Mixed forest experiment with oak and other broadleaved tree species

1. Introduction

The nemoral zone, characterized by temperate broadleaf and mixed forests, covers large portions of southern Scandinavia, including most of Denmark, southern Sweden, and parts of southern Norway (Diekmann, 1994). This ecological region hosts a variety of broadleaved tree species, which are integral to the natural forest composition, contributing to the ecological complexity and resilience of the region (Påhlsson, 1998). However, climate change and human activities, such as the promotion of coniferous species and deforestation for agriculture, decreased especially the distribution of oaks and associated mixed forests in Southern Scandinavia over the past centuries (Lindbladh and Foster, 2010). Nowadays, forest management practices in these areas predominantly favour coniferous species, particularly Norway spruce (*Picea abies* (L.) H. Karst.) and Scots pine (*Pinus sylvestris* L.) (Drössler, 2010; Lindbladh et al., 2014), as they are easy to manage and of high economical interest. Consequently, forest management in Sweden and Norway, in particular, is adapted to these species, including planting patterns, thinning regimes and clear-cuts.

However, climate change will increasingly limit the distribution range of Norway spruce and Scots pine in the future (Bradshaw et al., 2000; Wessely et al., 2024), putting the current silvicultural practices at a higher risk. Although hotter drought events will not be as frequent as in other parts of Europe in the future (Sutanto et al., 2020), the annual temperatures will increase in Scandinavia. Combined with a slightly lower precipitation in summer months (Lind et al., 2023) and a higher evapotranspiration due to higher temperature this will challenge the drought resilience of forests. Also, storms may increase in number and intensity, damaging spruce dominated forest stands (Löf et al., 2012). Furthermore, higher temperatures promote the proliferation of pathogens like bark beetles (Machado Nunes Romeiro et al., 2022). A consequence could be large calamities, as already observed in Central Europe, and an accompanying increased economic risk (Fuchs et al., 2022). Broadleaved species, in contrast, can profit from the warmer temperatures and even increase their distribution range further north (Hickler et al., 2012). Furthermore, broadleaved species are enhancing the biodiversity and recreation function of forests (Felton et al., 2010, 2021; Norman et al., 2010), both important factors that face an increasing demand from society and politics. So is the establishment and protection of mixed forests consisting with native broad-leaved species encouraged and supported by politics, e.g., in the EU forest strategy for 2030 (European Commission and Directorate-General for Environment, 2023).

Thereby, especially mixed oak forest are in the centre of interest. Oak-dominated stands are typical broadleaved forests in boreo-nemoral zone or on nutrient-poor sites and dry sandy soils of the nemoral zone (Diekmann, 1994). Typical admixed species in those oak forests are Norway maple (*Acer platanoides* L.), European hornbeam (*Carpinus betulus* L.) and hazel (*Corylus avellana* L.). Combined with more rare and heat tolerant tree species like field maple (*Acer campestre L.*), and wild service tree (*Torminalis glaberrima* (Gand.) Sennikov & Kurtto; formerly *Sorbus torminalis* (L.) Crantz) they a promising option for the creation of resilient and climate stable forest stands in Southern Scandinavia. All of the above species have a broad distribution range over whole Europe and are native to the temperate zones of Scandinavia. Prior research attest them a high drought tolerance (Kunz et al., 2018; Schmucker et al., 2023) and their wood is highly demanded for high-quality products in furniture and veneer production. The potential distribution range of European hornbeam and wild service tree is even expected to increase in Scandinavia under different climate change scenarios (Koch et al., 2022).

To increase the share of such mixed-broadleaved stands the conversion of coniferous stands (Nordén et al., 2019) or the afforestation of agricultural land are two options. The species can thereby be introduced actively by planting or sowing or passively by natural regeneration. Natural regeneration of noble hardwood species is possible, but limited due to low distribution of species (Götmark et al., 2005) and browsing (Petersson et al., 2019). Therefore, planting mixed oak forests is an important tool to increase their distribution. To achieve stable mixed forest stands, a sensible planting pattern and management especially in the first years of a forest stand is very important.

So far there is only little knowledge about the growth and management of young mixed plantations of broadleaved tree species. The low abundance combined with the low economical interest in especially rare broadleaved species in the past led to a limited knowledge on managing and establishing near-natural mixed broadleaved forests in Scandinavia (Löf et al., 2010).

The data form the research plots in Påarp, Trolleholm, and the plots in Denmark can now be used to:

1) Derive some basic growth and yield values for European hornbeam, wild service tree, oak and field maple in mixed stands on different sites.
2) Assess differences in competition sensitivity among tree species and determine whether interspecific competition varies in its impact based on the identity of the competing species.
3) Assessthe survival of the species depending on the identity of the competing species.

In this report we give an overview over the results of point 1 and present some values for the growth and yield of the 5 tree species.

2. Material

2.1 Experiment

To address the research questions, we used data from a field experiment established in 2014 at five locations in Southern Sweden and Northern Denmark (Figure 1). All sites were planted on formerly agricultural land using the same pattern (planting on exact coordinated with a spacing of 1.5 x 1.5 m) and species composition, except at the Swedish site, where field maple was substituted for Norway maple. All plants were from the same origin. The wild service tree and the hornbeam came from Sailershausen, Germany and was raised in SLU's experimental nursery in Alnarp, Sweden.

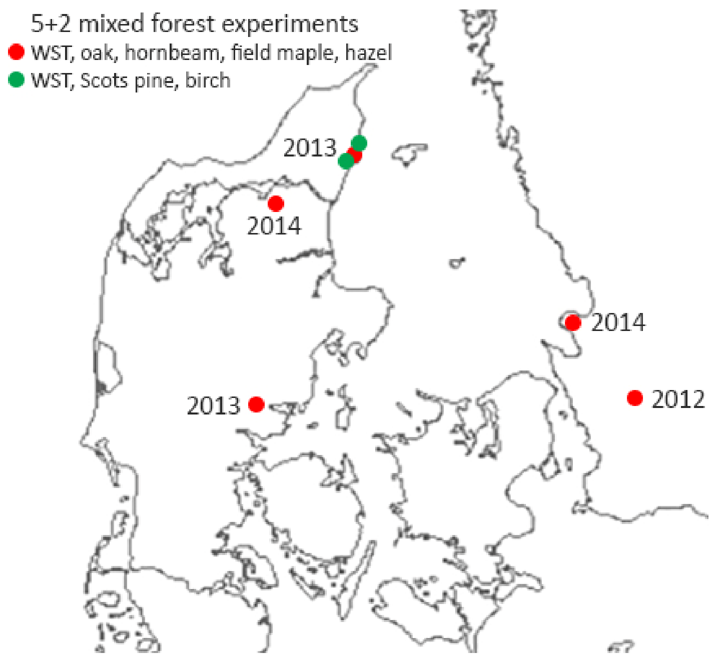

Figure 1 Location of the experimental plots in Sweden and Denmark

Each site contains one experimental block, with the exception of Drastrup, which has two blocks (Drastrup East and Drastrup West). Each block is divided into four parcels with different planting patterns and combinations of wild service tree, oak, hazel, hornbeam, and maple (Figure 2). Additionally, all sites include a fifth treatment, consisting solely of wild service tree.

The treatments can be described as followed:

- Variant one is a checkerboard pattern consisting of alternating 3 x 3 blocks of maple and wild service tree, and oak and European hornbeam. The repetitions of this pattern are divided by single rows of hazel.
- Variant two consists of alternating 3 x 3 blocks of maple and European hornbeam enclosing three wild service trees, alternated with three rows of oak and one row of hazel.

