Climate change experience, knowledge and management goals shape native and non-native tree species choices among European foresters

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Abstract

Assisted migration (AM) is increasingly considered in forest adaptation to climate change, yet its implementation depends on how forestry practitioners evaluate concrete planting options rather than on support for the concept alone. We surveyed 743 forestry practitioners and researchers across Europe, assessing planting preferences for 30 tree species differing in geographic origin, together with respondents' demographic profiles, experiences, knowledge, and management and governance priorities. Among forestry practitioners, three dimensions were associated with species choice in distinct ways: greater experience of climate-change-related forest disturbance was associated with broader willingness to plant, whereas greater eco-evolutionary knowledge and stronger conservation-oriented management goals were associated with stronger preference for native species. Residual geographical variation remained after accounting for these characteristics, but did not follow an obvious East–West pattern. Species origin provided an additional strong structure to planting preferences: model-adjusted preference among practitioners was highest for locally native species (85.2%), intermediate for European species outside their local native range (60.7%), and lowest for non-European species (39.6%). Researchers showed stronger preference for locally native species and lower preference for non-European species than practitioners. Substantial variation nevertheless remained among individual species and geographical contexts. Favorable evaluations were typically accompanied by multiple and broadly shared perceived benefits, whereas concerns were fewer and more species-specific; invasiveness and disease susceptibility dominated, while concern about importing pests and pathogens was less frequent and showed no supported geographical variation. These findings suggest that forestry responses to AM are more nuanced, and potentially more actionable, than a simple divide between support and opposition or native and non-native species. Importantly, eco-evolutionary knowledge and management goals emerged as potentially actionable dimensions of climate-adaptive decision-making, suggesting that opportunities for professional learning and clearer consideration of management objectives may provide more effective levers for future forest choices than information provision alone.

Introduction

Rapid climate change and accelerating land-use transformations are increasingly compromising the persistence, productivity, and stability of forest ecosystems in Europe and other parts of the world. Forest practitioners face mounting challenges associated with altered disturbance regimes, increased tree mortality [Senf et al., 2020, Camarero et al., 2025], reduced regeneration success [König et al., 2022], shifts in the climatic suitability of tree species [Barragan et al., 2023], limited capacity for natural migration to newly suitable areas [Saltré et al., 2015], and declining forest productivity [Bottero et al., 2017]. Together, these interacting pressures increase forest vulnerability to climate change [Seidl et al., 2017, Forzieri et al., 2021, Brodribb et al., 2020, Kowalski et al., 2026, Migliavacca et al., 2025], with cascading consequences for biodiversity, carbon sequestration, and other ecosystem services.

In Europe, drought alone caused approximately 500,000 ha of excess forest mortality between 1987 and 2016 [Senf et al., 2020, Senf and Seidl, 2021]. The subsequent 2018-2022 period was marked by exceptional and recurrent drought and heat, with widespread impacts on forest conditions across Europe [Knutzen et al., 2025]. More broadly, recent satellite analyses show accelerating forest biomass losses, increasing by 46% after 2018 alongside elevated natural-disturbance activity in temperate European forests [Kowalski et al., 2026]. Consequently, increasing forests' adaptive capacity while maintaining ecosystem services has become an important management, research, and policy priority [Masson-Delmotte et al., 2021, Mauri et al., 2023, Scherpenhuijzen et al., 2025, Migliavacca et al., 2025]. This is reflected in major European Union (EU) policy frameworks, including the EU Forest Strategy for 2030, the EU Biodiversity Strategy for 2030, and the Nature Restoration Regulation [Menéndez-Miguélez et al., 2025, Deutscher et al., 2026, Hermoso et al., 2022]. These initiatives increasingly emphasize ecosystem restoration, resilience, and climate adaptation, while recognizing forests as central components of European sustainability strategies.

Sustainable management, restoration, and conservation of ecosystems are central to these policies but also depend on forest management practices that span a continuum from close-to-nature forestry to intensive silviculture throughout the European landscape [Scherpenhuijzen et al., 2025]. Within this broader adaptation effort, assisted migration (AM) is increasingly considered an important approach for supporting the adaptation of forests to rapidly changing climatic conditions. Developed and extensively discussed within conservation biology as a means of facilitating species movement in response to climate change [Hällfors et al., 2026, Hällfors and Dalrymple, 2022], AM in forestry encompasses the intentional movement of tree species or populations to improve their suitability to anticipated future conditions [Bower et al., 2024, Chakraborty et al., 2024, Gömöry et al., 2020].

Although forest regeneration can occur naturally, through planting or direct seeding, and combinations of these approaches, implementing AM may suggest increased intentional establishment of selected tree species and forest reproductive material (FRM). Natural regeneration remains the dominant mode of regeneration in natural and semi-natural forests across Europe, but locally available species or populations may not be adapted to future conditions, while better-adapted ones may be unable to reach newly suitable areas through natural dispersal. Tree migration rates vary substantially among species and are further constrained by competition and habitat fragmentation, resulting in potentially considerable lags between shifts in climatic suitability and species range expansion [Meier et al., 2012, Zani et al., 2023, Axer et al., 2021]. Intentional planting can overcome these dispersal limitations by introducing species or FRM from populations expected to be better adapted to future climatic conditions [Chakraborty et al., 2024, Gömöry et al., 2020, Streit et al., 2024]. It can therefore provide an important means of implementing AM where natural regeneration and dispersal alone are unlikely to deliver the species or populations considered suitable for future conditions.

In conservation, AM refers to climate-motivated translocation of species or populations to an area outside their indigenous range where they would be predicted to move as climate changes, were it not for anthropogenic dispersal barriers or lack of time [Hällfors et al., 2014]. Related approaches include assisted gene flow (AGF), which facilitates adaptation through the intentional movement of individuals or genetic material among populations within a species [Aitken and Whitlock, 2013]. Climate-motivated translocation approaches are increasingly considered in forestry as potential strategies to enhance forest resilience under rapid climate change [Pelai et al., 2021, Palik et al., 2022, Chakraborty et al., 2024]. Here, we use assisted migration (AM) as an overarching term for climate-motivated translocations in forestry and forest conservation, including population-level interventions such as AGF, while recognizing that its conceptualization and terminology differ across forestry, conservation biology, and conservation-translocation frameworks [IUCN/SSC, 2013] (Fig. 1).

In forestry, AM includes a range of interventions that vary in the extent of movement and ecological change involved (Fig. 1), from AGF to the establishment of species beyond their biogeographic boundaries [Aitken and Whitlock, 2013, Hamilton and Miller, 2016]. Accordingly, the potential benefits, risks, and uncertainties of AM depend on the type of intervention considered (Fig. 1). As biological distance increases along this continuum, additional ecological risks may emerge or become more prominent, particularly those associated with genetic incompatibility, invasiveness, and broader ecological impacts (Fig. 1). At the same time, AM outcomes across the continuum remain difficult to predict due to local adaptation and phenotypic plasticity [Petit and Hampe, 2006, Csilléry et al., 2020, Csillery et al., 2026, Gibson et al., 2016], while movements beyond species' current distributions may entail unintended risks related to invasiveness and pathogen introduction [Simler et al., 2019]. These uncertainties significantly complicate the selection of species and reproductive material for future forests [Clark et al., 2024].

Indeed, conservation-oriented AM has been implemented only rarely [Hällfors and Dalrymple, 2022]. In forestry, however, intentional movement of tree species and FRM has a much longer history. Numerous species have been introduced to Europe from beyond their native ranges for silvicultural purposes, including *Pseudotsuga menziesii*, *Quercus rubra* and *Robinia pseudoacacia*, long before such movements were framed as AM or undertaken explicitly for climate adaptation [Alizoti et al., 2022, Brus et al., 2019]. Some of these long-established introduced species are now also being considered as potential options for adapting forests to future climatic conditions [Pötzelsberger et al., 2020b, Konic et al., 2024]. Thus, what is relatively recent is not the movement of tree species itself, but its deliberate use as a strategy to adapt forests to future climatic conditions. Under this framing, much current work on AM focuses on modeling, provenance and common-garden trials, experimental field studies, and demonstration projects [Williams and Dumroese, 2013, Palik et al., 2022, Twardek et al., 2023, Royo et al., 2023]. These approaches build on both accumulated forestry experience and new experimental evidence, but uncertainties remain regarding the performance of species and populations under future climatic conditions, particularly for less-tested species and provenances, and the longer-term consequences of different establishment choices for forest ecosystem functioning [Twardek et al., 2023, Chakraborty et al., 2024].

