
Estimating and modelling harvester productivity in pine stands of different ages, densities and thinning intensities

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PULS

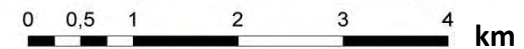
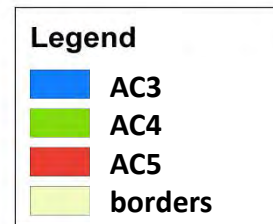
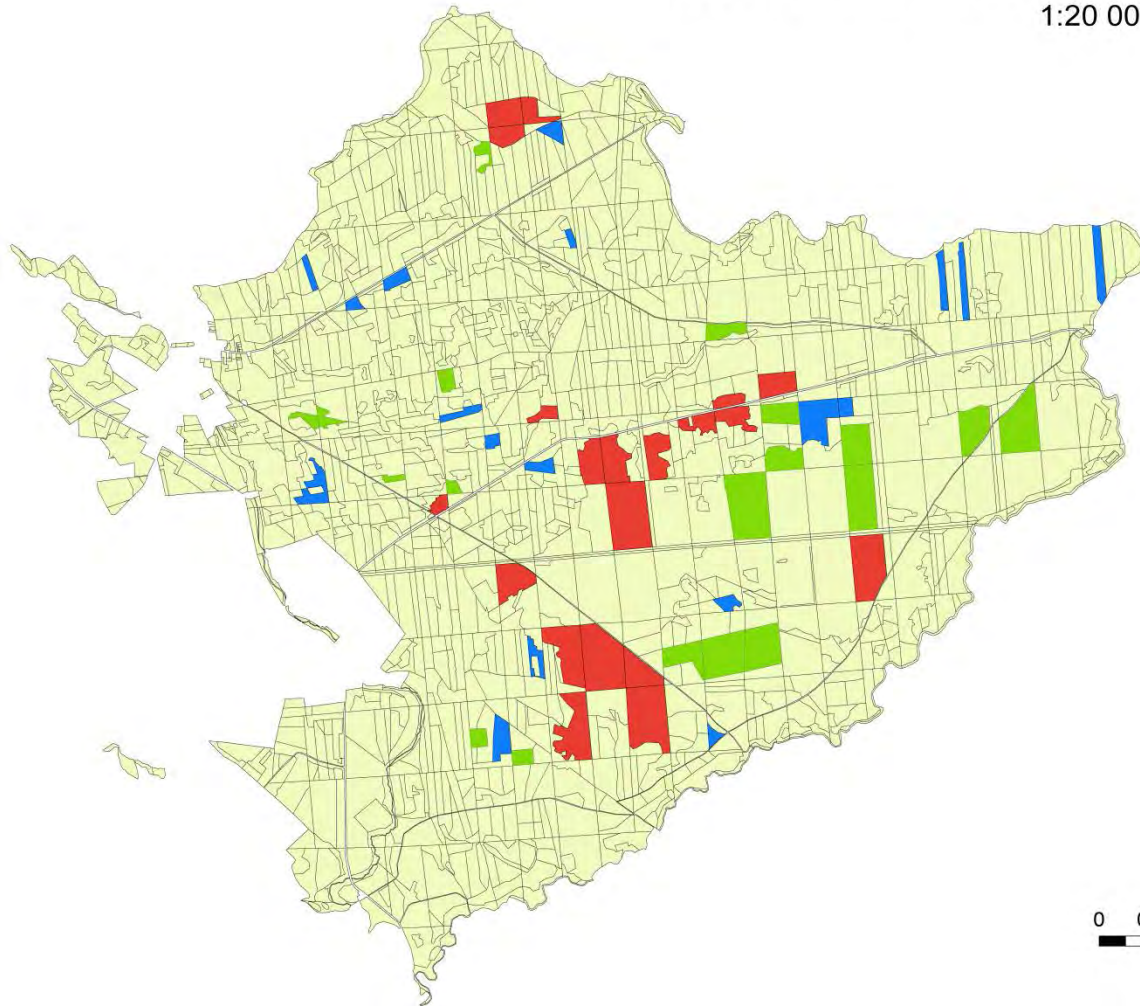
Content