- Variant three consists of alternating rows of oak with single wild service trees, rows of maple and rows of hazel. European hornbeam is not included.
- Variant four consists of two rows of oak with one to three European hornbeams, maple and wild service tree planted in an alternating pattern. Wild service tree is surrounded by hazel.

Figure 2 Design of the blocks on each of the experimental sites. Red pentagons symbolise wild service tree, yellow up-pointing triangles field maple, green squares oak, blue down-pointing triangles European hornbeam and black dots hazel

On each plot qualitative promising trees were selected, permanently marked, pruned and promoted by removing direct competitors. Criteria for the future crop tree selection were (in this order) stem straightness, favourable branching habit, small size of branches, vitality, species and spatial distribution. Wild service trees and oaks were preferably selected.

2.2 Measurements

In Drastrup, tree plots were measured in 2022 and 2024; in Sæby, they were measured in 2024; and in Tiset, measurements were taken in 2022, 2023, and 2024. In Påarp hiehgt measurements were taking place in 2014-2017 and diameters measurements in 2023. In Trolleholm the plants were measured for initial height and survival during their first years of their growths.

On all plots, all trees larger than 1.30 m were measured for diameter using a caliper, while future crop trees were also measured for height with an 8-meter measuring stick. Additional height measurements were taken for unpruned trees. Hazel bushes were assessed by counting all shoots taller than 1.30 meters. Additionally, for 3 to 5 bushes per row, shoot heights and diameters were measured using a measuring stick and a caliper. Sample sizes are listed in The corners of each plot were permanently marked and their locations recorded via GPS. Combined with the planting patterns, this information was used to create a stem map for all trees. Especially field maple was often multi stemmed. If the forking occurred below 1.30 meters, each stem was treated as a separate tree, with diameter and height measured for each one. However, all stems from the same tree were assigned to a single stem base position.

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3. Methods

We conducted a standard analysis of the experimental plots (Pretzsch, 2009a). This included the calculation of the tree number per hectare (N), the diameter of the 100 largest trees per hectare (d_{100}), the top height (h_{100}), the mean quadratic height (h_q) and diameter (d_q), the slenderness (h_q/d_q and h_{100}/d_{100}), the basal area (BA) and the volume per hectare (V) for each species on each plot. All values, besides top height and diameter, were calculated both for the remaining and removed stand for all trees higher than 1.30 m. The removed stand consists both of natural mortality and thinned trees.

Additionally, we calculated the gross volume yield (GY_V), the mean basal area (mBA), the periodic annual increment of basal area (PAI_{BA}), the periodic annual increment of volume (PAI_V) and the mean annual volume increment (MAI_V) per hectare for the total stand. The equations used for the calculation can be found in Table 1.

Table 1 Stand variables with abbreviation, unit and equation. i refers to the tree, with i = 1…n, per refers to the period in years, BA refers to the basal area.

	Abbrev.	Unit	Equation
Single stem volume	v_i	m^3	$v_i = ba_{1.3} \times h_i \times f_{1.3}$
Standing volume	V	m^3ha^{-1}	$V = \sum_{i=1}^{n} v_i$
Volume Yield	VY	m^3ha^{-1}	$VY = V_{remain} + V_{removed}$
Periodic annual increment basal area	PAI_{BA}	$m^2ha^{-1}yr^{-1}$	$PAI_{BA} = \frac{(BA_{2remain} - BA_{1remain})}{per}$
Periodic annual increment volume	PAI_V	$m^3ha^{-1}yr^{-1}$	$PAI_V = \frac{(V_{2remain} - V_{1remain})}{per}$
Mean annual volume increment	MAI_V	$m^3ha^{-1}yr^{-1}$	$MAI_t = \frac{Gross\ volume\ yield_t}{age}$

As heights were only measured as samples, we calculated diameter-height curves per species, plot, treatment and year using the height curves by Michailoff (1943) (Eq. 3) and Petterson (1955) (Eq. 4). The equations were developed for even-aged and single-layered stands and are frequently used in this context (Pretzsch, 2009b).

$$h = 1.3 + a_0 * e^{-\frac{a_1}{d}} \tag{3}$$

$$h = 1.3 + \left(\frac{d}{a_0 + a_1 \times d}\right)^3 \tag{4}$$

For each per species, plot, treatment and year the model with the higher R^2 was selected. Missing heights were then estimated using the fitted curves.

To calculate the stem volume for oak, we applied the stem volume function developed by Tarp-Johansen et al. (1997), specifically designed for oak in Denmark. For hornbeam we used the equation from Lockow (1977), and for field maple, we applied an equation originally fitted for sycamore (*Acer pseudoplatanus* L.) (Lockow, 2003). Since no specific volume function exists for the wild service tree, we decided to use the oak volume function by Tarp-Johansen due to the tree's similar growth pattern (Schmucker et al., 2023, 2022). This is a common practice when estimating the volume of wild service trees (Hansen and Nagel, 2014).

4. Results

Table 2 gives an overview over the growth variables of the plots for the latest measurements. We could observe that treatment two had the highest increments and basal area over all sites. The standing volume per hectare for all sites and treatments in 2024 was between 4.5 and 46.7 m^3. The plot in Saeby showed the lowest yield, followed by the plots in Drastrup. Tiset showed the highest increment over all treatments.

Table 2 Overview over growth and yield variables for the latest measurements per plot (Exp = Experimental site, DRE = Drastrup East, DRW = Drastrup West, Paa = Påarp, SAE = Saeby, TIS = Tiset; Year = year of measurement, age = tree age in years; Plot = Treatment; N = stem number per ha; GYv = Gross volume yield; mBA = mean basal area; PAIba = periodic annual basal area increment, PAIv = periodic annual volume increment; MAIv = mean annual volume increment; per = period since last measurement; BA = basal area; V = volume). All values refer to 1 ha. Detailled values can be found in the Appendix.

Exp	Year	age	Plot	N	GYv	mBA	PAIba	PAIv	MAIv	per	BA	V
		yr			m^3	m^2	m^2yr^{-1}	m^3yr^{-1}	m^3yr^{-1}	yr	m^2	m^3
DRE	2024	10	1	4174	18.04	1.10	1.06	9.02	1.80	2.00	6.57	18.04
			2	4174	26.72	1.51	1.24	13.36	2.67	2.00	8.78	26.72
			3	3289	9.31	0.59	0.57	4.66	0.93	2.00	3.54	9.31
			4	4300	21.98	1.34	1.07	10.99	2.20	2.00	7.79	21.98
			5	5433	18.16	1.22	0.91	9.08	1.82	2.00	6.99	18.16
DRW	2024	10	1	2998	18.61	1.04	1.09	9.30	1.86	2.00	6.26	18.61
			2	3868	23.22	1.25	1.24	11.61	2.32	2.00	7.50	23.22
			3	2656	22.24	1.23	1.05	11.12	2.22	2.00	7.21	22.24
			4	3089	18.21	1.05	0.98	9.10	1.82	2.00	6.22	18.21
			5	3222	4.80	0.32	0.29	2.40	0.48	2.00	1.89	4.80
PAA	2024	11	1	4985							6.68	
			2	5115							8.74	
			3	3700							8.61	
			4	4844							6.02	
SAE	2024	11	1	1811	3.91				0.36	11.00	1.51	3.91
			2	2175	4.53				0.41	11.00	1.75	4.53
			3	1689	6.22				0.57	11.00	2.37	6.22
			4	2222	8.70				0.79	11.00	3.24	8.70
			5	122	0.02				0.00	11.00	0.01	0.02
TIS	2024	11	1	4151	58.57	1.15	2.05	10.74	5.32	1.00	13.63	51.65
			2	3445	53.72	1.05	1.99	9.19	4.88	1.00	12.60	46.69
			3	3400	52.02	0.86	1.67	6.21	4.73	1.00	10.31	36.27
			4	3067	44.84	0.87	2.20	8.46	4.08	1.00	10.65	36.64
			5	3722	20.89	0.52	1.48	4.50	1.90	1.00	6.47	18.07

