SMALLWOOD

Small diameter wood utilization with innovative stand management for multifunctional forests and a growing sustainable bio-economy

Tomas Nordfjell, SLU, Swedish University of Agricultural Sciences

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SMALLWOOD

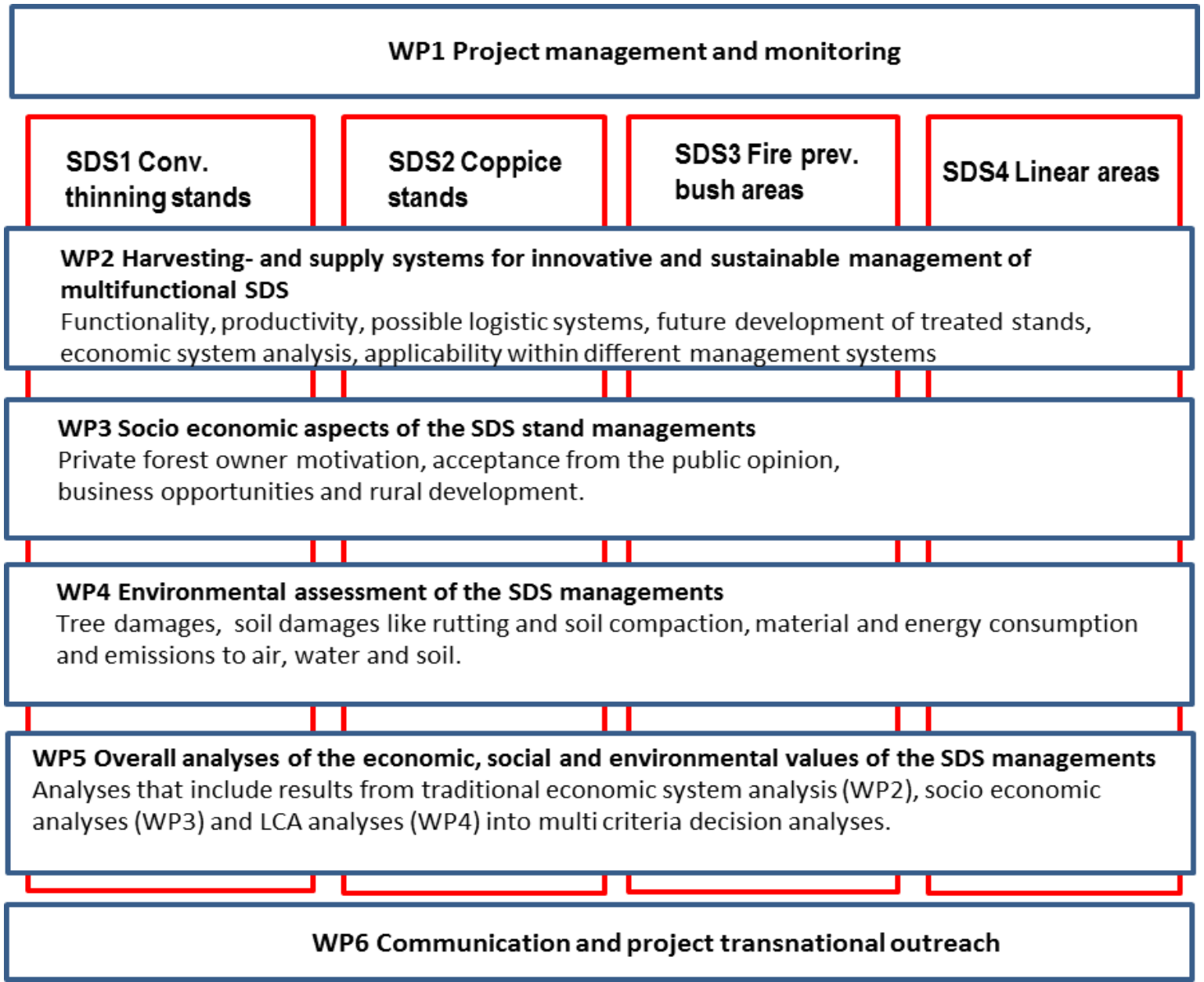
Overall objective:

To develop and evaluate **new technologies and new business and operational models** that can support a sustainable management and utilization of different types of small diameter wood.