- 1) Introduction: productivity in wider context
- 2) Hypothesis
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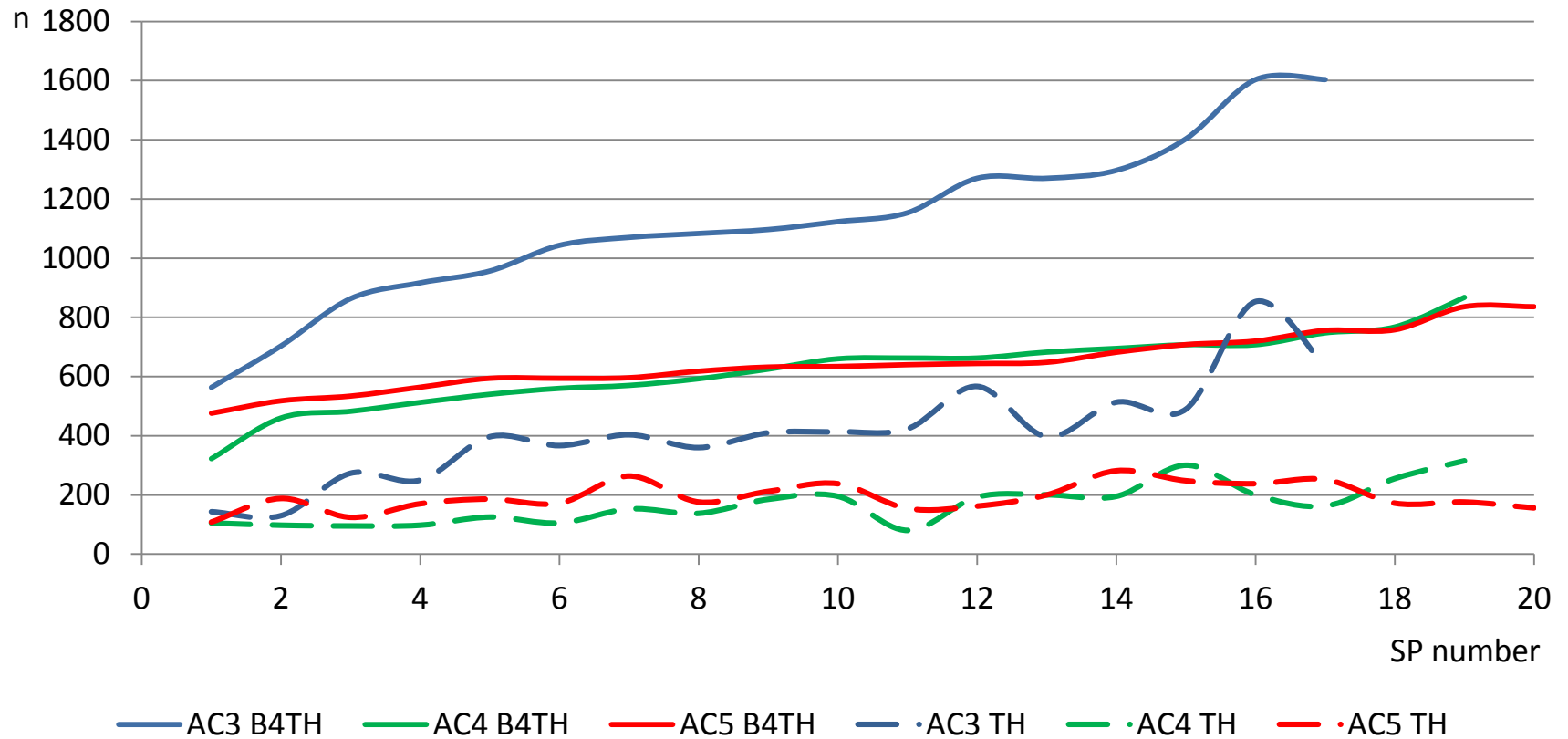