When looking at the diameter distribution on the different sites (Figure 3), we can see first differences between species, treatments and sites. In Drastrup East, European hornbeam and oak exhibited generally higher diameters under all treatments compared to maple and wild service tree. Drastrup

West displayed a consistent pattern of diameters across species and treatments, with a high variability for oak and wild service tree. At the site in Påarp, oak showed higher diameters than the other species. European hornbeam generally had higher diameters in treatments 1 and 3 on this site. In Saeby the diameters were lower than on all other sites, with oak showing the highest diameters of all species. In Tiset dbh distributions were more variable, particularly for maple and oak. Across all sites the treatment effect seemed to have the biggest effect on oak and wild service tree. Wild service tree generally had lower diameters than the other species.

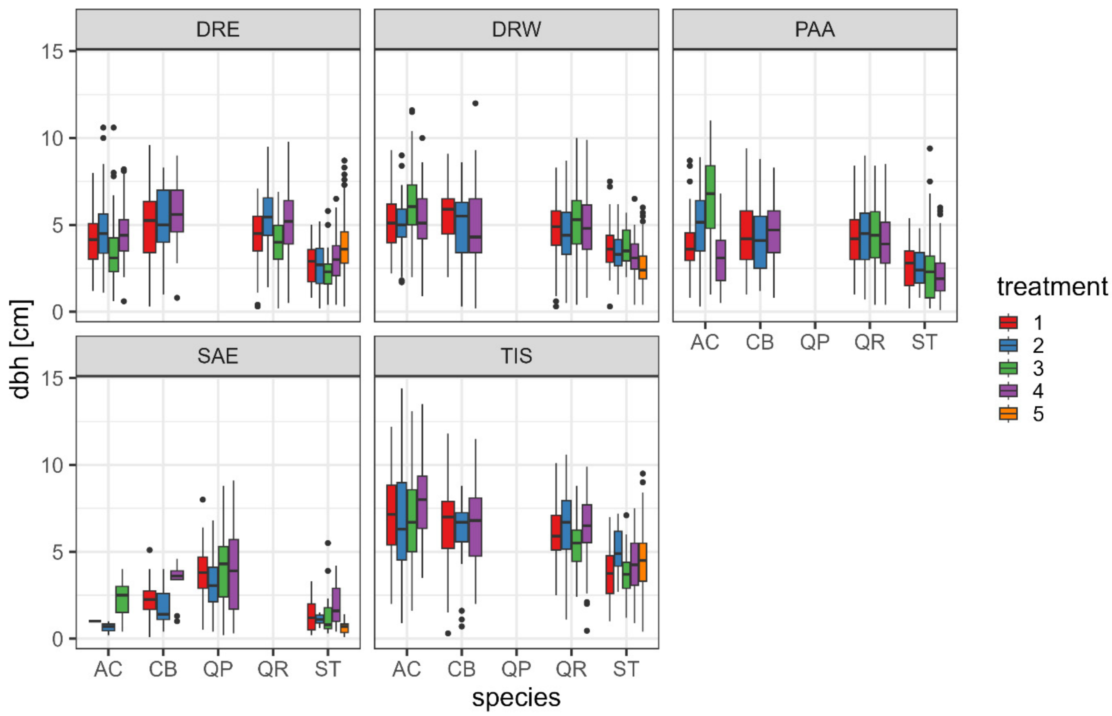

Figure 3 Boxplot diagram of the diameter distribution for the different species (AC = field maple, CB = European hornbeam, QP/QR = oak, ST = wild service tree) for each treatment. DRE = Drastrup East, DRW = Drastrup West, PAA = Påarp, SAE = Saeby, TIS = Tiset.

Figure 4 shows an expected positive relationship between height and dbh for all species. In Drastrup East and West European hornbeam and oak showed a wider spread of diameters values and greater heights compared to maple and wild service tree. In Saeby the range of values for both height and dbh was narrower than on the other sites, generally showing lower values of diameter and height. Tiset showed a high variability in dbh and height, especially for oak and wild service tree. Treatment 5 was consistently associated with the smallest dbh and height values in all groups, while treatment 1 and 4 often represented higher values. Oak generally showed the least variability in height and dbh across all locations.

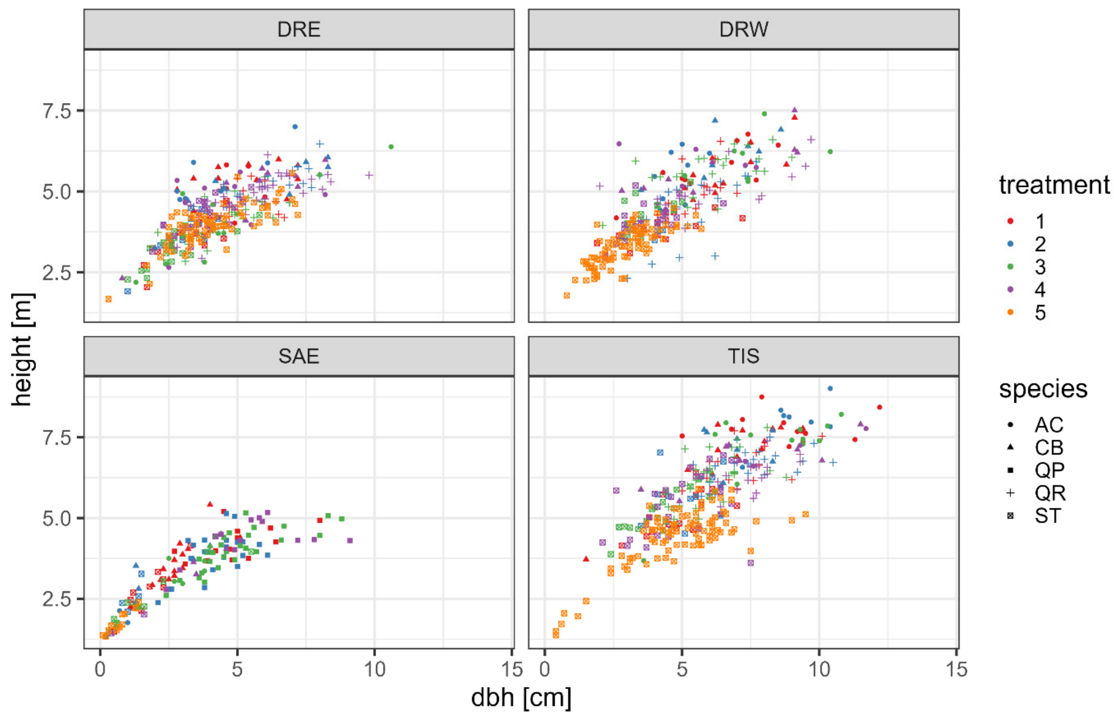

Figure 4 Scatterplot showing the relationship between dbh [cm] and height [m] per species (AC = field maple, CB = European hornbeam, QP/QR = oak, ST = wild service tree), treatment and site (DRE = Drastrup East, DRW = Drastrup West, PAA = Påarp, SAE = Saeby, TIS = Tiset). Treatments are indicated by colors, species by symbol.