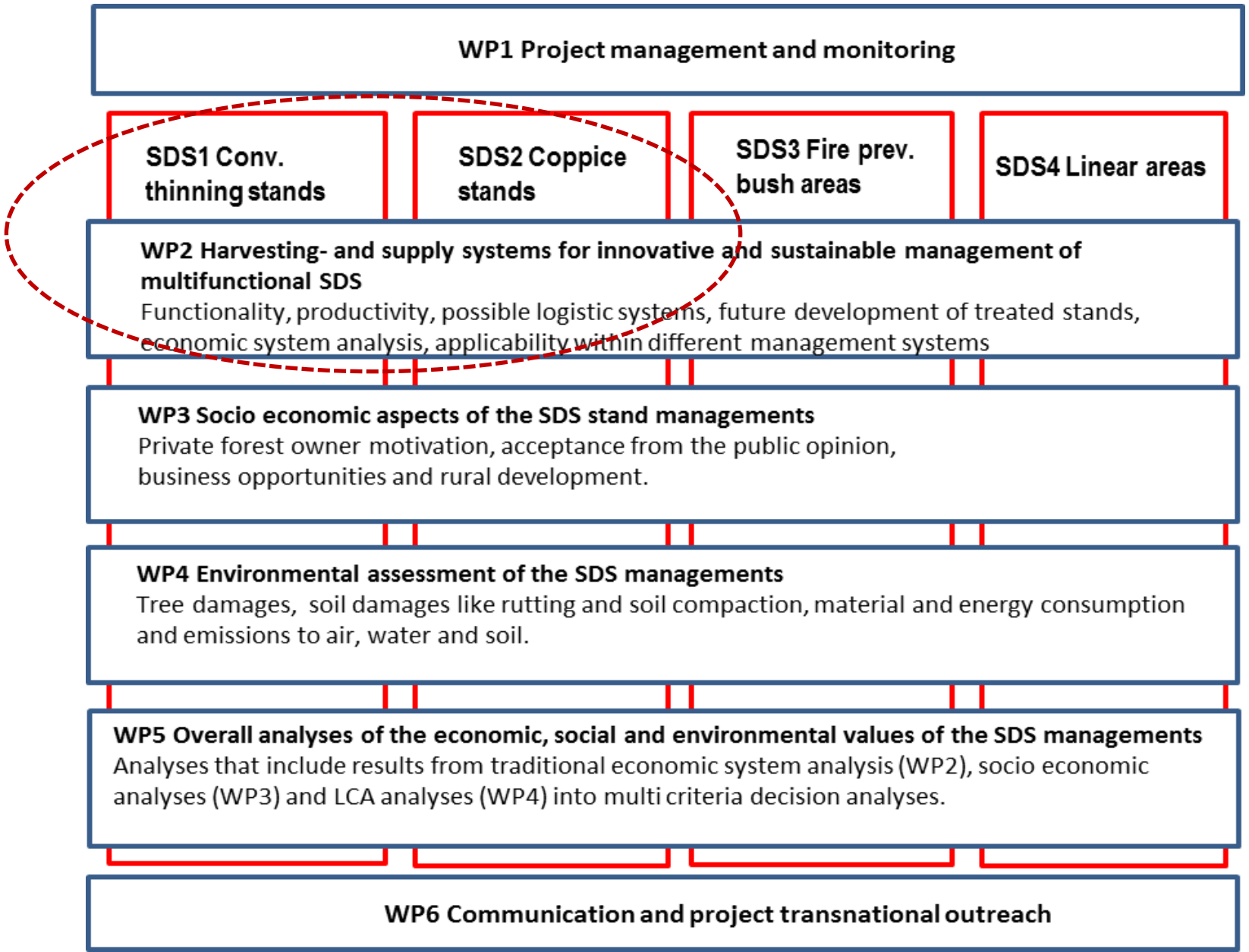
Project partners

Partner	Country	Respective funding organization	Contact person
Swedish University of Agricultural Sciences (SLU)	Sweden	Vinnova/Formas/SWEA	Prof.dr. Tomas Nordfjell
Universidad Politécnica de Madrid (UPM)	Spain	ES/MINECO-AEI	Prof.dr. Eduardo Tolosana
Slovenian Forest Institute (SFI)	Slovenia	SI/MIZS	Dr. Nike Krajnc
University of eastern Finland, School of Forest Sciences (UEF)	Finland	FI/MMM and FI/AKA	Prof.dr Teppo Hujala
Faculty of Economics and Business, University of Maribor (FEB)	Slovenia	SI/MIZS	Prof.dr. Zdenka Ženko
Bracke Forest	Sweden	Vinnova/Formas/SWEA	CEO Klas-Håkan Ljungberg

SMALLWOOD Project WPs



SMALLWOOD Project WPs



Preliminary results

WP2 Harvesting and supply systems

ForestValue presentation, 17-18th November 2020 (Webinar)

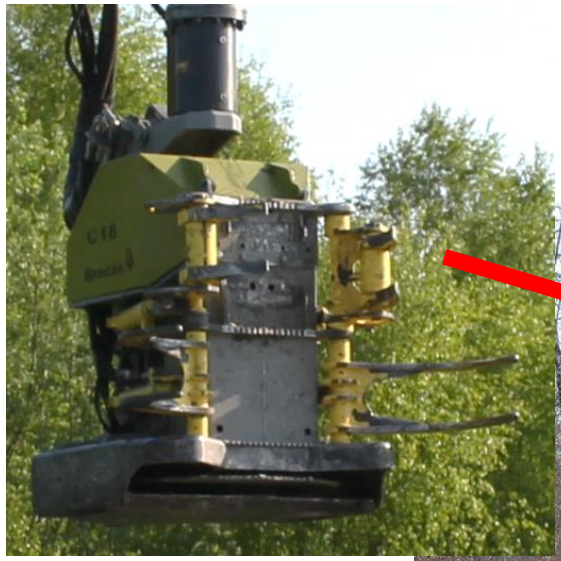
Tomas Nordfjell, Professor in Forest Technology at SLU.