Therefore, forest practitioners must evaluate the potential benefits and risks of AM under considerable uncertainty and decide whether, what, and where to establish before many long-term outcomes are known. Such decisions about adapting tree species and the genetic composition of forests are unlikely to depend on ecological evidence alone. Forest stakeholders differ substantially in professional backgrounds, experience, knowledge, values, and management objectives [Matilainen and Lähdesmäki, 2023, Matilainen et al., 2019, Deuffic et al., 2018, Ficko et al., 2019], which may shape how they evaluate the benefits, risks, and suitability of different planting options. Established conservation norms, such as preferences for maintaining native species and historically occurring ecosystem composition, may also influence these decisions, particularly where interventions involve species or genetic material originating beyond their current ranges [Hagerman et al., 2010]. Such evaluations involve a fundamental trade-off between the risks of intervention and non-intervention, as introducing alternative species can help maintain forest resilience and ecosystem services under changing climatic conditions, but can also introduce risks to biodiversity and ecosystem functioning [Bindewald et al., 2021]. These considerations are particularly relevant to AM because interventions can range from using alternative reproductive material of the same species to introducing species expected to be better suited to future climatic conditions.

Beyond differences in preferences and convictions among individual decision-makers and stakeholders, AM decisions are also embedded within broader socio-political, ecological, and institutional contexts. Europe provides a particularly heterogeneous setting for examining these responses, with forests spanning broad climatic and biogeographical gradients and substantial differences in species composition, management histories, ownership and governance, and regulatory frameworks governing FRM and non-native tree species [Pötzelsberger et al., 2020a, Dimitrova et al., 2022, Menéndez-Miguélez et al., 2025]. Recent European evidence indicates that forestry practitioners consider introducing new tree species a potentially effective adaptation option, but apply it considerably less frequently than more established measures such as thinning or species mixing, with regulatory restrictions and low social acceptance among the perceived barriers to implementation [Willig et al., 2025]. Despite increasing ecological and experimental research on AM [Robson and Garzón, 2018, Isaac-Renton et al., 2014, Streit et al., 2024, Leverkus et al., 2026, Bison et al., 2026], comparatively little is known about how forestry stakeholders evaluate different species as adaptation options, how preferences for native species relate to the acceptance of species originating beyond their local range, or how these responses vary with stakeholder characteristics and geographical context. Given the diversity of interventions encompassed by AM, understanding stakeholder responses may therefore require examining acceptance of specific species and their geographic origin rather than treating attitudes toward AM as a single, uniform preference. Such insights are increasingly relevant as AM strategies move from experimental settings towards practical consideration in forest management [Gordeeva et al., 2022].

To address these gaps, we conducted a targeted pan-European questionnaire among forest practitioners and researchers to examine attitudes towards AM in European forestry. Rather than asking respondents whether they explicitly supported AM as a broad concept, we elicited these responses indirectly, primarily through their willingness to establish a set of tree species differing in geographic origin and current distributions across Europe (Fig. 1). Specifically, we investigated (1) the relationship between general willingness to plant and native species preference; (2) how these responses are associated with practitioners' knowledge, experience, and management objectives; (3) the extent to which geographical variation in these responses remains after accounting for measured respondent-level characteristics; and (4) species-specific preferences across geographic-origin categories and geographical contexts, together with the perceived benefits and concerns accompanying favorable and unfavorable species evaluations.

Results

Respondent profiles

Survey respondents were predominantly experienced forestry practitioners (Fig. 2) as most reported at least 10 years of forestry-related experience. The largest respondent group lay in the 51–60 age class and reported more than 20 years of experience. Respondents aged 30 years or younger represented a relatively small proportion of the sample. The respondent pool was also highly educated (Fig. 2b). Master's degrees were the most common qualification, and doctoral degrees were also frequent. Educational specialization was strongly concentrated in forestry (71.7%), whereas ecology and/or evolution (9.9%), agronomy (5.2%), governance and policy (1.6%), and other fields (11.5%) accounted for smaller portions of the sample. Forest managers represented the largest professional group, followed by respondents working in public administration, forest ownership and management, and other forestry-related occupations (Fig. 2c). Researchers represented a comparatively small fraction of the sample.

The 194 respondents affiliated with *MyGardenOfTrees* (see Materials and Methods, Questionnaire design) showed broadly similar demographic and professional profiles to the remainder of the survey sample. No significant differences were detected in age class ($\chi^2 = 6.10$, df $= 5$, $P = 0.297$), forestry-related work experience ($\chi^2 = 2.62$, df $= 3$, $P = 0.454$), or discipline of highest degree ($\chi^2 = 7.28$, df $= 4$, $P = 0.122$). However, *MyGardenOfTrees* respondents had a higher frequency of doctorate-level degrees ($\chi^2 = 32.08$, df $= 4$, $P < 0.001$), and their current work roles also differed from those of other respondents ($\chi^2 = 16.61$, df $= 7$, $P = 0.020$), with greater representation in academic and public-sector research. Forest managers nevertheless remained the largest professional group in both subsets.

Representation of native species in the survey and geographic variation in AM attitudes

The proportion of the 30 evaluated species that were both native to a European country and associated with a given reference forest type varied substantially across the respondents' country contexts (Fig. 3a). Across country–forest-type combinations, an average of 16.3% of species met both criteria. This proportion varied among countries, averaging 20.6% in Bulgaria compared with 6.3% in Portugal and 9.7% in Belgium. Mountainous beech forests, thermophilous deciduous forests, and Alpine coniferous forests had the highest representation of associated native species among those evaluated (> 20%), whereas broadleaved evergreen forests, non-riverine alder, birch and aspen forests, and boreal forests had the lowest (< 10%) (Fig. 3a).

General willingness to plant and native species preference varied substantially among countries and regions (Fig. 3b) and forest types (Fig. 3c). The country means of the two scores showed a non-significant but negative correlation ($r = -0.24$, $df = 16$, $P = 0.33$), with respondents selecting a higher number of species tending to show weaker preference for native species. General willingness to plant was highest in Germany, Portugal, Czechia, Romania, and Denmark. Native species preference was highest in Poland and Switzerland, followed by the United Kingdom and Ireland, whereas Germany, France, Portugal, Denmark, Spain, and the Western Balkans showed comparatively greater openness toward non-native species (Fig. 3b,c).

Constructs associated with AM attitudes among forestry practitioners

The bivariate mixed-effects model included 520 forestry practitioners with complete data for both outcome scores, the theory-driven constructs, and covariates. Three constructs showed evidence of associations with at least one of the two AM outcomes (Fig. 4a; Table 2). More exposure to climate-change driven disturbances, reflecting broader direct experience with climate-related forest impacts (Table 1), was associated with higher general willingness to plant. Eco-evolutionary knowledge, representing respondents' recognition of ecological and evolutionary processes relevant to forest adaptation, was associated with stronger native species preference. Management goal preference also influenced native species preference: respondents with stronger conservation-oriented, relative to production-oriented, management goals showed a stronger preference for native species (Table 1). Its association with general willingness to plant was weaker. None of the remaining theory-driven constructs showed statistically supported associations with either outcome (Table 2).

Among the covariates, the proportion of the 30 predefined species that were native to the respondent's country was positively associated with native species preference but not with general willingness to plant (Table 2). Participation in *MyGardenOfTrees* was associated with weaker native species preference, whereas its association with general willingness to plant was not statistically supported. Forestry-related experience showed no detectable association with either outcome, while higher education showed only a marginal positive association with general willingness to plant (Table 2).

Residual geographical variation remained after accounting for the constructs and covariates (Fig. 4b,c; Table S5). General willingness to plant was higher than the overall fitted mean in Germany (BLUP = 0.436, SE = 0.139) and lower in Switzerland (BLUP = −0.353, SE = 0.124). Native species preference was higher than the fitted mean in Poland (BLUP = 0.480, SE = 0.152) and Switzerland (BLUP = 0.282, SE = 0.135), but lower in France (BLUP = −0.332, SE = 0.155), Germany (BLUP = −0.343, SE = 0.150), and Portugal (BLUP = −0.493, SE = 0.246). These regional effects represent deviations after adjustment for all fixed explanatory variables, rather than unadjusted geographical differences.

Species-specific planting preferences

Species preferences differed between forestry practitioners and researchers in their response to species origin, despite no overall difference in planting preference between the two groups ($F_{1,553.3} = 0.13$, $P = 0.718$; Table 3). The interaction between respondent group and species origin was strong ($F_{2,14052} = 16.69$, $P < 0.001$). Researchers showed a higher preference than forestry practitioners for locally native species and a lower preference for non-European species. Their preferences for European but locally non-native species were more similar.

Among forestry practitioners, species origin had a strong overall effect on planting preference ($F_{2,69.8} = 38.10$, $P < 0.001$). Model-adjusted preference was highest for species native to the respondent's country (85.2%, SE = 3.9%), intermediate for European species that were locally non-native (60.7%, SE = 7.3%), and lowest for non-European species (39.6%, SE = 7.0%). Thus, forestry practitioners distinguished not only between native and non-native species, but also between European species outside their local native range and non-European species.