Figure 5 shows the relation between top height (height of the 100 trees with the biggest diameter per hectare) and the stand basal area. Here again, we could observe similiarities between Drastrup East and West with high values for both height and basal area for oak and maple. However, treatment 5 (pure wild service tree) had a much higher basal area in Drastrup East than West. In Saeby oak showed the highest basal area per ha of all species and the highest variation in top height between the species. In Tiset particularly maple and oak showed a high basal area, while the top height between species didn't vary that much.

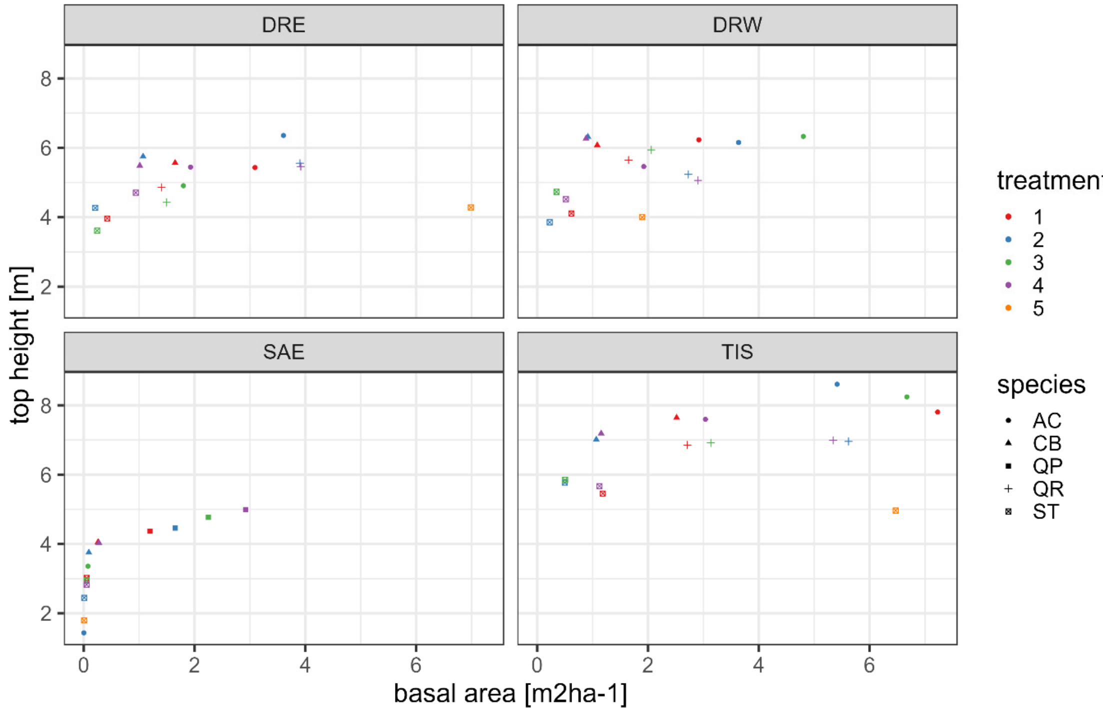

Figure 5 Scatterplot showing the relationship between basal area [m^2ha^{-1}] and top height [m] per species (AC = field maple, CB = European hornbeam, QP/QR = oak, ST = wild service tree), treatment and site (DRE = Drastrup East, DRW = Drastrup West, PAA = Påarp, SAE = Saeby, TIS = Tiset). Colors indicate the treatment, symbols the species.

5. Conclusions and outlook

So far, our analysis suggests site-specific and species-specific growth-responses to different treatments. Oak seems to be the most stable species, being amongst the species with the best growth on all the sites. Wild service tree grows mostly better in mixed than in pure stands on all sites. More analysis are needed to describe species specific growth patterns better and to find the underlying relations between competition, treatment and sites conditions. These analysis will be conducted during the next months. Finally, the results will make it possible to derive and identify site-specific planting patterns, species combinations and thinning intensities appropriate for the species. This will promote the establishment and growth of noble hard-woods for high-value timber production on different sites.