Evaluation of Bracke C16c SMALLWOOD version

Materials and Methods

We upgraded and evaluated the accumulating felling head Bracke C16.c, with a Komatsu 901.4 as base machine, during the first thinning of dense forests.

The innovation: unique for these trials, **a "horn-shaped" support was mounted between the head and the rotator, aiming to stabilize the handling of long trees during the movement of the crane**.



Evaluation of Bracke C16c SMALLWOOD version

Materials and Methods

Field trials were performed in Sweden, Finland and Slovenia during the Fall-Spring 2019/2020, using **the same head, base-machine and operator**. (Postponed in Spain due to the Covid-19 pandemic)

Evaluation of Bracke C16c SMALLWOOD version

Materials and Methods

The thinning trials aimed to compare **two working methods**:

The novel, boom-corridor (BC) thinning with a conventional, selective **(S)** thinning from bellow as reference

harvested

remaining

Boom-corridor thinning (BC)

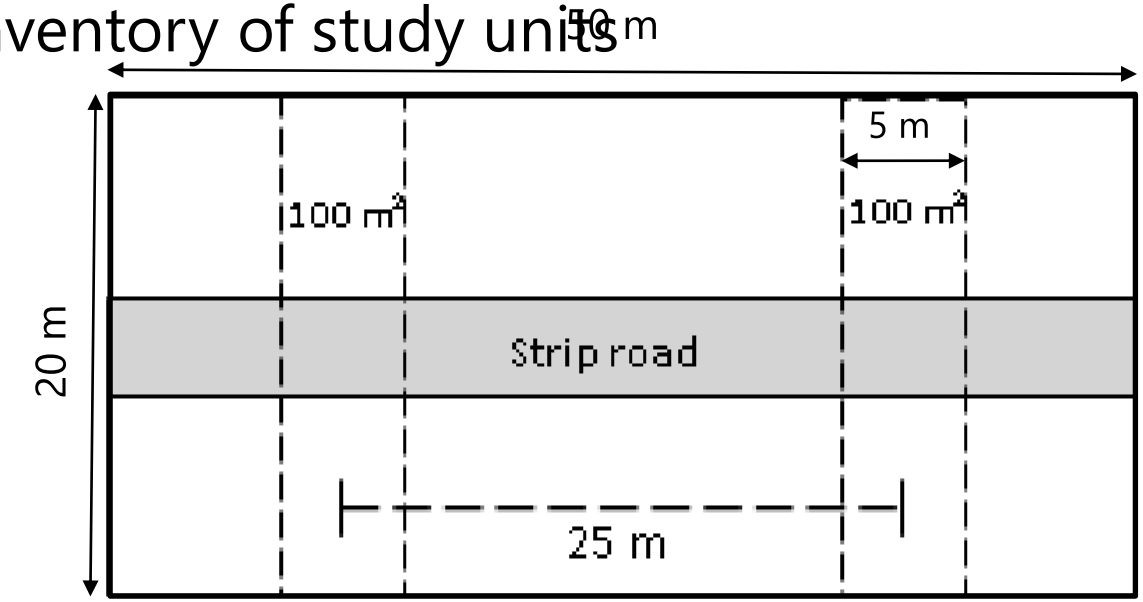
Reference:

Conventional selective thinning (S)