Substantial variation nevertheless remained among individual species after accounting for geographic origin (Fig. 5a). Among European species, *Castanea sativa*, *Quercus petraea* and

Pinus sylvestris showed positive species-specific deviations, whereas *Fagus orientalis* and *Populus alba* showed negative deviations. Among non-European species, *Pseudotsuga menziesii*, *Juglans nigra* and *Quercus rubra* showed some of the largest positive deviations, while *Paulownia tomentosa*, *Eucalyptus globulus*, *Pinus contorta* and *Pinus controta* showed strong negative deviations. Thus, geographic origin was strongly associated with species preferences but did not fully account for differences among individual species.

Model-based country–species predictions also revealed substantial geographical variation within both European and non-European species (Fig. 5b). For European species, preference often varied according to whether the species was native to the respondent's country, while considerable geographical heterogeneity remained beyond this country-level nativeness effect. Non-European species likewise showed pronounced geographical variation, with several species receiving relatively high predicted preference in particular parts of Europe despite their non-European origin.

Perceived benefits and concerns accompanying species-specific preferences

Perceived benefits and concerns differed between favorable and unfavorable species evaluations (Fig. 6). Reasons underlying positive and negative planting decisions were broadly similar between forestry practitioners and researchers. None of the seven reasons associated with positive planting decisions differed between respondent groups. Among reasons for rejecting species, researchers more frequently selected frost susceptibility (4.5% vs. 2.4%, $P = 0.009$) and invasiveness (8.5% vs. 4.9%, $P = 0.028$), although absolute differences were small. All other rejection reasons showed no supported differences between groups (Table S6).

Respondents selected at least one perceived benefit for 94.1% of favorable evaluations, compared with at least one perceived concern for 47.9% of unfavorable evaluations. Favorable evaluations were typically accompanied by multiple perceived benefits (median = 3, mean = 2.76, IQR = 1–4), with 73.5% accompanied by at least two benefits and 50.6% by at least three. This pattern was widespread among respondents, with 84.0% selecting multiple benefits for at least half of the species they evaluated favorably. In contrast, unfavorable evaluations were generally accompanied by either no stated concern or a single concern (median = 0, mean = 0.63, IQR = 0–1), and only 10.7% of rejected decisions included two or more concerns.

Biodiversity value was the most frequently selected benefit (20.2% of benefit selections), followed by increased genetic diversity (18.2%), economic value (16.0%) and maintaining forest composition (15.0%). Species with the largest overall numbers of stated benefits included *Quercus petraea, Fagus sylvatica* and *Pinus sylvestris*, but the relative composition of perceived benefits was broadly similar across species despite substantial differences in species-specific preferences.

Perceived concerns were considerably more species-specific (Fig. 6). Invasiveness was the most frequently selected concern (24.0%) and was strongly concentrated in *Robinia pseudoacacia, Paulownia tomentosa* and *Eucalyptus globulus*. Disease susceptibility was the second most frequently selected concern (23.3%) for a much broader range of species. It also differed strongly geographically after accounting for respondents and species effects ($\chi^2_{20} = 172.5$, $P < 0.001$), with particularly high raw frequencies in the United Kingdom (40.7%), France (25.9%) and Belgium (23.5%), and very low frequencies in Germany (2.0%) and Poland (1.3%). Potential threat of ecosystem collapse was the third most common rejection reason (19.7%), followed by the risk of importing pests and pathogens (14.1%). In contrast to disease susceptibility, geographical variation in concern about importing pests and pathogens was not supported after accounting for respondent and species effects ($\chi^2_{20} = 21.3$, $P = 0.380$). Each of the remaining reasons accounted for less than 10% of selections.

Discussion

Forest assisted migration (AM) is often framed as a question of whether to intervene and how far planting should extend beyond locally native species or populations [Chakraborty et al., 2024, Gömöry et al., 2020, Hällfors et al., 2026, Leech et al., 2011, Bower et al., 2024]. Our results provide a more differentiated account of how forestry practitioners approach these choices. Three practitioner-level dimensions were associated with species choice in distinct ways. Greater experience of climate-change-related forest disturbance was associated with broader willingness to plant, whereas greater eco-evolutionary knowledge and stronger conservation-oriented management goals were associated with stronger native species preference (Fig. 4a). These findings suggest that climate-adaptive tree species choice is not well represented by a single positive or negative attitude towards AM, but instead reflects a differentiated decision process involving practitioner experience, knowledge and management objectives as well as the identity and geographic origin of the species considered. Species origin provided an additional strong structure to planting preferences, with locally native species most strongly preferred, European species outside their local native range intermediate, and non-European species least preferred. Yet substantial variation remained among individual species and geographical contexts. Thus, responses relevant to assisted migration appear to emerge from several partly independent dimensions of decision-making rather than from a single continuum of acceptance. This may help explain why broad support for active forest adaptation does not necessarily translate into similar choices of species or reproductive material.

Research on AM has largely addressed its ecological feasibility, potential benefits, and risks [Park and Talbot, 2018, Xu and Prescott, 2024]. Yet, translating AM into practice also depends on how forest stakeholders evaluate different adaptation options, a dimension that is increasingly recognized in research on AM and forest adaptation [Moreira et al., 2024, Clark et al., 2024, Findlater et al., 2022, Willig et al., 2025]. Recent surveys suggest that forestry professionals recognize the need for active adaptation, while the implementation of more transformative strategies can be constrained by information, regulatory, and social-acceptance barriers [Himes et al., 2023, Willig et al., 2025]. In our study, rather than asking forest practitioners and researchers whether they explicitly supported AM as a broad concept, we examined their species-specific preferences and the perceived benefits and concerns associated with these evaluations. This approach allowed us to examine how respondents evaluate specific species choices relevant to AM and how these preferences vary according to species and geographic origin. Our results show that responses relevant to AM cannot be reduced to a simple position for or against the strategy. Instead, responses to climate-adaptation options reflect the species being considered, its geographic origin, the respondent evaluating it, and the broader context in which that evaluation occurs.

Practitioner responses to climate-adaptive species choice

Among practitioners, general willingness to plant and native species preference captured distinct dimensions of how they approached species choice in the context of forest adaptation through AM. Although countries with greater general willingness to plant tended to show weaker native species preference, the relationship between the two scores was weak and not statistically supported (Fig. 3). The geographical patterns reinforce this distinction. Germany, for example, showed relatively high general willingness to plant with weak native species preference, whereas Switzerland showed lower general willingness to plant with strong native species preference. These patterns suggest that openness to considering planting a broader range of species does not necessarily imply weaker preference for native species. Instead, the two measures appear to capture complementary aspects of practitioners' responses to climate-adaptive species choice.

Experience of climate-related forest disturbance was associated with greater general willingness to plant but not with native species preference, whereas years of forestry-related experience showed no detectable association with either general willingness to plant or native species preference (Fig. 4a). This distinction suggests that direct experience of changing forest conditions may be more relevant to practitioners' willingness to consider planting than professional experience alone. Previous studies similarly indicate that experience of forest disturbance and adaptation practices can influence how practitioners evaluate the need for and implementation of adaptation responses [Seidl et al., 2016, Sallmannshofer et al., 2023, Nikinmaa et al., 2024, Willig et al., 2025]. In our study, however, the association was specific to general willingness to plant: climate-disturbance experience showed no detectable association with native species preference. This suggests that experience of climate-related forest impacts may be associated with greater openness to planting as an adaptation response, without a corresponding shift in native species preference.

A different pattern emerged for eco-evolutionary knowledge and management objectives, which were associated primarily with native species preference (Fig. 4a). Greater eco-evolutionary knowledge was associated with stronger native species preference but showed no detectable association with general willingness to plant. Rather than indicating opposition to climate-adaptive planting, this pattern may reflect greater selectivity regarding which species are considered appropriate. Such selectivity may be particularly relevant to AM decisions, where potential adaptation benefits must be weighed against uncertainties associated with ecological suitability, maladaptation, and unintended ecosystem consequences [Saenz-Romero et al., 2020, Lavrik, 2021]. Greater emphasis on conservation over production goals was associated with stronger native species preference, suggesting that management objectives may influence which species practitioners consider appropriate. This is consistent with previous research showing that stakeholders assess AM against multiple forest values and management objectives while weighing uncertain ecological, social, and economic consequences [Findlater et al., 2022, Konic et al., 2024]. More broadly, native species preference may therefore reflect how practitioners evaluate species choices in relation to their knowledge and management objectives, rather than their general willingness to consider planting.