Drawno Forest District - sample plots in selected compartments

1:20 000



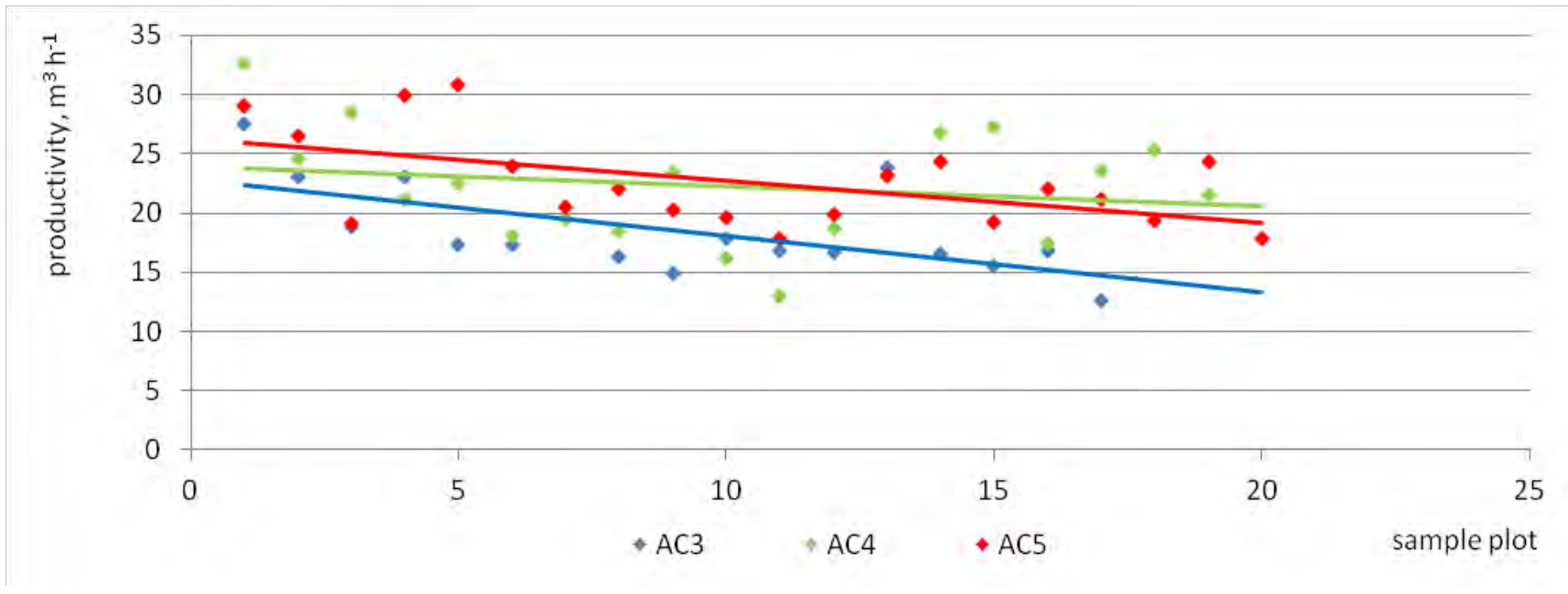
Material and methods: stands and trees



Material and methods

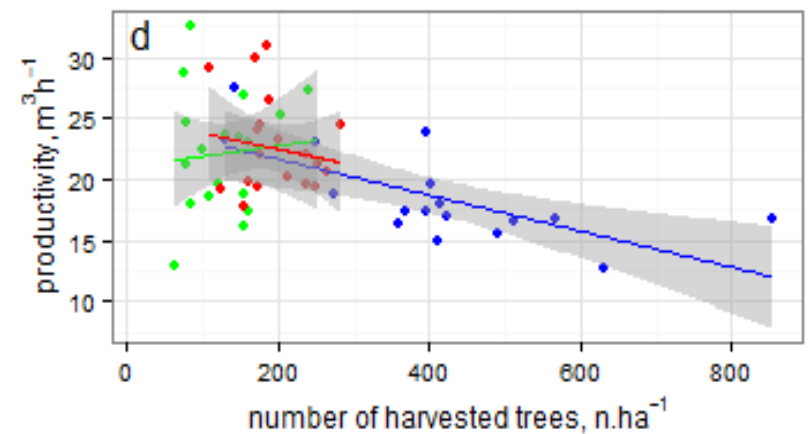
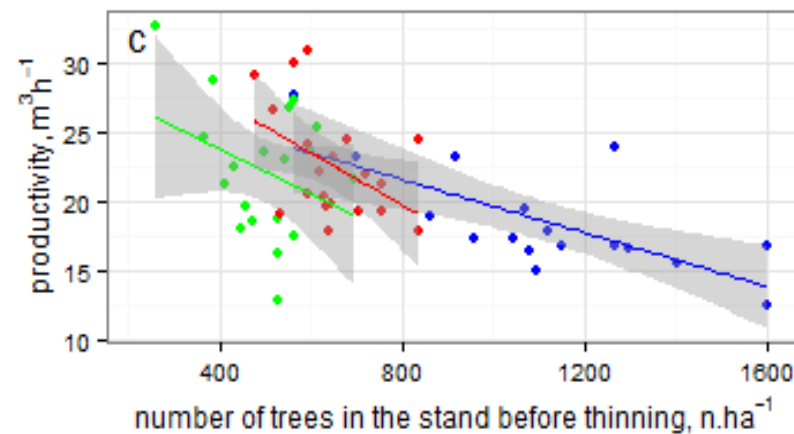
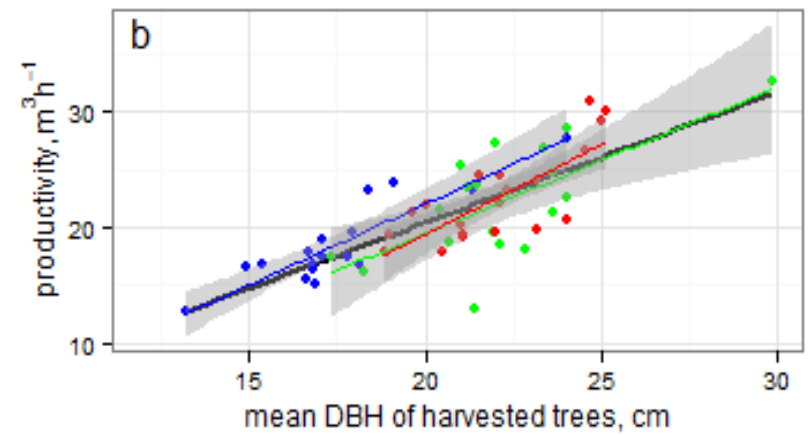
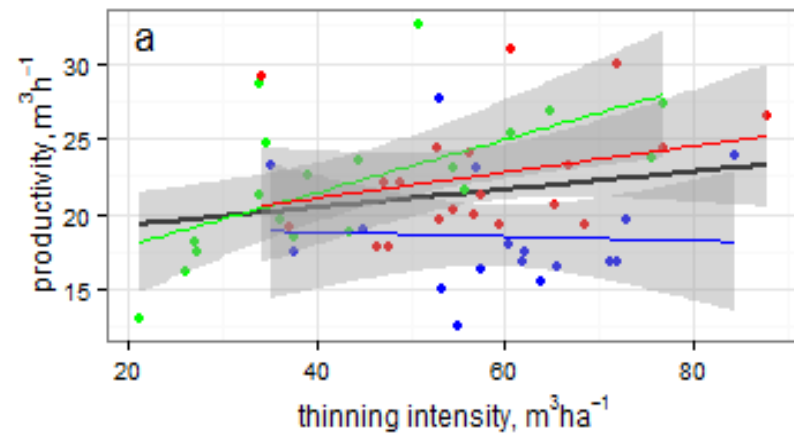