Evaluation of Bracke C16c SMALLWOOD version

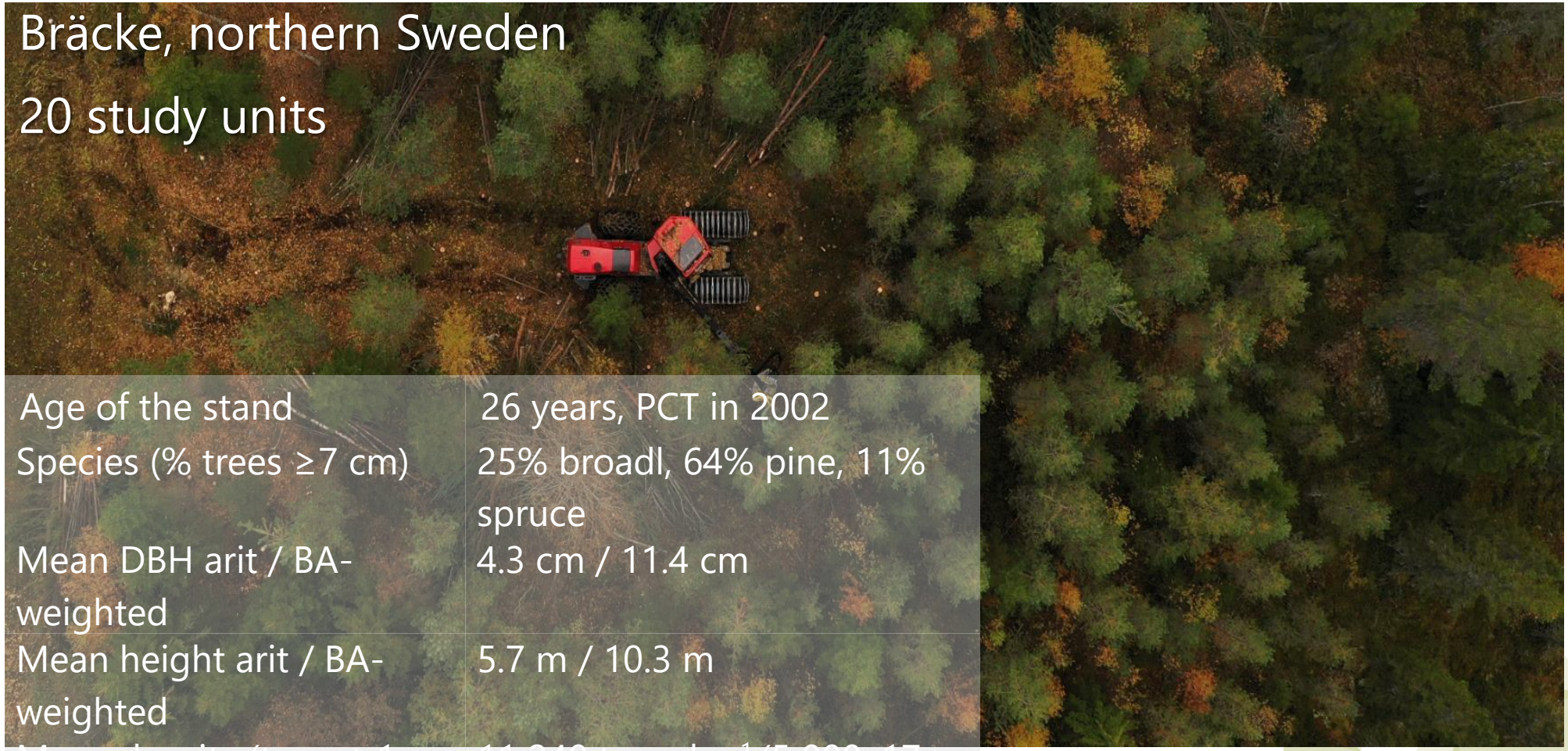
Materials and Methods

1. Marking and pre-inventory of 1000 m^2 study units within a number of stands;
2. Time study of the Bracke C16c SMALLWOOD version;
3. Forwarding and scaling of biomass;
4. Post-inventory of study units