Forest management across Europe takes place in contexts that differ in forest composition and climate-related pressures, silvicultural traditions, forest and environmental governance, regulatory frameworks governing species use, and broader social and cultural conditions [Aszalós et al., 2022, Pötzelsberger et al., 2020a, Mason et al., 2021]. Despite these contextual differences, geographical variation in the general willingness to plant and native species preference we analyzed was relatively limited, although some country-level deviations remained after accounting for the measured respondent characteristics (Fig. 4b,c). These broadly shared patterns, alongside some remaining national variation, may be particularly relevant as European-level frameworks increasingly seek to facilitate climate-adaptive forest management, with common rules for forest reproductive material applied across diverse national forestry contexts.

Species-specific preferences across geographic origins and contexts

Among forestry practitioners, geographic origin was strongly associated with species-specific planting preferences (Fig. 5). Model-adjusted preference was highest for locally native species, followed by European-native species outside their local range and then non-European species. A separate comparison with researchers showed the same overall ordering, but the magnitude of preference differed by origin: researchers showed stronger preference for locally native species and lower preference for non-European species than practitioners, while preferences for European-native species outside their local range were more similar between groups (Table3). The intermediate preference for European-native species outside their local ranges indicated that species were not evaluated according to a simple native/non-native distinction. Instead, respondents differentiated between species locally native to their country, species native elsewhere in Europe, and species originating outside Europe. A similar differentiation among AM options has been reported in British Columbia, where public support varied according to the type of movement considered and potential controversy was greatest for strategies involving species beyond their native ranges [Peterson St-Laurent et al., 2018]. The lower preference for non-European species may partly reflect perceptions associated with non-native status. Studies outside forestry have shown that plants perceived as non-native can be considered environmentally riskier, with familiarity moderating this relationship [Humair et al., 2014], and that labels as native and invasive can influence plant preferences [Yue et al., 2011]. Although comparable evidence from forestry remains limited, these findings suggest that geographic origin may influence species evaluations not only through anticipated ecological consequences, but also through how the non-native status is perceived.

Geographic origin however did not fully account for the species-specific preference among the respondents (Fig. 5a). Among non-European species, *Pseudotsuga menziesii*, *Juglans nigra* and *Quercus rubra* were evaluated more favorably than the broader pattern for non-European species would suggest, whereas *Paulownia tomentosa*, *Eucalyptus globulus* and *Pinus contorta* were evaluated less favorably. Comparable contrasts occurred among species native to Europe, whose origin status depended on the respondent's country: the same species could be locally native for some respondents but European-native outside its local range for others. Within this group, *Castanea sativa*, *Pinus sylvestris* and *Quercus petraea* were evaluated more favorably, whereas *Fagus orientalis*, *Ulmus laevis* and *Populus alba* were evaluated less favorably. This differentiation is relevant because species considered for climate-adaptive forestry can differ substantially in their implications for productivity, biodiversity, ecosystem services, and climate adaptation [Felton et al., 2023, Konic et al., 2024].

Beyond the broad pattern associated with geographic origin and the differences among individual species, species evaluations also varied according to where in Europe they were assessed (Fig. 5b, S5). For example, *Pseudotsuga menziesii* was generally evaluated favorably across most of Europe, although the strength of this preference varied among countries, while *Robinia pseudoacacia* and *Paulownia tomentosa* showed more heterogeneous geographical patterns. Similar variation occurred among species native to parts of Europe, including *Fagus orientalis* and *Pinus nigra*, which were also evaluated differently among countries. These patterns may reflect several aspects of geographical context, including current ecological and climatic suitability, regional familiarity and silvicultural experience, perceived species performance, and national histories of species use [Brus et al., 2019, Pötzelsberger et al., 2020b, Dimitrova et al., 2022]. Geographic origin therefore does not necessarily correspond to novelty in forestry practice: a non-European species with a long history of cultivation may represent a familiar management option in some parts of Europe, while a species native elsewhere in Europe may be comparatively unfamiliar in another region. Species preferences may therefore depend not only on where a species originates, but also on how familiar it is within a particular forestry context.

Considering species-specific preferences alongside the perceived benefits and concerns provides complementary insight into how respondents evaluated particular species choices. The reasons accompanying species-specific preferences revealed a marked asymmetry between favorable and unfavorable evaluations (Fig. 6). Favorable evaluations were typically accompanied by multiple perceived benefits, with nearly three-quarters associated with at least two stated benefits, whereas substantially fewer reasons accompanied unfavorable evaluations. Biodiversity value and increased genetic diversity were the most frequently identified benefits, but the relative composition of perceived benefits was broadly similar across species despite substantial differences in their geographic origin and overall preference. This consistency suggests that favorable species evaluations may reflect consideration of several potential outcomes simultaneously, in line with the multi-criteria nature of tree-species selection under climate change [Park et al., 2018, Friedrich et al., 2021].

Unfavorable evaluations showed a different pattern: fewer concerns were reported, and those that were reported were considerably more species-specific (Fig. 6). Invasiveness was the most frequently selected concern, reported primarily for *Robinia pseudoacacia*, *Paulownia tomentosa* and *Eucalyptus globulus*. The latter two species were also evaluated less favorably than the broader pattern for non-European species would suggest, in contrast to the favorable evaluations of *Pseudotsuga menziesii*, *Juglans nigra* and *Quercus rubra*. This contrast suggests that perceived invasiveness was associated with particular species rather than with non-European origin, consistent with the species-specific risks associated with non-native trees in European forestry [Dimitrova et al., 2022, Alizoti et al., 2022].

Disease-related concerns revealed a different form of context dependence. Unlike invasiveness, concern about disease susceptibility was distributed across a broader range of species and showed strong geographical variation after accounting for respondent and species effects. This may reflect differences in forest-health experience, locally important pests and pathogens, or knowledge of species-specific vulnerability. By contrast, concerns about importing pests and pathogens showed no geographical variation, suggesting that perceptions of this risk were more consistent across countries. Although the role of international plant movements and trade in facilitating pest and pathogen introductions is well recognized [Bonnamour et al., 2023, Eschen et al., 2017], how these risks translate to the movement of forest species and reproductive material for climate adaptation remains less well understood. Potential threat of ecosystem collapse was also a prominent concern, showing that unfavorable evaluations extended beyond risks to individual species performance to perceived consequences for the wider ecosystem. Together, these concerns highlight a central challenge for AM, where anticipated adaptation benefits must be weighed against potential ecological risks and unintended consequences [Lavrik, 2022].

Taken together, these findings show that responses relevant to AM cannot be represented by a single level of acceptance. AM encompasses interventions ranging from the movement of populations within species' ranges to introductions beyond current species distributions (Fig. 1), while our survey directly examined species-specific preferences within this broader continuum. Within this scope, evaluations reflected not only geographic origin, but also species identity, the context in which the species was evaluated, and the perceived benefits and concerns associated with its use. For climate-adaptive forestry, these findings suggest that decisions and communication around AM may be more useful when framed around concrete species choices rather than AM as a general strategy.

Decision support could therefore combine evidence on future climatic suitability and expected benefits with species-specific ecological risks, management objectives, local forestry experiences, and regulatory conditions governing species movement. Such approach is consistent with broader forest-adaptation research emphasizing the integration of climate and ecosystem science with local management knowledge and needs in decision-making [Keenan, 2015], as well as with work highlighting the regulatory considerations for AM [Lavrik, 2022] and calls to move forest AM from conceptual and experimental work towards pragmatic operational implementation [Palik et al., 2022]. For concerns such as invasiveness, species- and context-specific evidence may therefore be more informative for decision-making across stakeholder groups than general distinctions between native and non-native species.

Limitations and caveats

Several limitations should be considered when interpreting these findings. Participation was uneven across countries and professional groups, and the sample should therefore not be considered representative of the European forestry community or of individual countries. Moreover, the observational, cross-sectional design identifies associations between practitioner characteristics and the respondent-level outcomes but cannot establish causal relationships. The geographically broad survey also required a predefined species set that could not capture the full diversity of planting options relevant across European forest regions, as illustrated by the more than 100 additional species proposed by respondents (Table S4). Similarly, perceived benefits and concerns were assessed using predefined response categories. Although respondents could select multiple reasons, the observed difference in the number of reasons accompanying favorable and unfavorable evaluations may partly reflect the number and formulation of the available response options and should therefore not be interpreted as a direct measure of the strength of positive or negative attitudes. Its multilingual implementation also introduced potential challenges in achieving consistent interpretation across countries, as conceptual equivalence can remain difficult to ensure in cross-cultural surveys even after careful translation procedures [Behr, 2017, Repke and Dorer, 2021, Roberts et al., 2020].