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Appendix

				Remaining stand										Removal stand						Total stand							
Exp	Year	age	Plot	sp	N	h100	d100	h100/d100	hq	dq	hq/dq	BA	V	N	hq	dq	hq/dq	BA	V	GYv	mBA	PAIba	PAIv	MAIv	per	BA	V
		yr				m	cm		m	cm		m2	m3		m	cm		m2	m3	m3	m2	m2yr-1	m3yr-1	m3yr-1	yr	m2	m3
DRE	2022	8	1	AC	1963.55		6.20			3.81		2.24	0.00	164.61		4.32		0.24	0.00	0.00				0.00	8.00	2.48	0.00
DRE	2022	8	1	CB	728.98		6.40			4.21		1.01	0.00	0.00				0.00	0.00	0.00				0.00	8.00	1.01	0.00
DRE	2022	8	1	QR	764.26		5.51			3.83		0.88	0.00	35.27		2.59		0.02	0.00	0.00				0.00	8.00	0.90	0.00
DRE	2022	8	1	ST	599.65		3.75			2.60		0.32	0.00	58.79		2.12		0.02	0.00	0.00				0.00	8.00	0.34	0.00
DRE	2022	8	2	AC	1857.73		7.09			4.30		2.70	0.00	70.55		4.16		0.10	0.00	0.00				0.00	8.00	2.79	0.00
DRE	2022	8	2	CB	435.04		6.20			4.58		0.72	0.00	47.03		4.48		0.07	0.00	0.00				0.00	8.00	0.79	0.00
DRE	2022	8	2	QR	1528.51		6.66			4.76		2.72	0.00	23.52		2.47		0.01	0.00	0.00				0.00	8.00	2.73	0.00
DRE	2022	8	2	ST	282.19		3.62			2.75		0.17	0.00	0.00				0.00	0.00	0.00				0.00	8.00	0.17	0.00
DRE	2022	8	3	AC	1711.11		6.11			3.11		1.30	0.00	166.67		3.49		0.16	0.00	0.00				0.00	8.00	1.46	0.00
DRE	2022	8	3	QR	1033.33		4.96			3.33		0.90	0.00	33.33		4.19		0.05	0.00	0.00				0.00	8.00	0.95	0.00
DRE	2022	8	3	ST	455.56		3.68			2.35		0.20	0.00	0.00				0.00	0.00	0.00				0.00	8.00	0.20	0.00
DRE	2022	8	4	AC	1100.00		6.30			4.18		1.51	0.00	88.89		4.80		0.16	0.00	0.00				0.00	8.00	1.67	0.00
DRE	2022	8	4	CB	377.78		6.20			4.71		0.66	0.00	88.89		5.36		0.20	0.00	0.00				0.00	8.00	0.86	0.00
DRE	2022	8	4	QR	1700.00		7.08			4.52		2.72	0.00	33.33		5.29		0.07	0.00	0.00				0.00	8.00	2.80	0.00
DRE	2022	8	4	ST	1088.89		4.99			2.98		0.76	0.00	0.00				0.00	0.00	0.00				0.00	8.00	0.76	0.00
DRE	2022	8	5	ST	5388.89		6.53			3.50		5.17	0.00	22.22		3.56		0.02	0.00	0.00				0.00	8.00	5.19	0.00
DRE	2024	10	1	AC	1798.94	5.43	7.30	0.74	4.68	4.41	1.06	2.75	7.19	199.88	4.77	4.66	1.02	0.34	0.90	8.09	0.53	0.43	4.05	0.81	2.00	3.09	8.09
DRE	2024	10	1	CB	646.68	5.57	7.23	0.77	5.38	4.98	1.08	1.26	3.78	82.30	5.59	7.77	0.72	0.39	1.14	4.92	0.27	0.32	2.46	0.49	2.00	1.65	4.92
DRE	2024	10	1	QR	764.26	4.86	6.56	0.74	4.51	4.80	0.94	1.38	3.86	47.03	3.62	2.48	1.46	0.02	0.06	3.92	0.23	0.26	1.96	0.39	2.00	1.40	3.92
DRE	2024	10	1	ST	599.65	3.96	4.19	0.95	3.48	2.99	1.16	0.42	1.09	35.27	1.86	1.01	1.84	0.00	0.01	1.10	0.07	0.05	0.55	0.11	2.00	0.42	1.10
DRE	2024	10	2	AC	1552.03	6.35	8.33	0.76	5.72	4.91	1.16	2.94	9.20	329.22	5.76	5.05	1.14	0.66	2.07	11.27	0.63	0.45	5.63	1.13	2.00	3.60	11.27
DRE	2024	10	2	CB	364.49	5.75	7.50	0.77	5.34	5.55	0.96	0.88	2.62	70.55	5.41	5.83	0.93	0.19	0.56	3.18	0.18	0.18	1.59	0.32	2.00	1.07	3.18
DRE	2024	10	2	QR	1457.97	5.55	7.90	0.70	5.12	5.73	0.89	3.76	11.28	94.06	4.70	4.43	1.06	0.15	0.43	11.70	0.66	0.59	5.85	1.17	2.00	3.90	11.70
DRE	2024	10	2	ST	305.70	4.27	3.99	1.07	3.65	2.93	1.25	0.21	0.56	0.00				0.00	0.00	0.56	0.04	0.02	0.28	0.06	2.00	0.21	0.56
DRE	2024	10	3	AC	1677.78	4.91	7.07	0.69	3.78	3.61	1.05	1.72	3.84	44.44	4.30	4.85	0.89	0.08	0.19	4.03	0.31	0.25	2.02	0.40	2.00	1.80	4.03
DRE	2024	10	3	QR	1077.78	4.43	6.07	0.73	4.03	4.20	0.96	1.49	4.67	11.11	1.73	0.80	2.16	0.00	0.00	4.67	0.24	0.30	2.34	0.47	2.00	1.50	4.67
DRE	2024	10	3	ST	455.56	3.61	3.87	0.93	3.17	2.51	1.27	0.22	0.57	22.22	3.38	3.05	1.11	0.02	0.04	0.61	0.04	0.02	0.30	0.06	2.00	0.24	0.61
DRE	2024	10	4	AC	1077.78	5.44	7.52	0.72	4.71	4.73	1.00	1.89	4.93	22.22	4.57	4.36	1.05	0.03	0.08	5.02	0.34	0.21	2.51	0.50	2.00	1.93	5.02
DRE	2024	10	4	CB	366.67	5.49	7.70	0.71	5.23	5.93	0.88	1.01	2.90	0.00				0.00	0.00	2.90	0.17	0.18	1.45	0.29	2.00	1.01	2.90
DRE	2024	10	4	QR	1711.11	5.46	8.21	0.66	4.87	5.40	0.90	3.92	11.46	11.11	1.35	0.50	2.69	0.00	0.01	11.47	0.66	0.60	5.73	1.15	2.00	3.92	11.47
DRE	2024	10	4	ST	1111.11	4.71	5.50	0.86	4.08	3.28	1.24	0.94	2.60	0.00				0.00	0.00	2.60	0.17	0.09	1.30	0.26	2.00	0.94	2.60

					Remaining stand									Removal stand						Total stand							
Exp	Year	age	Plot	sp	N	h100	d100	h100/d100	hq	dq	hq/dq	BA	V	N	hq	dq	hq/dq	BA	V	GYv	mBA	PAIba	PAIv	MAIv	per	BA	V
		yr				m	cm		m	cm		m2	m3		m	cm		m2	m3	m3	m2	m2yr-1	m3yr-1	m3yr-1	yr	m2	m3
DRE	2024	10	5	ST	5133.33	4.28	7.63	0.56	3.94	4.00	0.99	6.46	16.79	300.00	4.05	4.75	0.85	0.53	1.38	18.16	1.22	0.91	9.08	1.82	2.00	6.99	18.16
DRW	2022	8	1	AC	1269.84		6.86			4.47		1.99	0.00	587.89		5.16		1.23	0.00	0.00				0.00	8.00	3.22	0.00
DRW	2022	8	1	CB	399.76		5.95			4.57		0.66	0.00	164.61		5.18		0.35	0.00	0.00				0.00	8.00	1.00	0.00
DRW	2022	8	1	QR	811.29		6.14			4.10		1.07	0.00	82.30		4.77		0.15	0.00	0.00				0.00	8.00	1.22	0.00
DRW	2022	8	1	ST	482.07		4.51			3.13		0.37	0.00	58.79		3.26		0.05	0.00	0.00				0.00	8.00	0.42	0.00
DRW	2022	8	2	AC	1751.91		6.59			4.44		2.71	0.00	129.34		4.75		0.23	0.00	0.00				0.00	8.00	2.94	0.00
DRW	2022	8	2	CB	364.49		6.05			4.37		0.55	0.00	105.82		4.86		0.20	0.00	0.00				0.00	8.00	0.74	0.00
DRW	2022	8	2	QR	1457.97		6.10			3.74		1.61	0.00	58.79		5.06		0.12	0.00	0.00				0.00	8.00	1.72	0.00
DRW	2022	8	2	ST	223.40		3.76			3.05		0.16	0.00	0.00				0.00	0.00	0.00				0.00	8.00	0.16	0.00
DRW	2022	8	3	AC	1511.11		8.13			5.32		3.36	0.00	455.56		5.58		1.12	0.00	0.00				0.00	8.00	4.47	0.00
DRW	2022	8	3	QR	844.44		7.23			4.71		1.47	0.00	77.78		4.39		0.12	0.00	0.00				0.00	8.00	1.59	0.00
DRW	2022	8	3	ST	288.89		4.44			3.48		0.27	0.00	0.00				0.00	0.00	0.00				0.00	8.00	0.27	0.00
DRW	2022	8	4	AC	811.11		7.13			4.76		1.44	0.00	266.67		4.48		0.42	0.00	0.00				0.00	8.00	1.86	0.00
DRW	2022	8	4	CB	322.22		7.29			4.88		0.60	0.00	33.33		5.85		0.09	0.00	0.00				0.00	8.00	0.69	0.00
DRW	2022	8	4	QR	1277.78		7.14			4.27		1.83	0.00	100.00		5.17		0.21	0.00	0.00				0.00	8.00	2.04	0.00
DRW	2022	8	4	ST	600.00		4.39			2.87		0.39	0.00	0.00				0.00	0.00	0.00				0.00	8.00	0.39	0.00
DRW	2022	8	5	ST	3177.78		4.62			2.30		1.32	0.00	11.11		3.60		0.01	0.00	0.00				0.00	8.00	1.33	0.00
DRW	2024	10	1	AC	1164.02	6.23	8.10	0.77	5.61	5.40	1.04	2.66	8.08	105.82	5.66	5.55	1.02	0.26	0.78	8.86	0.49	0.46	4.43	0.89	2.00	2.92	8.86
DRW	2024	10	1	CB	329.22	6.07	7.68	0.79	5.46	6.17	0.89	0.98	2.96	70.55	4.33	4.24	1.02	0.10	0.26	3.23	0.17	0.21	1.61	0.32	2.00	1.08	3.23
DRW	2024	10	1	QR	799.53	5.65	7.32	0.77	4.87	5.09	0.96	1.63	4.87	23.52	3.98	3.45	1.16	0.02	0.06	4.93	0.27	0.29	2.46	0.49	2.00	1.65	4.93
DRW	2024	10	1	ST	470.31	4.11	5.64	0.73	3.83	3.94	0.97	0.57	1.48	35.27	3.82	3.90	0.98	0.04	0.11	1.59	0.10	0.12	0.79	0.16	2.00	0.62	1.59
DRW	2024	10	2	AC	1622.57	6.15	7.30	0.84	5.50	5.08	1.08	3.29	9.90	129.34	5.75	5.80	0.99	0.34	1.05	10.94	0.63	0.46	5.47	1.09	2.00	3.63	10.94
DRW	2024	10	2	CB	329.22	6.32	6.96	0.91	5.82	5.25	1.11	0.71	2.34	58.79	6.23	6.62	0.94	0.20	0.68	3.02	0.15	0.18	1.51	0.30	2.00	0.91	3.02
DRW	2024	10	2	QR	1469.72	5.23	7.46	0.70	4.16	4.78	0.87	2.64	8.44	35.27	4.57	5.64	0.81	0.09	0.24	8.68	0.43	0.56	4.34	0.87	2.00	2.73	8.68
DRW	2024	10	2	ST	211.64	3.85	4.30	0.90	3.63	3.54	1.03	0.21	0.53	11.76	3.83	4.20	0.91	0.02	0.04	0.57	0.04	0.03	0.29	0.06	2.00	0.22	0.57
DRW	2024	10	3	AC	1166.67	6.33	9.65	0.66	5.77	6.22	0.93	3.55	10.81	344.44	5.90	6.81	0.87	1.25	3.85	14.67	0.82	0.72	7.33	1.47	2.00	4.80	14.67
DRW	2024	10	3	QR	844.44	5.94	8.22	0.72	5.56	5.56	1.00	2.05	6.57	11.11	4.88	3.30	1.48	0.01	0.03	6.60	0.35	0.29	3.30	0.66	2.00	2.06	6.60
DRW	2024	10	3	ST	288.89	4.73	5.01	0.94	4.39	3.91	1.12	0.35	0.98	0.00				0.00	0.00	0.98	0.06	0.04	0.49	0.10	2.00	0.35	0.98
DRW	2024	10	4	AC	733.33	5.46	8.06	0.68	5.56	5.42	1.02	1.69	4.98	77.78	5.52	6.13	0.90	0.23	0.66	5.65	0.34	0.24	2.82	0.56	2.00	1.92	5.65
DRW	2024	10	4	CB	311.11	6.27	8.58	0.73	5.83	5.76	1.01	0.81	2.58	33.33	5.67	5.10	1.11	0.07	0.22	2.80	0.15	0.14	1.40	0.28	2.00	0.88	2.80
DRW	2024	10	4	QR	1300.00	5.06	8.84	0.57	4.86	5.24	0.93	2.80	8.07	22.22	5.01	7.56	0.66	0.10	0.28	8.35	0.47	0.54	4.18	0.84	2.00	2.90	8.35
DRW	2024	10	4	ST	600.00	4.52	4.87	0.93	3.94	3.31	1.19	0.52	1.40	11.11	2.15	1.00	2.15	0.00	0.00	1.41	0.09	0.06	0.70	0.14	2.00	0.52	1.41
DRW	2024	10	5	ST	3166.67	4.00	5.21	0.77	3.25	2.73	1.19	1.85	4.69	55.56	3.45	3.20	1.08	0.04	0.11	4.80	0.32	0.29	2.40	0.48	2.00	1.89	4.80