Evaluation of Bracke C16c SMALLWOOD version

Materials and Methods

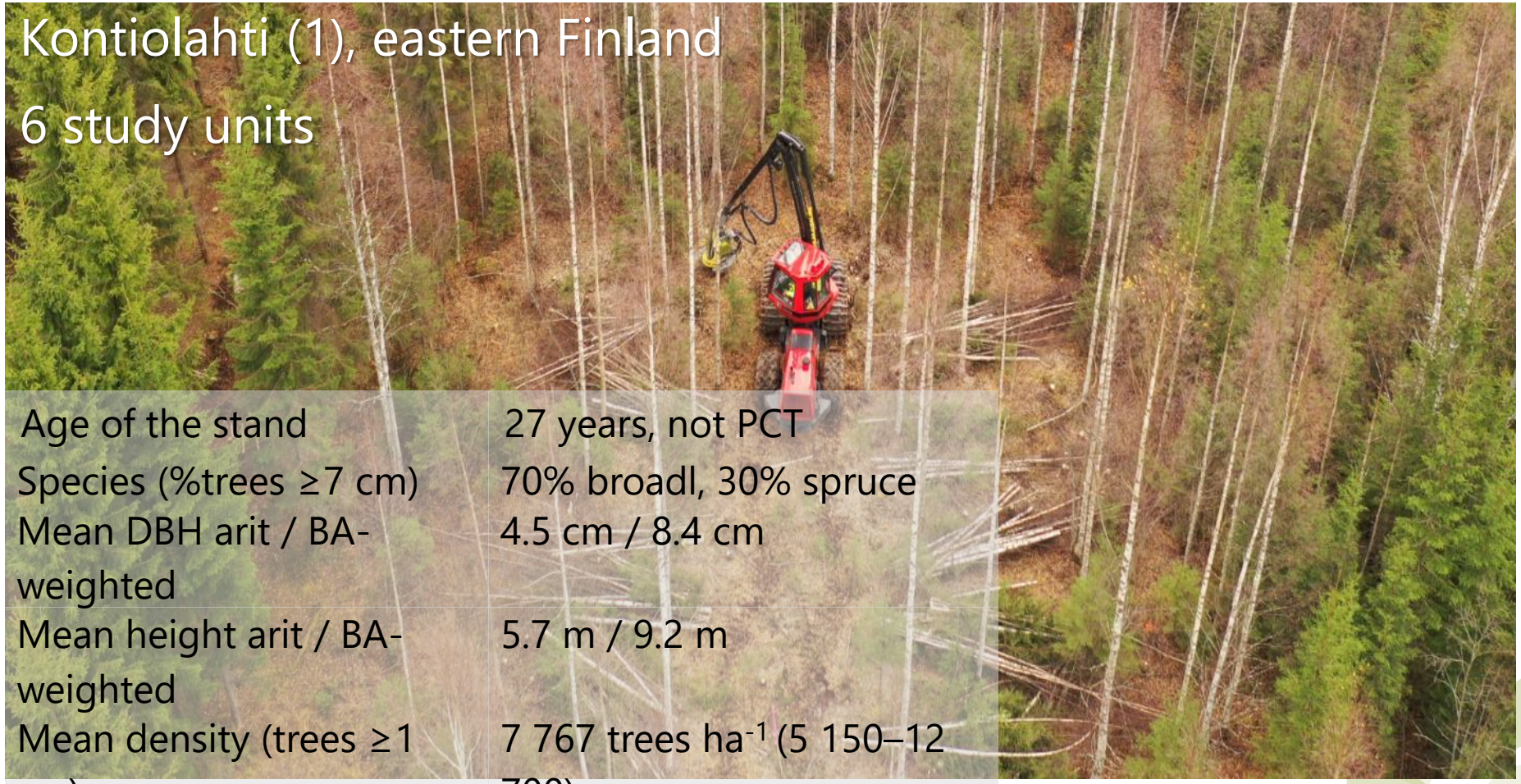


Age of the stand	26 years, PCT in 2002
Species (% trees ≥7 cm)	25% broadl, 64% pine, 11% spruce
Mean DBH arit / BA-weighted	4.3 cm / 11.4 cm
Mean height arit / BA-weighted	5.7 m / 10.3 m
Mean density (trees ≥1 cm)	11 240 trees ha^{-1} (5 000–17 750)

All drone images in this presentation were taken by Christian Höök (SLU)