Taxonomic conventions and species recognition may likewise differ geographically; for example, *Pinus mugo* may have been interpreted differently where *Pinus uncinata* or *Pinus mugo* subsp. *uncinata* is more commonly recognized. Species-specific patterns should therefore be interpreted with appropriate caution. Finally, stated species-specific preference should not be equated with actual management behavior, which is additionally constrained by regulatory, economic, and operational conditions [Mason et al., 2021, Pötzelsberger et al., 2020a]. The species-choice questions also did not distinguish among seed sources or provenances. Our findings therefore address species-specific preferences relevant to AM but cannot determine how respondents would evaluate assisted gene flow or other within-species movements represented in the broader AM framework.

Conclusions

Our findings show that climate-adaptive tree species choices cannot be reduced to a single preference for AM. Among forestry practitioners, climate-change experience, eco-evolutionary knowledge and management goals were associated with distinct dimensions of species choice, while substantial geographical variation remained. Across practitioners and researchers, geographic origin and the ecological species context structured species-specific preferences but did not determine them. Favorable evaluations were accompanied by multiple, relatively consistent perceived benefits, whereas unfavorable evaluations were associated with fewer and more species-specific concerns, with a strong awareness of potential risk invasiveness, surprisingly little awareness about the risk of importing pests and diseases [Pötzelsberger et al., 2021], and a policy-wise underappreciated yet emerging major risk due to ungulate browsing.

Together, these findings suggest that responses relevant to AM emerge from the interaction between the decision-maker, the species being considered, and the ecological context in which that choice is made. Moving beyond a general concept of "AM preference" towards concrete, species- and context-specific decisions may therefore provide a more useful basis for climate-adaptive forestry. Such an approach can make explicit the trade-offs among future climatic suitability, ecological risks, expected benefits and management objectives, while also creating opportunities for professional learning where eco-evolutionary knowledge is relevant to those choices. Rather than seeking a single level of acceptance for AM, decision support may be more effective when it helps practitioners evaluate which species, for which objectives, and under which ecological and geographical conditions should be considered, which echoes findings when understanding public representations of biodiversity [Buijs et al., 2008].

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Materials and Methods

Questionnaire design

Given the objective of capturing the diversity of attitudes and management practices across Europe, the questionnaire was designed to target two primary respondent groups: (i) forestry practitioners, including forest managers, forest owners, and forest administration personnel, and (ii) researchers whose work primarily focused on forests. We slightly adapted the questionnaire for each group to ensure relevance while maintaining comparability across key components. The questionnaire comprised 36 questions and was estimated to take approximately 20 minutes to complete (Table S1). The authors developed the questionnaire with additional feedback from a range of stakeholders across the European forestry sector, including practitioners, researchers, and institutional actors. The questionnaire was translated into 23 European languages by local forestry experts, ensuring consistent interpretation of forestry-specific terminology. Additional definitions and explanatory information were included in the questionnaire for terminology that could be interpreted differently among countries (Tables SS2 and SS3).

The questionnaire first collected demographic and professional information, including education, professional role, and forestry-related experience. Notably, a question regarding their work sector enabled us to identify forest practitioners and researchers through self-assessment. Subsequent sections addressed respondents' experiences with extreme events, climate change, and forest damage; adaptive forest management practices; the use of forest reproductive materials, including material from different provenances; and perceived barriers to the use of non-native forest reproductive material (Table S1).

The following section evaluated individual tree species, asking respondents whether they would plant in their forest each of the predefined tree species. Respondents first defined a reference forest for interpreting the species choices in large countries with diverse forest types. The reference forest was selected from forest categories based on the European Environment Agency classification [Barbati et al., 2006], with definitions of each category provided within the questionnaire via a hover option (Table S2). The species set comprised 30 trees, including 15 conifers and 15 broadleaved trees, of established or emerging relevance to forestry across Europe (Table S4). Species selection was expert-informed and aimed to include species familiar to the respondents. For each of the 30 tree species, respondents were provided with its scientific name, the species name in the respective language, and a botanical illustration showing characteristic morphological features, such as shoots and foliage, cones or other reproductive structures, seeds and/or seedlings, where applicable, to facilitate species recognition (see the exact images used at `https://github.com/kcsillery/TAMERS/`).

The selection included species native across large parts of Europe (e.g. *Fagus sylvatica*, *Betula pendula*, *Pinus sylvestris*), species with more geographically restricted native distributions within Europe (e.g. *Castanea sativa*, *Fagus orientalis*, *Tilia tomentosa*), and species introduced from outside Europe, commonly discussed in forestry debates (e.g. *Pseudotsuga menziesii*, *Quercus rubra*, *Eucalyptus globulus*). For each species, respondents indicated if and when they would use the species, or considered it not applicable to their reference forest, or did not know. Respondents could additionally select one or more predefined reasons for accepting or rejecting each species.

Following the species questions, respondents were asked about broader forest-management and institutional contexts. The final questionnaire section recorded how respondents had learned about the survey and participation in forest-related research projects and networks, including *MyGardenOfTrees* (Table S1). The MyGardenOfTrees project is a European next-generation citizen-science project involving forest practitioners in a simulated assisted-migration experiment [Bison et al., 2026],

Survey dissemination

The questionnaire was hosted online using LimeSurvey at LimeSurvey. Between September and December 2024, we pilot-tested the questionnaire with colleagues to ensure that the terminology, explanations, and question structure were clear. Data presented here comprise responses collected between December 2024 and July 2026.

The questionnaire was disseminated through a decentralized network across Europe. Dissemination was led by members of the TAMERS project team and was substantially supported by local coordinators of the *MyGardenOfTrees* project, as well as by colleagues and professional contacts who acted as amplifiers within their own institutional and professional networks. Forestry and research societies, professional organizations, and other institutions further disseminated the questionnaire through mailing lists, newsletters, websites, and social-media channels. Recipients of direct invitations were also encouraged to forward the questionnaire to relevant colleagues and networks.

We systematically documented dissemination efforts whenever possible (see full records on `https://github.com/kcsillery/TAMERS`). Recorded actions included personalized and non-personalized emails to individual addresses, emails to mailing or distribution lists, informal communication by telephone or in person, social-media posts and website entries. Each record in the dissemination log represented one dissemination action rather than one person reached. Overall, the documented recruitment effort included 1,459 individual email addresses and 411 mailing or distribution lists associated with relevant projects, institutions and public or private organizations. In addition, personal invitations were sent to 302 active participants in *MyGardenOfTrees* and to 107 people who had begun registration for the project but ultimately did not participate. Participation in *MyGardenOfTrees* was recorded in the questionnaire and included as a covariate in the statistical analyses because these respondents represented a distinct recruitment channel with previous exposure to assisted migration of species and provenances.

Because dissemination frequently occurred through mailing lists, newsletters, institutional networks, and subsequent forwarding by recipients, complete traceability of the number of people ultimately reached was not possible. Approximate audience size was recorded for some dissemination actions, but this information was not consistently available and was therefore not used to quantify recruitment intensity. Figure S1 instead summarizes the geographical and temporal distribution of documented dissemination actions and should be interpreted as an indication of recruitment effort rather than a complete measure of survey exposure.

Species nativeness by countries, regions, and forest types

Because the same set of 30 species was evaluated across countries and reference forest types, the proportion of species that were both native to a given country and associated with a given forest type varied across the contexts (Fig. 3). Across country and forest-type combinations, an average of 16.3% of the 30 evaluated species met both criteria (Fig. 3). This proportion varied by country, averaging 20.6% in Bulgaria compared to 6.3% and 9.7% in Portugal and Belgium, respectively. Mountainous beech forests, thermophilous deciduous forests, and Alpine coniferous forests had the highest proportions of associated native species among those evaluated (¿20%), whereas broadleaved evergreen forests, non-riverine alder, birch and aspen forests, and boreal forests had the lowest (¡10%) (Fig. 3).

Country-level nativeness was determined for each of the 30 predefined tree species and for the 112 additional species proposed by respondents through the free-text *Other species* questions G06Q02d and G06Q03d (Table S1). We classified species as native or non-native separately for each country represented in the survey. Classifications were based primarily on species-distribution information from EUFORGEN, Caudullo et al. [2017], and the Royal Botanic Gardens, Kew databases, supplemented by additional species-specific sources where necessary (see Table S4 for a full list of resources). For the 30 predefined species, associations with the forest categories used in the questionnaire were derived from Barbati et al. [2006] and cross-checked with San-Miguel-Ayanz et al. [2016].