				Remaining stand										Removal stand						Total stand							
Exp	**Year**	**age**	**Plot**	**sp**	**N**	**h100**	**d100**	**h100/d100**	**hq**	**dq**	**hq/dq**	**BA**	**V**	**N**	**hq**	**dq**	**hq/dq**	**BA**	**V**	**GYv**	**mBA**	**PAIba**	**PAIv**	**MAIv**	**per**	**BA**	**V**
		yr				**m**	**cm**		**m**	**cm**		**m2**	**m3**		**m**	**cm**		**m2**	**m3**	**m3**	**m2**	**m2yr-1**	**m3yr-1**	**m3yr-1**	**yr**	**m2**	**m3**
PAA	2024		1	AC	975.90		6.88			4.12		1.30	0.00	0.00				0.00	0.00	0.00						1.30	0.00
PAA	2024		1	CB	1493.24		7.94			4.76		2.66	0.00	0.00				0.00	0.00	0.00						2.66	0.00
PAA	2024		1	QR	1234.57		6.97			4.40		1.88	0.00	0.00				0.00	0.00	0.00						1.88	0.00
PAA	2024		1	ST	1281.60		4.68			2.89		0.84	0.00	0.00				0.00	0.00	0.00						0.84	0.00
PAA	2024		2	AC	1034.69		8.05			5.34		2.32	0.00	0.00				0.00	0.00	0.00						2.32	0.00
PAA	2024		2	CB	999.41		7.92			4.63		1.68	0.00	0.00				0.00	0.00	0.00						1.68	0.00
PAA	2024		2	QR	2610.23		7.56			4.66		4.46	0.00	0.00				0.00	0.00	0.00						4.46	0.00
PAA	2024		2	ST	470.31		3.98			2.74		0.28	0.00	0.00				0.00	0.00	0.00						0.28	0.00
PAA	2024		3	AC	1255.56		10.38			6.97		4.79	0.00	0.00				0.00	0.00	0.00						4.79	0.00
PAA	2024		3	QR	1900.00		7.97			4.76		3.38	0.00	0.00				0.00	0.00	0.00						3.38	0.00
PAA	2024		3	ST	544.44		6.19			3.20		0.44	0.00	0.00				0.00	0.00	0.00						0.44	0.00
PAA	2024		4	AC	455.56		5.92			3.70		0.49	0.00	0.00				0.00	0.00	0.00						0.49	0.00
PAA	2024		4	CB	855.56		7.68			4.94		1.64	0.00	0.00				0.00	0.00	0.00						1.64	0.00
PAA	2024		4	QR	2266.67		7.51			4.31		3.31	0.00	0.00				0.00	0.00	0.00						3.31	0.00
PAA	2024		4	ST	1266.67		4.89			2.41		0.58	0.00	0.00				0.00	0.00	0.00						0.58	0.00
SAE	2024	11	1	AC	23.52		0.48			1.00		0.00	0.00	0.00				0.00	0.00	0.00				0.00	11.00	0.00	0.00
SAE	2024	11	1	CB	564.37	4.05	3.59	1.13	3.38	2.41	1.40	0.26	0.59	0.00				0.00	0.00	0.59				0.05	11.00	0.26	0.59
SAE	2024	11	1	QP	893.59	4.37	6.00	0.73	4.04	3.96	1.02	1.10	2.93	58.79	4.15	4.48	0.92	0.09	0.25	3.17				0.29	11.00	1.20	3.17
SAE	2024	11	1	ST	270.43	3.02	2.27	1.33	2.71	1.57	1.72	0.05	0.14	0.00				0.00	0.00	0.14				0.01	11.00	0.05	0.14
SAE	2024	11	2	AC	35.27	1.44	0.42	3.39	1.74	0.71	2.44	0.00	0.00	0.00				0.00	0.00	0.00				0.00	11.00	0.00	0.00
SAE	2024	11	2	CB	246.91	3.76	3.02	1.24	3.43	2.17	1.58	0.09	0.21	0.00				0.00	0.00	0.21				0.02	11.00	0.09	0.21
SAE	2024	11	2	QP	1810.70	4.46	5.68	0.78	3.45	3.41	1.01	1.65	4.29	0.00				0.00	0.00	4.29				0.39	11.00	1.65	4.29
SAE	2024	11	2	ST	82.30	2.45	1.03	2.36	2.55	1.14	2.23	0.01	0.02	0.00				0.00	0.00	0.02				0.00	11.00	0.01	0.02
SAE	2024	11	3	AC	144.44	3.36	3.01	1.12	3.16	2.58	1.22	0.08	0.15	0.00				0.00	0.00	0.15				0.01	11.00	0.08	0.15
SAE	2024	11	3	QP	1388.89	4.77	7.86	0.61	3.90	4.49	0.87	2.20	5.81	22.22	4.22	5.45	0.77	0.05	0.14	5.95				0.54	11.00	2.25	5.95
SAE	2024	11	3	ST	133.33	2.95	2.52	1.17	2.84	2.19	1.30	0.05	0.12	0.00				0.00	0.00	0.12				0.01	11.00	0.05	0.12
SAE	2024	11	4	CB	285.71	4.03	4.21	0.96	3.50	3.49	1.00	0.27	0.62	0.00				0.00	0.00	0.62				0.06	11.00	0.27	0.62
SAE	2024	11	4	QP	1841.27	4.99	8.25	0.61	4.06	4.49	0.90	2.92	7.95	0.00				0.00	0.00	7.95				0.72	11.00	2.92	7.95
SAE	2024	11	4	ST	95.24	2.83	2.54	1.11	2.85	2.61	1.09	0.05	0.13	0.00				0.00	0.00	0.13				0.01	11.00	0.05	0.13
SAE	2024	11	5	ST	122.22	1.80	0.87	2.06	1.78	0.79	2.25	0.01	0.02	0.00				0.00	0.00	0.02				0.00	11.00	0.01	0.02
TIS	2022	9	1	AC	1693.12	6.22	8.43	0.74	6.09	5.82	1.05	4.50	14.48	352.73	6.11	6.13	1.00	1.04	3.35	17.82				1.98	9.00	5.54	17.82
TIS	2022	9	1	CB	1081.72	6.29	6.89	0.91	5.61	4.71	1.19	1.88	6.08	58.79	5.69	4.93	1.16	0.11	0.36	6.44				0.72	9.00	1.99	6.44

