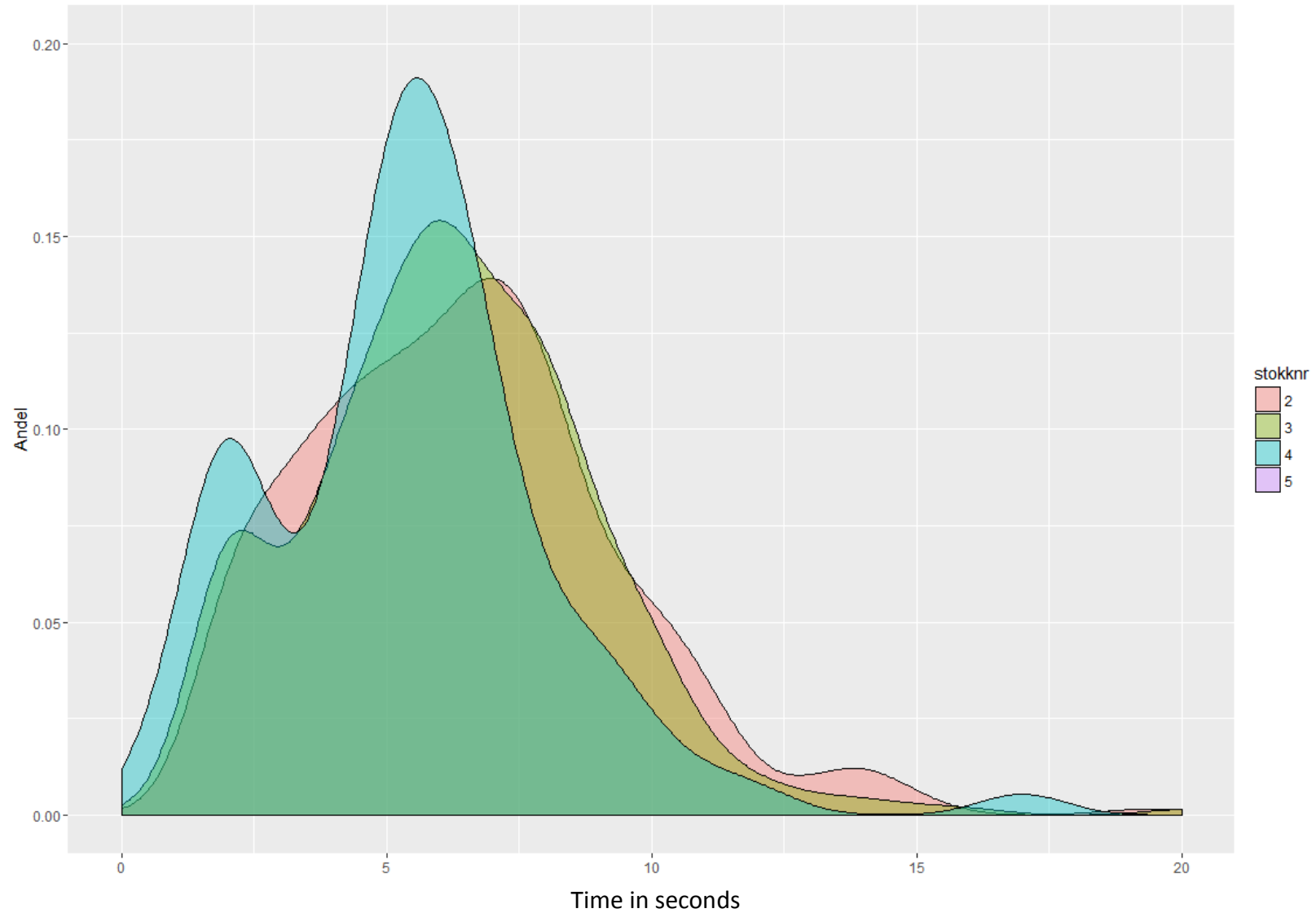
Figur 3. Distribution of time for harvesting and bucking trees in different diameter classes. dkl is diameter class, upper end of class intervall. Diagram (x-axis) restricted at 180 seconds.

Time for logs



Figur 4 . Distribution of time for logs with different positions in the stem. 1 = first log. Diagram (x-axis) restricted at 75 seconds.

Time for smaller logs (ex. bottom log)



Figur 5. Distribution of time for logs with different positions in the stem excluding the first log. Diagram (x-axis) restricted at 20 seconds.

Break even

$$= \text{value}(\text{volume, price}) - \text{cost}(\text{time})$$

Volume of individual trees (dm³ bb, Vestjordets, 1967). Diameter in cm and height in meters above stump. Coulored cells indicates the transition from negative to positive value with pulp price of 250 kr/cbm (red), 220 kr/cbm (green) and 190 kr/cbm (blue).

Dia.	Height															
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
7	13	15	16	18	20	22	24	26	29	31	33					
8	16	18	21	23	26	29	31	34	37	40	42	45				
9	19	23	26	29	32	35	39	42	45	49	52	56	59			
10	23	27	31	35	39	43	47	51	55	59	63	67	71	75		
11	28	33	37	42	47	51	56	61	66	71	75	80	85	90	95	
12	33	39	44	49	55	60	66	71	77	83	88	94	100	105	111	117
13	39	45	51	57	64	70	76	83	89	96	102	109	116	122	129	136
14	45	52	59	66	73	81	88	95	103	110	118	125	333	141	148	156
15	51	59	67	76	84	92	100	109	117	726	134	142	151	160	169	178
16	58	67	76	85	95	104	113	123	132	142	151	161	171	180	190	200
17	65	75	85	96	106	116	127	137	148	158	169	179	191	201	212	223
18	73	84	95	106	117	129	141	152	164	176	187	199	211	223	236	248
19	81	93	105	118	130	143	156	169	182	195	208	221	234	248	261	275
20		102	115	129	143	137	171	185	199	214	229	243	258	273	288	303
21		110	125	141	156	172	188	203	219	235	251	267	284	300	316	332