For visualization of native-species composition, we combined countries with similar native-species compositions into regional groups (Fig. 3). Similarity among countries was assessed using hierarchical clustering based on Jaccard distances calculated from the country-by-species native/non-native matrix for the 30 predefined species (Fig. S3). Countries were grouped only where their native-species sets were identical or differed by no more than one of the 30 species. This resulted in nine groups: Baltic (Finland, Latvia), Scandinavia (Norway, Sweden), Denmark-Belgium (Belgium, Denmark), France-Italy (France, Italy), Austria-Slovenia (Austria, Slovenia), Oder-Elbe Region (Czechia, Germany, Poland), Carpathian (Slovakia, Ukraine), Western Balkans (Albania, Bosnia & Herzegovina, Croatia, Kosovo, Montenegro, Serbia), and South-East Balkan (Bulgaria, Greece, North Macedonia). We retained eight countries individually (Ireland, Portugal, Romania, Switzerland, United Kingdom, Spain, Hungary, and Turkey) (Fig. S3). For regional summaries, we considered a species native to the group if it was native in at least one constituent country.

For statistical analyses requiring geographical aggregation, including the bivariate mixed-effects model, we used a less aggregated grouping in order to retain country-level variation wherever respondent numbers were sufficient. Only countries with small sample sizes were combined. This analysis grouping comprised Baltic (Finland, Latvia), Scandinavia (Norway, Sweden), Western Balkans (Albania, Bosnia & Herzegovina, Croatia, Kosovo, Montenegro, Serbia), Slovakia–Ukraine (Slovakia, Ukraine), Slovenia–Hungary (Slovenia, Hungary), and South-East Balkan (Bulgaria, Greece, North Macedonia); all other countries were retained individually. This grouping therefore differed from the grouping used to visualize native-species composition in Fig. 3, which was based specifically on similarity in native-species lists.

Sample size and data quality

Raw survey data comprised 1,484 responses across 243 variables. We removed 12 responses for which consent was not provided and four test submissions. Because the principal analyses were based on the species-selection questions, we further restricted the dataset to respondents who reached at least the conifer-species selection section. Following screening for duplicate or repeat submissions (Supplementary Methods 1.1), the final dataset comprised 743 respondents. Of these, all 743 answered the conifer-species questions, 682 continued to the broadleaf-species questions, and 642 completed the full questionnaire. Response duration was not used as an exclusion criterion. Missingness varied substantially among respondents, reflecting both the optional nature of several questionnaire items and differences in questionnaire completion; subsequent analyses were therefore conducted on question-specific subsets with sufficient overlapping data.

In the respondent profile dataset, we harmonized several answer labels to reduce fragmentation of conceptually similar categories before visualization. We grouped "Forest technician" degrees under "Forestry", shortened "Agronomy/Agricultural Sciences" to "Agronomy", and renamed "Public Administration" to "Governance & Policy" to distinguish educational background from current professional roles in public administration. We combined research-related occupational categories ("Private", "Not-for-profit", and "Consulting") into a single category ("Researcher in private sector") because respondents likely interpreted these categories inconsistently and because sample sizes within individual groups were small. One inconsistent response reporting a doctorate degree in the "<20" age class was reassigned to the "20–30" class. 194 participants of *MyGardenOfTrees* took part in the survey. To evaluate whether respondents already engaged in the *MyGardenOfTrees* initiative differed systematically from the remainder of the sample, we compared their demographic and professional profiles across multiple categorical variables using Chi-squared tests.

The experience questions were intended only for foresters. However, some respondents changed their occupation from forester to researcher using the return button and actually filled the experience questions (n=22). We included these answers in the analyses as forester responses.

AM attitude scores

To summarize respondents' attitudes toward AM, we derived two scores from the species-choice questionnaire. Responses to each of the 30 predefined species were first recoded as follows: acceptance of a species ("Yes in pure stocks", "Yes in mixed stocks", or "Yes, but sporadically") was coded as +1, rejection ("No") as −1, and "Not applicable for my reference forest" or "I don't know" as 0. The first score, general willingness to plant, was calculated as the sum of these recoded values and therefore reflects overall openness toward planting alternative tree species, irrespective of nativeness. Higher values indicate broader acceptance of planting options. The second score, native species preference, incorporated the nativeness of each species relative to the respondent's country. For native species, acceptance was coded as +1 and rejection as −1, whereas coding was reversed for non-native species (acceptance = −1; rejection = +1). Neutral responses remained coded as 0. Positive values therefore indicate a stronger preference for native species, whereas negative values indicate greater openness toward non-native species. Country-level nativeness was obtained from the species-by-country reference table described above.

Both scores were additionally adjusted to incorporate species proposed by respondents in the free-text *Other species* fields. For general willingness to plant, newly proposed species not already represented among the 30 predefined species increased the acceptance score. For native species preference, additional species with known country-level nativeness contributed according to whether they were native or non-native to the respondent's country.

Explanatory variables: theory-driven constructs

Survey responses were combined into theory-driven composite indices representing distinct dimensions of adaptive forest management attitudes, subsequently referred to as constructs (Table 1, Supplementary Methods 1.1). The indices were developed a priori from the conceptual definitions of the constructs rather than by empirical dimension reduction. Following recommendations for formative measurement, we calculated each score as a transparent composite of survey items representing complementary aspects of the construct, rather than assuming responses reflected a single latent variable. Consequently, internal consistency statistics were not used as a criterion for score construction because high inter-item correlations are not expected for formative indices [Bollen and Lennox, 1991, Edwards and Bagozzi, 2000, Hoyle et al., 2025]. See calculation details in Methods S2.

Statistical modeling of AM attitude scores

We related the theory-driven attitudinal constructs to two standardized outcome scores — general willingness to plant and native species preference — using a bivariate mixed-effects model fitted in ASReml-R (v4.2)[Butler et al., 2023]. This analysis was restricted to forestry practitioners because several explanatory constructs and the forestry-related experience covariate were based on questions asked only of this respondent group. Respondents who initially identified as practitioners and completed the practitioner-specific questions but subsequently changed their occupational classification to researcher were retained in this analysis as described above.

In addition to the theory-driven constructs, the model included four covariates representing survey design and respondent characteristics: the proportion of the 30 predefined species that were native to the respondent's country, years of forestry-related experience, education level, and participation in the participatory AM experiment *MyGardenOfTrees* [Bison et al., 2026].

The country-level proportion of native species among the 30 predefined species differed among countries and was constant among respondents within a country. Consequently, it was confounded with country when both were fitted as fixed effects, as confirmed by rank deficiency of the design matrix. We therefore fitted geographical region, using the minimally aggregated analysis grouping defined above, as a random effect and the country-level proportion of native species as a fixed covariate.

We modeled the two AM scores jointly to account for their residual correlation within respondents and to estimate outcome-specific effects of each construct and covariate within a common model. All continuous response variables, constructs, and covariates were standardized to mean 0 and standard deviation 1 before fitting. *MyGardenOfTrees* participation was retained as a binary indicator and was therefore not standardized.

The model was:

$$y_{ijk} = \mu_k + \sum_{m=1}^{M} \beta_{mk}\, x_{mi} + \sum_{q=1}^{Q} \gamma_{qk}\, c_{qi} + u_{jk} + e_{ijk}, \tag{1}$$

where y_{ijk} is the standardized value of outcome k (general willingness to plant or native species preference) for respondent i in region j; μ_k is the outcome-specific intercept; x_{mi} are the M theory-driven attitudinal constructs with outcome-specific coefficients β_{mk}; c_{qi} are the Q covariates with outcome-specific coefficients γ_{qk}; u_{jk} is a region-level random effect; and e_{ijk} is the residual. The covariates were the proportion of native species, forestry-related experience, education level, and *MyGardenOfTrees* participation.

Region-level random effects were modeled with an unstructured covariance between the two outcomes,

$$\begin{pmatrix} u_{j,\text{planter}} \\ u_{j,\text{nativer}} \end{pmatrix} \sim N\left(\mathbf{0}, \begin{pmatrix} \sigma^2_{u,p} & \sigma_{u,pn} \\ \sigma_{u,pn} & \sigma^2_{u,n} \end{pmatrix}\right), \tag{2}$$

and residuals were modeled with an analogous unstructured covariance within respondents,

$$\begin{pmatrix} e_{i,\text{planter}} \\ e_{i,\text{nativer}} \end{pmatrix} \sim N\left(\mathbf{0}, \begin{pmatrix} \sigma^2_{e,p} & \sigma_{e,pn} \\ \sigma_{e,pn} & \sigma^2_{e,n} \end{pmatrix}\right), \tag{3}$$

allowing correlated region effects and correlated residuals across the two AM scores.

Overall fixed effects were evaluated using conditional Wald F-tests jointly across the two outcomes. We additionally examined the outcome-specific coefficient estimates and their standard errors to determine the direction and magnitude of associations with general willingness to plant and native species preference. Region-level random effects were extracted as best linear unbiased predictors (BLUPs), representing each region's deviation on each outcome after accounting for all fitted constructs and covariates, and were mapped to visualize residual geographic variation.