Results: productivity in AC's and THI's



		P SMH	std error	r	min	max	groups
AC	3	18.57	0.9198	17	12.64	27.60	a
	4	22.24	1.0960	19	12.99	32.61	b
	5	22.60	0.8834	20	17.84	30.90	b
THI	A	16.19	1.1337	4	12.99	18.07	a
	B	21.44	0.7398	32	12.64	32.61	b
	C	21.98	1.0793	20	15.56	30.90	b

Results: productivity as function of



age.class AC3 AC4 AC5

Results: corelation matrix

	Number of whole stand trees	Number of harvested trees	Mean DBH of whole stand trees	Mean DBH of harvested trees	THI	Harvested volume	Mean volume from one tree	Productivity
Number of whole stand trees	1	0.81	-0.7	-0.67	0.47	0.11	-0.55	-0.46
Number of harvested trees	0.81	1	-0.71	-0.62	0.56	0.04	-0.72	-0.36
Mean DBH of whole std trees	-0.7	-0.71	1	0.94	-0.21	0.46	0.83	0.64
Mean DBH of harvested trees	-0.67	-0.62	0.94	1	-0.09	0.47	0.72	0.78
THI	0.47	0.56	-0.21	-0.09	1	0.5	-0.31	0.22
Harvested volume	0.11	0.04	0.46	0.47	0.5	1	0.41	0.37
Mean volume from one tree	-0.55	-0.72	0.83	0.72	-0.31	0.41	1	0.35
Productivity	-0.46	-0.36	0.64	0.78	0.22	0.37	0.35	1

$$Y = -7.8920 + 1.2494 * DBH_{\text{mean}} - 0.8587\delta_4 - 1.3237\delta_5 + 3.7631\delta_b + 5.2550\delta_c$$

$R^2 = 0.7168$

Y mean productivity per PMH,
 DBH_{mean} mean DBH of harvested trees,
 δ_i Kronecker's delta,

$$\delta_i = \begin{cases} 1 & \text{stand of } i - \text{age class (of } i - \text{thinning intensity)} \\ 0 & \text{in other case} \end{cases}$$

$$Y = 8.607 + 6.990 * V_{\text{mean}} + 3.901\delta_4 + 2.891\delta_5 + 7.720\delta_b + 9.401\delta_c$$

$R^2 = 0.3934$

Conclusion

The productivity of the Komatsu 931.1 harvester increased along with:

- 1) older AC,
- 2) the decreasing number of trees in the initial stand in each AC,
- 3) the lowering number of trees for harvesting in AC3 and AC5, and
- 4) the increasing THI only in older AC (AC4 and AC5).

The model presents, the larger the mean DBH of the trees for harvesting, the greater the productivity.

However, within the same mean DBH, the older the AC, the lower the productivity.

Thx

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full paper will be published in CROJFE:

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