				Remaining stand										Removal stand						Total stand							
Exp	Year	age	Plot	sp	N	h100	d100	h100/d100	hq	dq	hq/dq	BA	V	N	hq	dq	hq/dq	BA	V	GYv	mBA	PAIba	PAIv	MAIv	per	BA	V
		yr				m	cm		m	cm		m2	m3		m	cm		m2	m3	m3	m2	m2yr-1	m3yr-1	m3yr-1	yr	m2	m3
TIS	2022	9	1	QR	940.62	5.33	7.33	0.73	5.17	5.10	1.01	1.92	5.84	117.58	5.17	5.12	1.01	0.24	0.74	6.58				0.73	9.00	2.16	6.58
TIS	2022	9	1	ST	999.41	4.61	4.99	0.92	4.60	3.51	1.31	0.97	2.80	152.85	4.60	3.58	1.28	0.15	0.45	3.25				0.36	9.00	1.12	3.25
TIS	2022	9	2	AC	1634.33	7.06	8.45	0.84	5.67	5.24	1.08	3.52	11.33	352.73	5.60	5.12	1.09	0.73	2.29	13.62				1.51	9.00	4.25	13.62
TIS	2022	9	2	CB	493.83	6.03	6.06	1.00	5.63	4.51	1.25	0.79	2.57	141.09	6.02	6.00	1.00	0.40	1.31	3.88				0.43	9.00	1.19	3.88
TIS	2022	9	2	QR	1798.94	5.87	8.08	0.73	5.63	5.44	1.03	4.18	13.52	258.67	5.65	5.66	1.00	0.65	2.10	15.62				1.74	9.00	4.83	15.62
TIS	2022	9	2	ST	305.70	4.92	5.68	0.87	4.73	4.26	1.11	0.44	1.27	47.03	4.63	3.75	1.23	0.05	0.15	1.42				0.16	9.00	0.49	1.42
TIS	2022	9	3	AC	2300.00	6.43	8.64	0.74	6.19	5.32	1.16	5.11	16.92	1088.89	6.15	5.03	1.22	2.16	7.18	24.10				2.68	9.00	7.27	24.10
TIS	2022	9	3	QR	1466.67	5.85	7.09	0.83	5.29	4.70	1.13	2.54	8.04	366.67	5.39	5.03	1.07	0.73	2.31	10.35				1.15	9.00	3.27	10.35
TIS	2022	9	3	ST	666.67	5.03	5.11	0.98	4.55	3.19	1.42	0.53	1.57	11.11	4.34	2.70	1.61	0.01	0.02	1.59				0.18	9.00	0.54	1.59
TIS	2022	9	4	AC	711.11	6.51	8.23	0.79	6.08	5.64	1.08	1.78	5.78	444.44	5.95	5.10	1.16	0.91	2.94	8.71				0.97	9.00	2.69	8.71
TIS	2022	9	4	CB	377.78	6.11	6.58	0.93	5.49	4.80	1.14	0.68	2.17	100.00	5.31	4.41	1.20	0.15	0.48	2.65				0.29	9.00	0.84	2.65
TIS	2022	9	4	QR	1533.33	5.62	7.84	0.72	5.07	5.37	0.94	3.48	10.46	466.67	4.96	5.03	0.99	0.93	2.76	13.23				1.47	9.00	4.40	13.23
TIS	2022	9	4	ST	822.22	5.15	5.75	0.90	4.55	3.56	1.28	0.82	2.41	0.00				0.00	0.00	2.41				0.27	9.00	0.82	2.41
TIS	2022	9	5	ST	4755.56	4.23	6.40	0.66	3.53	3.34	1.05	4.17	10.64	1022.22	3.13	2.44	1.28	0.48	1.21	11.86				1.32	9.00	4.65	11.86
TIS	2023	10	1	AC	1622.57	7.13	9.82	0.73	7.00	6.87	1.02	6.01	21.77	23.52	7.06	7.90	0.89	0.12	0.42	25.53	0.53	1.63	7.70	2.55	1.00	6.13	22.18
TIS	2023	10	1	CB	658.44	7.69	8.33	0.92	7.01	6.28	1.12	2.04	7.78	411.52	5.48	3.61	1.52	0.42	1.42	9.56	0.22	0.58	3.13	0.96	1.00	2.46	9.20
TIS	2023	10	1	QR	870.08	5.97	8.15	0.73	5.85	5.93	0.99	2.40	7.93	58.79	5.26	2.43	2.17	0.03	0.09	8.76	0.22	0.51	2.18	0.88	1.00	2.43	8.02
TIS	2023	10	1	ST	964.14	5.23	5.51	0.95	4.92	3.87	1.27	1.13	3.44	35.27	4.74	3.28	1.45	0.03	0.09	3.98	0.11	0.20	0.73	0.40	1.00	1.16	3.53
TIS	2023	10	2	AC	1281.60	7.72	10.05	0.77	7.00	6.54	1.07	4.31	15.91	176.37	5.57	3.51	1.58	0.17	0.59	18.80	0.40	0.96	5.17	1.88	1.00	4.48	16.50
TIS	2023	10	2	CB	317.46	6.64	6.87	0.97	6.41	5.89	1.09	0.86	3.03	141.09	5.31	3.23	1.64	0.12	0.38	4.73	0.09	0.19	0.85	0.47	1.00	0.98	3.42
TIS	2023	10	2	QR	1575.54	6.48	9.13	0.71	6.18	6.33	0.98	4.96	17.09	94.06	5.05	2.69	1.88	0.05	0.18	19.37	0.46	0.83	3.75	1.94	1.00	5.02	17.27
TIS	2023	10	2	ST	235.16	5.35	6.02	0.89	5.25	5.06	1.04	0.47	1.46	35.27	4.40	1.88	2.34	0.01	0.03	1.64	0.05	0.05	0.22	0.16	1.00	0.48	1.49
TIS	2023	10	3	AC	1711.11	7.40	9.77	0.76	6.77	6.29	1.08	5.32	19.04	811.11	6.35	4.95	1.28	1.56	5.42	31.64	0.60	1.78	7.55	3.16	1.00	6.88	24.47
TIS	2023	10	3	QR	1255.56	6.49	7.65	0.85	5.78	5.37	1.08	2.85	9.54	200.00	4.54	3.15	1.44	0.16	0.48	12.33	0.28	0.46	1.98	1.23	1.00	3.00	10.01
TIS	2023	10	3	ST	400.00	5.62	5.38	1.04	5.00	3.88	1.29	0.47	1.48	255.56	4.03	2.43	1.66	0.12	0.34	1.84	0.06	0.06	0.24	0.18	1.00	0.59	1.82
TIS	2023	10	4	AC	566.67	7.40	9.85	0.75	6.94	7.13	0.97	2.26	8.14	233.33	6.18	4.70	1.32	0.41	1.39	12.47	0.22	0.89	3.76	1.25	1.00	2.67	9.53
TIS	2023	10	4	CB	300.00	6.60	7.72	0.85	6.13	5.95	1.03	0.84	2.81	33.33	3.91	2.18	1.79	0.01	0.03	3.33	0.08	0.16	0.68	0.33	1.00	0.85	2.85
TIS	2023	10	4	QR	1488.89	6.30	8.67	0.73	5.59	6.12	0.91	4.38	14.17	122.22	4.53	3.95	1.15	0.15	0.44	17.36	0.40	1.05	4.14	1.74	1.00	4.53	14.60
TIS	2023	10	4	ST	711.11	5.79	6.24	0.93	5.05	4.18	1.21	0.98	3.06	111.11	3.99	2.51	1.59	0.05	0.16	3.23	0.09	0.21	0.82	0.32	1.00	1.03	3.23
TIS	2023	10	5	ST	3655.56	5.09	7.13	0.71	4.08	4.17	0.98	4.99	13.57	1200.00	3.13	2.56	1.22	0.62	1.61	16.39	0.49	1.43	4.53	1.64	1.00	5.61	15.18
TIS	2024	11	1	AC	1105.23	7.81	10.76	0.73	7.77	7.42	1.05	4.78	18.95	540.86	7.77	7.59	1.02	2.45	9.73	32.45	0.60	1.21	6.92	2.95	1.00	7.23	28.68
TIS	2024	11	1	CB	529.10	7.65	9.03	0.85	7.21	6.86	1.05	1.96	7.49	141.09	7.27	7.09	1.02	0.56	2.14	11.42	0.21	0.48	1.85	1.04	1.00	2.52	9.63
TIS	2024	11	1	QR	834.80	6.85	8.68	0.79	6.49	6.35	1.02	2.65	9.53	35.27	6.07	4.75	1.28	0.06	0.22	10.58	0.23	0.31	1.83	0.96	1.00	2.71	9.75