Species preferences across regions

To examine how species preferences varied with species origin, we analyzed respondent–species decisions for the 30 predefined tree species. Responses "Yes in pure stocks", "Yes in mixed stocks", and "Yes, but sporadically" were coded as positive planting preferences (1), whereas "No" was coded as negative preferences (0); non-evaluative and missing responses were excluded. The primary analysis was restricted to forestry practitioners, using the same respondent classification and regional grouping as in the AM attitude model. Respondents who completed the practitioner-specific questions before subsequently identifying as researchers ($n = 22$) were retained in the forestry-practitioner group, and regions represented by fewer than three forestry practitioners were excluded.

For each respondent–species combination, species origin was classified from country-level nativeness information (Table S4) as locally native, European-native outside its local range, or non-European. We fitted a binomial mixed-effects model with a logit link in ASReml-R (v4.2)[Butler et al., 2023], with origin status as a fixed effect and respondent, region, species, and region-by-species combination as random effects. The overall effect of origin was evaluated using a conditional Wald F-test, and model-adjusted probabilities were obtained by back-transforming predictions from the logit scale.

To test whether responses to species origin differed between forestry practitioners and researchers, we fitted the same model to both groups, adding respondent group and its interaction with origin status as fixed effects. Species-specific deviations and geographical predictions were derived from the forestry-practitioner model as described in Supplementary Methods 1.1.

Reasons underlying species-specific preferences

For each of the 30 predefined species, respondents could select multiple reasons for favorable and unfavorable planting evaluations. We treated the seven reasons accompanying favorable evaluations as perceived benefits and the seven accompanying rejections as perceived concerns. For each respondent–species combination, we counted the number of selected reasons and summarized their distribution and the proportions of evaluations accompanied by one or multiple reasons. We also summed selections of each reason overall and by species to characterize the composition of perceived benefits and concerns.

We compared forestry practitioners and researchers for each reason separately. For benefits, analyses were restricted to favorable respondent–species evaluations; for concerns, they were restricted to unfavorable evaluations. Selection of a given reason was coded as a binary response (1 = selected, 0 = not selected). We fitted binomial mixed-effects models with a logit link in ASReml-R (v4.2)[Butler et al., 2023], with respondent group as a fixed effect and random intercepts for respondent, region, and species. Respondent groups were defined using the same classification as in the species-preference analysis, including respondents who completed the practitioner-specific questionnaire before subsequently identifying as researchers in the forestry-practitioner group. Regions were defined using the same geographical grouping and minimum representation criterion as in the species-preference model. Model-adjusted probabilities of selecting each reason were estimated for both respondent groups, and differences were evaluated using Wald contrasts on the logit scale.

Finally, we examined geographical variation in two concerns that were common across a broad range of species: susceptibility of the planted species to disease and the risk of importing pests and pathogens. For each concern, we considered only unfavorable respondent–species evaluations and coded whether the reason was selected as a binary response. We fitted binomial mixed-effects models with geographical group as a fixed effect and random intercepts for respondent and species. The overall geographical effect was evaluated by likelihood-ratio comparison with a model omitting geography. Raw percentages by geographical group were used to describe the direction and magnitude of supported geographical differences.

Data availability

The questionnaire did not request directly identifying information as part of the core survey. However, LimeSurvey recorded IP addresses, and respondents could optionally provide a *MyGardenOfTrees* garden ID (G07Q33) or an email address if they wished to receive information about the survey results (G09Q27). Before public release, these fields were further de-identified by replacing their original values with consistent dummy identifiers. Identical original values were assigned identical dummy values so that the duplicate-screening and data-cleaning procedures remain fully reproducible without disclosing personal information. The de-identified raw survey data, manually curated translations and recodings of non-English and free-text responses, and data describing the nativeness of the 30 predefined and respondent-suggested tree species across countries and forest types are available at `https://github.com/kcsillery/TAMERS`.

Code availability

All custom-developed R scripts are available on `https://github.com/kcsillery/TAMERS`.

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Author contributions

K.C. conceptualized the research and administered the project. K.C., T.S., and D.M.S. designed the questionnaire with input from all authors. D.M.S. and T.S. implemented the questionnaire. D.M.S., A.D., and K.C. disseminated the questionnaire. K.C. and A.D. led data curation and formal analyses, and created the visualizations. A.D. drafted the original manuscript with support from K.C. K.C. and T.S. acquired funding. All authors contributed to reviewing and editing the manuscript.

Ethics and informed consent

Before participation, respondents were provided with information about the purpose of the study, the participating institutions, the intended use of the research findings, and the treatment of survey responses as anonymous. Participation was voluntary, and informed consent was obtained from all respondents included in the analysis; responses for which consent was not provided were excluded. No sensitive personal data were collected, and participants contributed in a professional capacity. Data were handled in accordance with the General Data Protection Regulation (GDPR) and applicable national data-protection guidelines.

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Competing interests

The authors declare no competing interests.

Tables

Table 1: Theory-driven composite constructs used in the analyses. Constructs were defined *a priori* from the study hypotheses and operationalized as transparent composite indices rather than latent psychometric scales. Higher values always indicate a stronger expression of the construct described in the final column.

Domain	**Construct**	**Conceptual definition**	**Survey indicators**	**Scoring rule and interpretation**
Experience	Climate-change disturbance experience	Breadth of direct experience with climate-related forest impacts.	Observed disturbances in the respondent's reference forest (plus coded free-text responses).	Sum of reported disturbance types (excluding "None of the above"). Higher values indicate broader experience with climate-related disturbances.
	Adaptive management strategy	Whether adaptive management primarily targets forest composition or immediate threats.	Forest management actions implemented to adapt forests to climate change.	Mean(tree- and forest-modifying actions) − mean(threat-control actions). Negative values indicate emphasis on controlling pests, pathogens and browsing; positive values indicate emphasis on modifying forest composition, regeneration and silviculture.
	Assisted gene flow readiness (native species)	Degree of practical experience introducing reproductive material from native species.	Current planting practices.	0 = natural regeneration only; 1 = same region of provenance; 2 = different region of provenance. Higher values indicate greater assisted gene flow readiness.
	Assisted gene flow readiness (non-native species)	Degree of practical experience introducing reproductive material from non-native species.	Current planting practices.	Calculated identically to the native-species index.
	Barrier orientation	Whether barriers are perceived mainly as practical or institutional.	Barriers to introducing forest reproductive material.	Mean(institutional barriers) − mean(local implementation barriers). Respondents reporting no barriers, no experience, ethical concerns or preference for local material were assigned 0. Negative values indicate practical barriers; positive values indicate legislative or institutional barriers.
Knowledge	Eco-evolutionary knowledge	Knowledge of evolutionary and ecological processes relevant for forest adaptation.	Recognition of ecological and evolutionary concepts.	Sum of selected concepts. Higher values indicate greater eco-evolutionary knowledge.
	Information-source level	Extent to which respondents rely on evidence-based information sources.	Information sources used for adaptive forest management.	Weighted sum: none/own experience = 0, non-specialized media = 1, local professional sources = 2, institutional sources = 3, scientific journals = 4. Higher values indicate greater reliance on evidence-based information.
	Knowledge-transfer preference	Perceived need for improving communication between science and practice.	Suggested measures to improve knowledge exchange.	Sum of selected knowledge-transfer measures (researcher–practitioner collaboration, workshops, training and written communication). Higher values indicate stronger perceived need for knowledge transfer.
Governance	Management goal preference	Relative preference for conservation versus production objectives.	Desired forest management goals.	Mean(conservation goals) − mean(production goals). Negative values indicate stronger production orientation; positive values indicate stronger conservation orientation.
	Policy urgency	Perceived need for additional policy support for climate adaptation.	Agreement with current adaptation policies.	Reverse of the mean agreement that current EU and national policies sufficiently support adaptation. Higher values indicate greater perceived policy urgency.
	Support philosophy	Preferred philosophy for supporting adaptive forest management.	Preferred support measures.	Mean(education and collaboration) − mean(professional autonomy, financial incentives and legislative change). Negative values indicate preference for structural or legislative interventions; positive values indicate preference for capacity building through education and collaboration.

Table 2: Fixed effects from the bivariate mixed-effects model of general willingness to plant and native species preference. Continuous predictors and both response variables were standardized prior to analysis. Constructs are defined in Table 1. The proportion of native species indicates the proportion out of the 30 pre-defined species in the respondent's country (see Table S4); participation in the assisted migration experiment, MyGardenOfTrees, was binary and represents the adjusted difference between participants and non-participants. Outcome-specific P-values are based on the coefficient estimate relative to its standard error; joint P-values are from conditional Wald tests across both outcomes. Significant effects ($P < 0.05$) are shown in bold.