Evaluation of Bracke C16c SMALLWOOD version

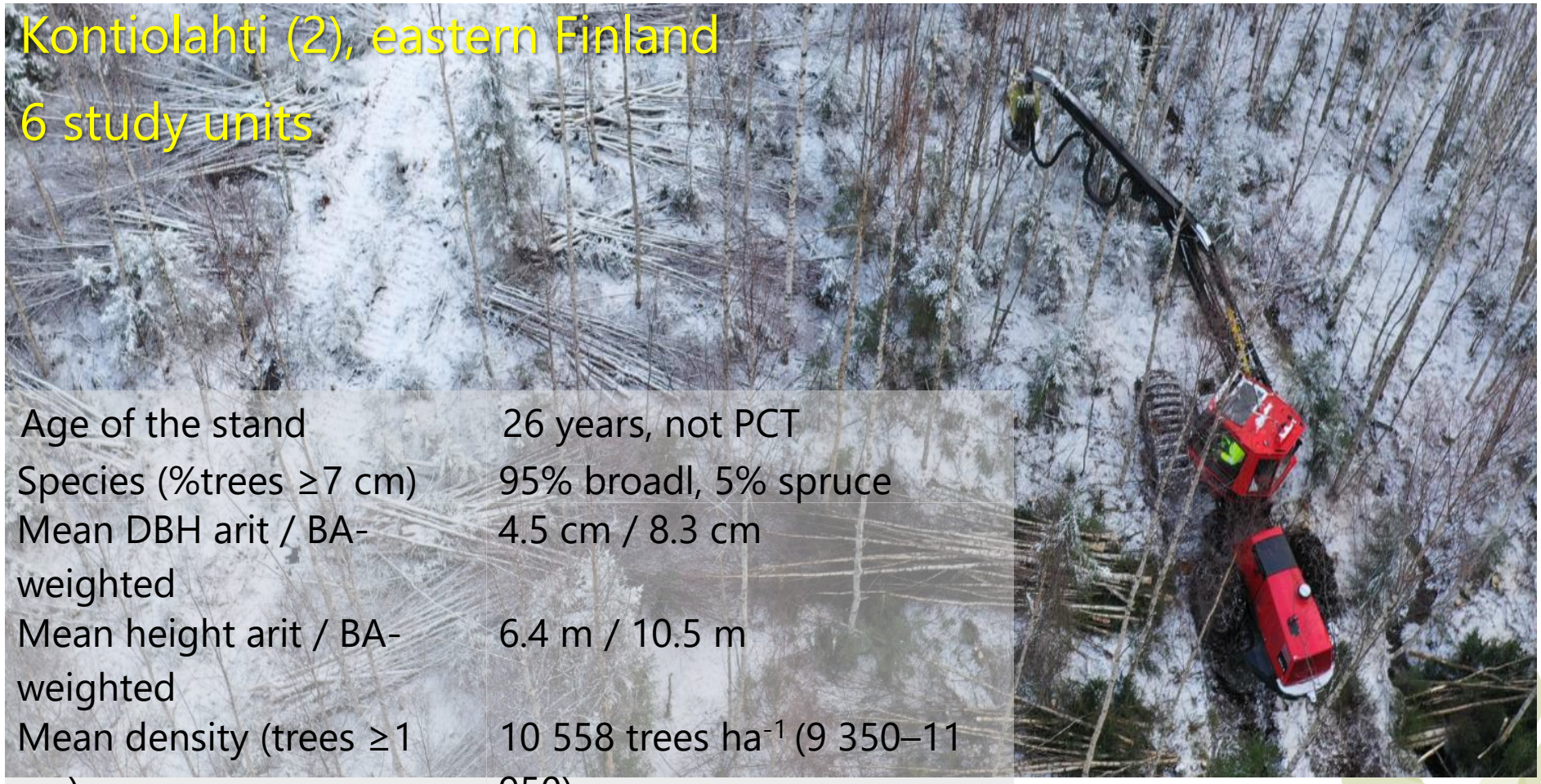
Materials and Methods



Age of the stand	27 years, not PCT
Species (%trees ≥7 cm)	70% broadl, 30% spruce
Mean DBH arit / BA-weighted	4.5 cm / 8.4 cm
Mean height arit / BA-weighted	5.7 m / 9.2 m
Mean density (trees ≥1 cm)	7 767 trees ha^{-1} (5 150–12 700)
Mean density (trees ≥4	4 083 trees ha^{-1} (2 650–6

Evaluation of Bracke C16c SMALLWOOD version

Materials and Methods



Age of the stand	26 years, not PCT
Species (%trees ≥7 cm)	95% broadl, 5% spruce
Mean DBH arit / BA-weighted	4.5 cm / 8.3 cm
Mean height arit / BA-weighted	6.4 m / 10.5 m
Mean density (trees ≥1 cm)	10 558 trees ha^{-1} (9 350–11 950)
Mean density (trees ≥4	5 658 trees ha^{-1} (4 800–6

Evaluation of Bracke C16c SMALLWOOD version

Materials and Methods

Species	Mix of broadleaves
Mean DBH arit	5.3 cm
Mean height arit	8 m
Mean density (trees ≥1 cm)	11 083 trees ha^{-1} (7 850–15 450)
Mean standing volume (stem+branches)	231 m^3 ha^{-1}

Fagus sylvatica
Acer pseudoplatanus
Fraxinus excelsior
Ulmus glabra
Tilia cordata
Other broadleaves
Ostrya carpinifolia
Betula pendula
Corylus avellana

Evaluation of Bracke C16c SMALLWOOD version

Materials and Methods

Species	Beech
Mean DBH arit	3.7 cm
Mean height arit	6.5 m
Mean density (trees ≥1 cm)	11 565 trees ha^{-1} (8 000–14 900)
Mean standing volume (stem+branches)	110 m^3 ha^{-1}