				Remaining stand										Removal stand						Total stand							
Exp	Year	age	Plot	sp	N	h100	d100	h100/d100	hq	dq	hq/dq	BA	V	N	hq	dq	hq/dq	BA	V	GYv	mBA	PAIba	PAIv	MAIv	per	BA	V
		yr				m	cm		m	cm		m2	m3		m	cm		m2	m3	m3	m2	m2yr-1	m3yr-1	m3yr-1	yr	m2	m3
TIS	2024	11	1	ST	964.14	5.46	5.70	0.96	4.80	3.95	1.21	1.18	3.58	0.00				0.00	0.00	4.12	0.11	0.05	0.14	0.37	1.00	1.18	3.58
TIS	2024	11	2	AC	1034.69	8.61	10.65	0.81	7.04	7.10	0.99	4.09	15.70	258.67	7.54	8.06	0.94	1.32	5.25	23.83	0.44	1.10	5.03	2.17	1.00	5.41	20.95
TIS	2024	11	2	CB	246.91	7.01	7.47	0.94	7.02	6.60	1.06	0.84	3.15	82.30	7.02	5.85	1.20	0.22	0.83	5.67	0.09	0.20	0.94	0.52	1.00	1.07	3.97
TIS	2024	11	2	QR	1387.42	6.96	9.49	0.73	6.44	6.55	0.98	4.67	16.69	199.88	6.70	7.78	0.86	0.95	3.44	22.41	0.48	0.66	3.04	2.04	1.00	5.62	20.13
TIS	2024	11	2	ST	223.40	5.77	5.94	0.97	5.62	5.09	1.10	0.45	1.48	11.76	5.92	7.00	0.85	0.05	0.15	1.81	0.04	0.03	0.17	0.16	1.00	0.50	1.63
TIS	2024	11	3	AC	1200.00	8.24	10.38	0.79	6.35	6.64	0.96	4.16	14.53	511.11	7.09	7.91	0.90	2.51	9.34	36.47	0.55	1.35	4.82	3.32	1.00	6.67	23.87
TIS	2024	11	3	QR	1155.56	6.92	7.80	0.89	5.91	5.56	1.06	2.80	9.61	122.22	6.08	5.88	1.04	0.33	1.17	13.57	0.27	0.29	1.25	1.23	1.00	3.13	10.78
TIS	2024	11	3	ST	400.00	5.85	5.52	1.06	5.20	3.99	1.30	0.50	1.61	11.11	3.07	1.50	2.05	0.00	0.01	1.97	0.04	0.03	0.14	0.18	1.00	0.50	1.62
TIS	2024	11	4	AC	422.22	7.60	11.18	0.68	6.96	8.21	0.85	2.23	7.96	144.44	7.02	8.41	0.83	0.80	2.85	15.14	0.24	0.77	2.67	1.38	1.00	3.04	10.81
TIS	2024	11	4	CB	288.89	7.19	9.08	0.79	6.84	6.90	0.99	1.08	3.91	11.11	7.19	9.10	0.79	0.07	0.26	4.69	0.09	0.32	1.36	0.43	1.00	1.15	4.17
TIS	2024	11	4	QR	1355.56	6.99	9.40	0.74	5.96	6.71	0.89	4.79	16.18	133.33	6.19	7.24	0.86	0.55	1.93	21.31	0.44	0.96	3.94	1.94	1.00	5.34	18.11
TIS	2024	11	4	ST	700.00	5.67	6.65	0.85	5.30	4.50	1.18	1.12	3.53	11.11	4.65	2.75	1.69	0.01	0.02	3.71	0.10	0.14	0.49	0.34	1.00	1.12	3.55
TIS	2024	11	5	ST	3611.11	4.96	8.13	0.61	4.52	4.73	0.95	6.35	17.74	111.11	4.24	3.67	1.16	0.12	0.33	20.89	0.52	1.48	4.50	1.90	1.00	6.47	18.07