Evaluation of Bracke C16c SMALLWOOD version

Finally then

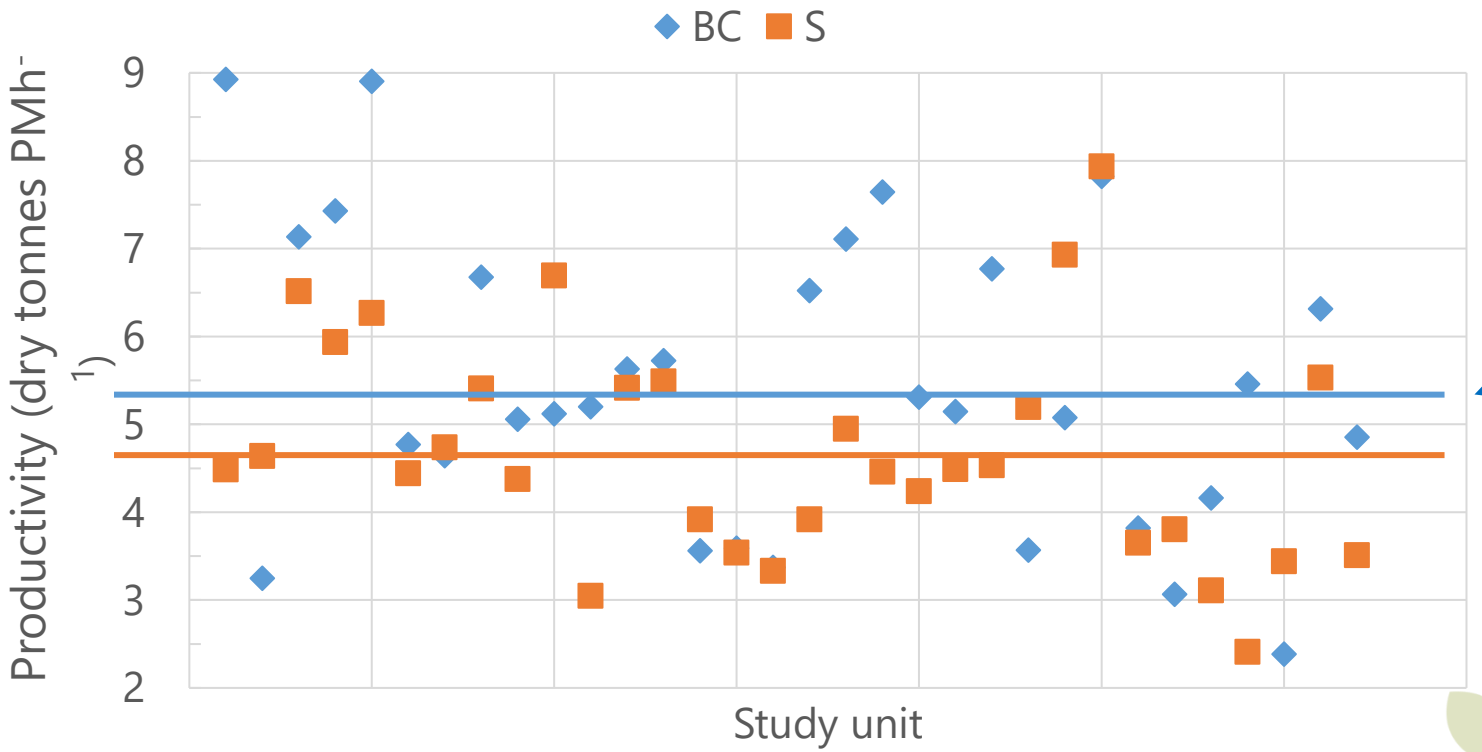
Preliminary

RESULTS !

Evaluation of Bracke C16c SMALLWOOD version

Results

In general, the novel BC thinning method gave a higher productivity than the conventional S method. All study units in all stands in all countries (n=64): **Overall 16% higher productivity with the novel BC method (average 5.4 and 4.7 dry tonnes/PMh). Differences almost statistically significant (p = 0.054).**



Boom corridor thinning

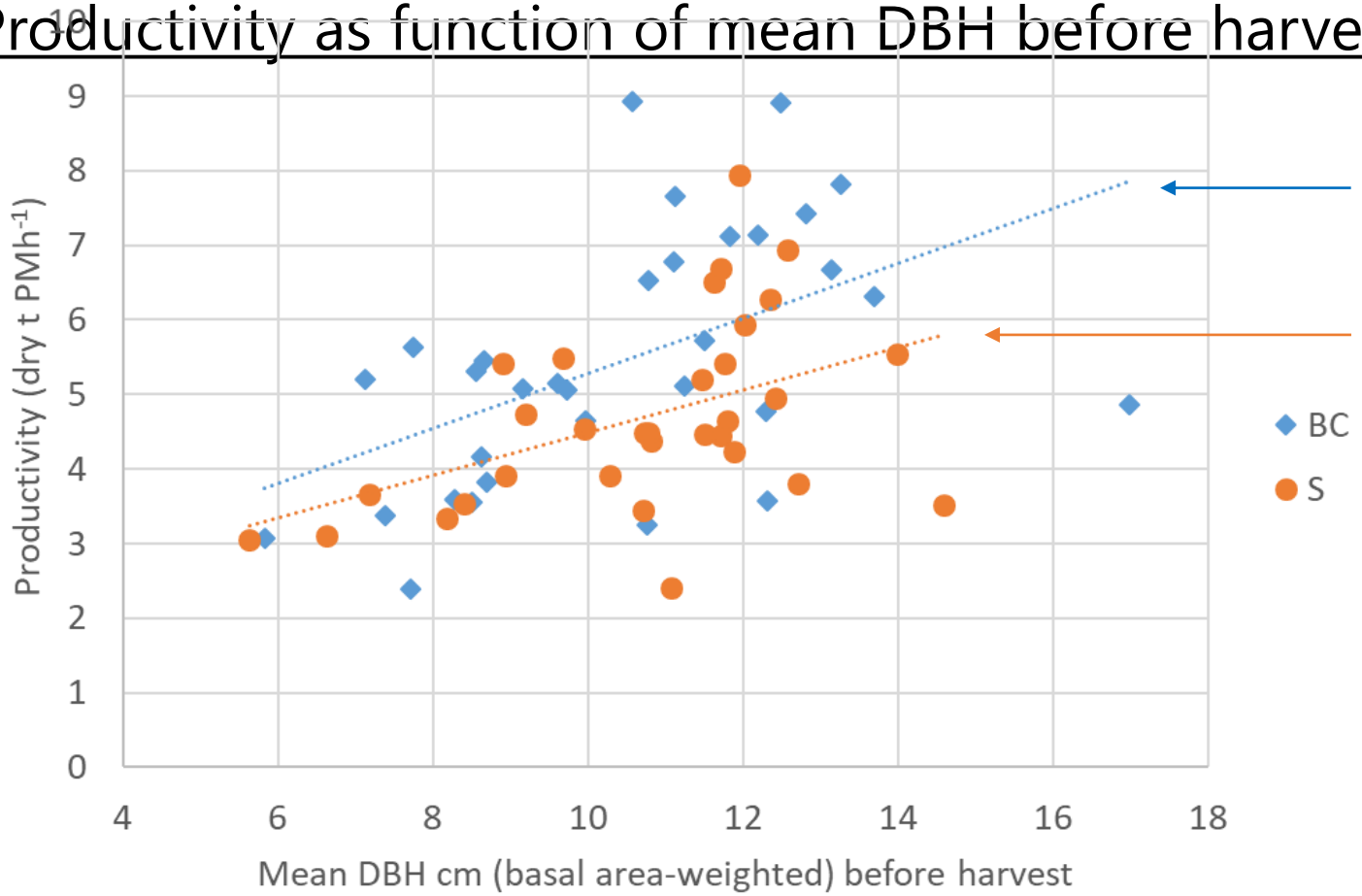
Selective thinning (reference)

Evaluation of Bracke C16c SMALLWOOD version

Results

In general, the novel BC thinning method gave a higher productivity than the conventional S method. All study units in all stands in all countries (n=64):

Productivity as function of mean DBH before harvest.



Boom corridor thinning

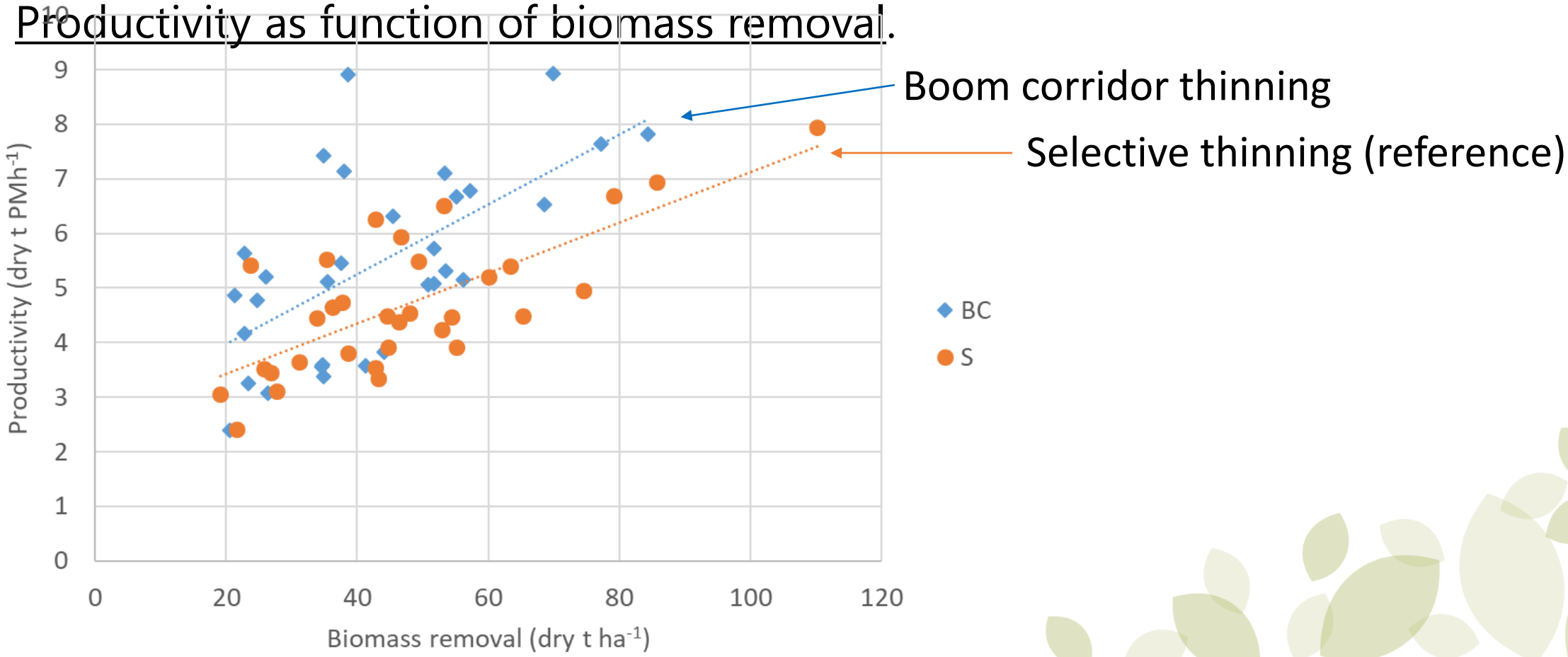
Selective thinning (reference)

Evaluation of Bracke C16c SMALLWOOD version

Results

In general, the novel BC thinning method gave a higher productivity than the conventional S method. All study units in all stands in all countries (n=64):

Productivity as function of biomass removal.



SMALLWOOD

international experiences

Sweden and Finland have often bad ground conditions!

Slovenia has often steep terrain!

Thanks for your attention!

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