	General willingness to plant		Native species preference		Joint
Variable	β (SE)	P	β (SE)	P	P
Theory-driven constructs					
Climate-change disturbance experience	**0.096 (0.047)**	**0.040**	0.017 (0.044)	0.700	0.067
Adaptive management strategy	-0.054 (0.046)	0.247	0.001 (0.044)	0.978	0.479
Barrier orientation	0.060 (0.045)	0.184	0.012 (0.043)	0.787	0.314
Eco-evolutionary knowledge	-0.010 (0.047)	0.827	**0.109 (0.044)**	**0.013**	**0.039**
Information-source level	0.057 (0.049)	0.241	0.046 (0.046)	0.315	0.173
Knowledge-transfer preference	0.015 (0.048)	0.753	0.052 (0.045)	0.250	0.397
Management goal preference	-0.086 (0.046)	0.061	**0.119 (0.043)**	**0.006**	**0.014**
Policy urgency	-0.030 (0.046)	0.517	0.038 (0.043)	0.382	0.635
Support philosophy	-0.045 (0.046)	0.328	0.075 (0.044)	0.086	0.210
Covariates					
Proportion of native species	0.082 (0.069)	0.235	**0.241 (0.077)**	**0.002**	**0.002**
Forestry experience	-0.057 (0.045)	0.211	0.034 (0.042)	0.423	0.421
Education	0.090 (0.046)	0.050	0.023 (0.043)	0.601	0.071
MyGardenOfTrees participation	0.126 (0.108)	0.244	**-0.260 (0.102)**	**0.011**	**0.038**

Table 3: **Differences in species preferences between forestry practitioners and researchers.** Model-adjusted probabilities of positive planting preference were obtained from the mixed-effects model including the interaction between species origin and respondent group. Differences are expressed as researcher minus forestry-practitioner percentage points; P-values are from pairwise Wald contrasts on the logit scale.

Species origin	Forestry practitioners (%)	Researchers (%)	Difference (pp)	P
Locally native	85.5	89.7	4.2	0.039
European, locally non-native	60.7	55.4	−5.2	0.383
Non-European	41.6	30.2	−11.4	0.009

Figures

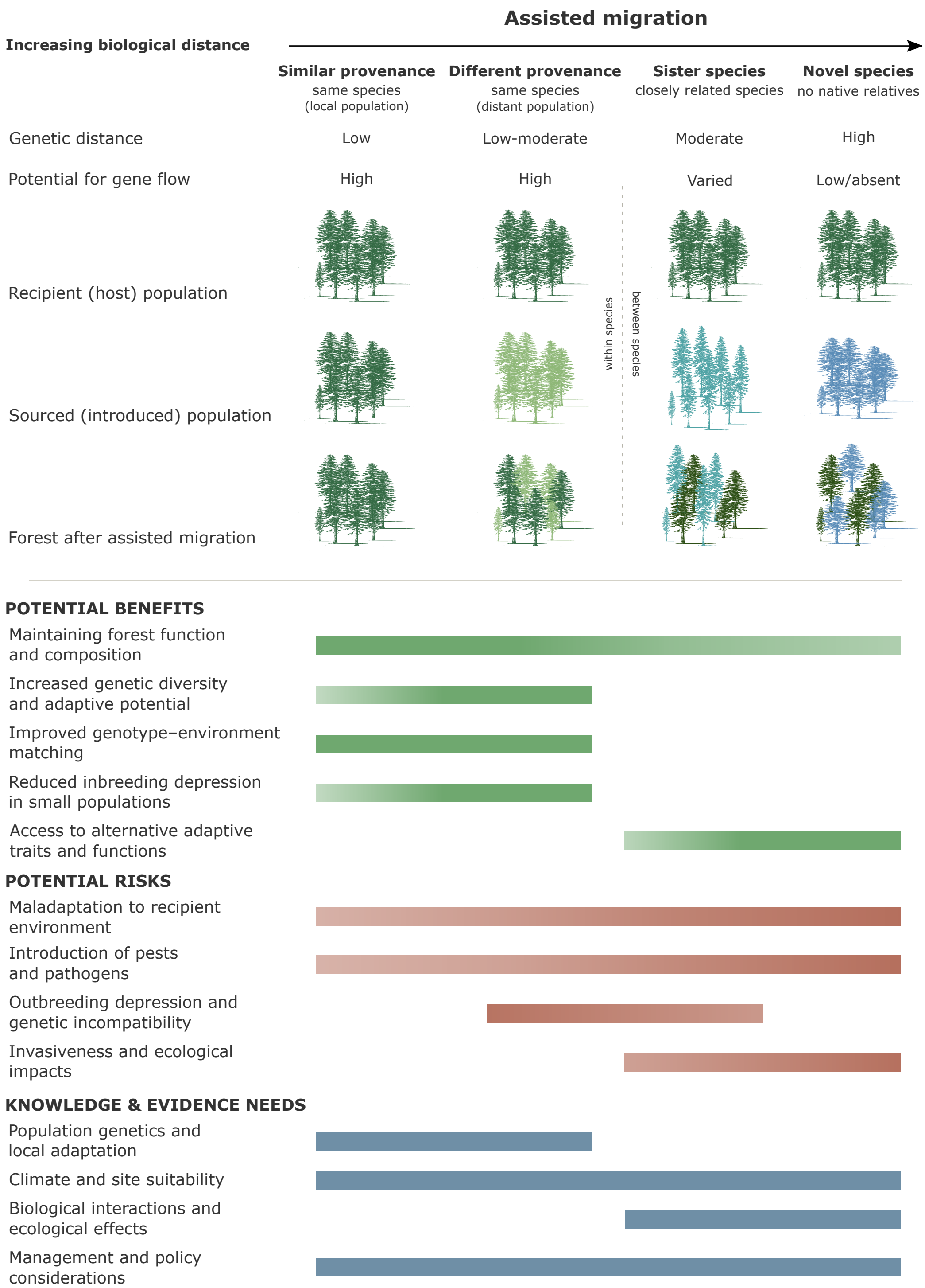

Figure 1: **Conceptual framework of assisted migration (AM) strategies for forest trees.** AM is represented as a continuum of increasing genetic distance, from the movement of provenances within species to the introduction of sister or novel species. Potential benefits, risks, and knowledge needs summarize major considerations identified in the literature [Williams and Dumroese, 2013, Aitken and Bemmels, 2016, Xu and Prescott, 2024]. Bar positions and gradients indicate relevance of considerations rather than quantitative estimates. Absence of a bar indicates that a consideration is not a primary emphasis of a scenario, not necessarily its absence.

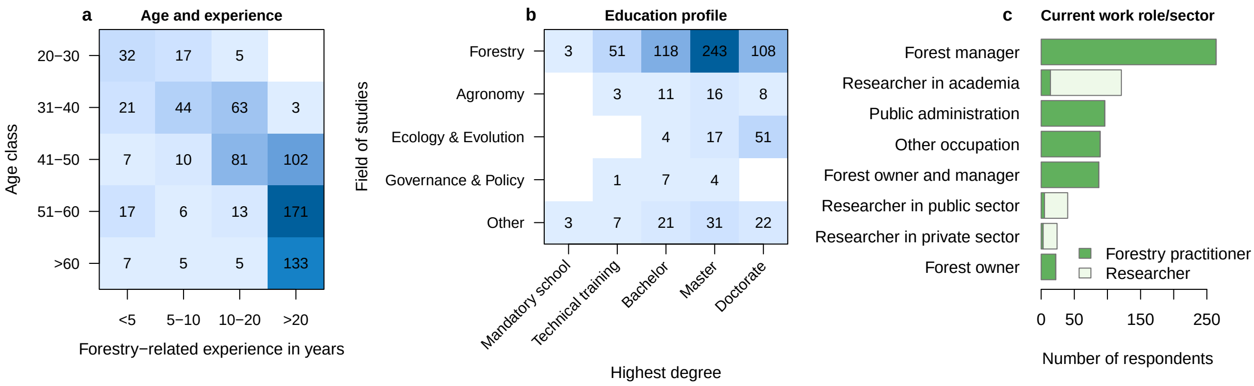

Figure 2: **Respondent demographic and professional profile.** (a) Cross-tabulation of respondent age class and years of forestry-related experience. (b) Cross-tabulation of the field of highest degree and the highest educational qualification. Cell values indicate the number of respondents in each category combination. (c) Distribution of current work role/sector. Research-related occupational categories ("Private", "Not-for-profit", and "Consulting") were combined into a single category ("Researcher in private sector"). Respondents used in the models, including forestry professionals, are indicated in dark green.

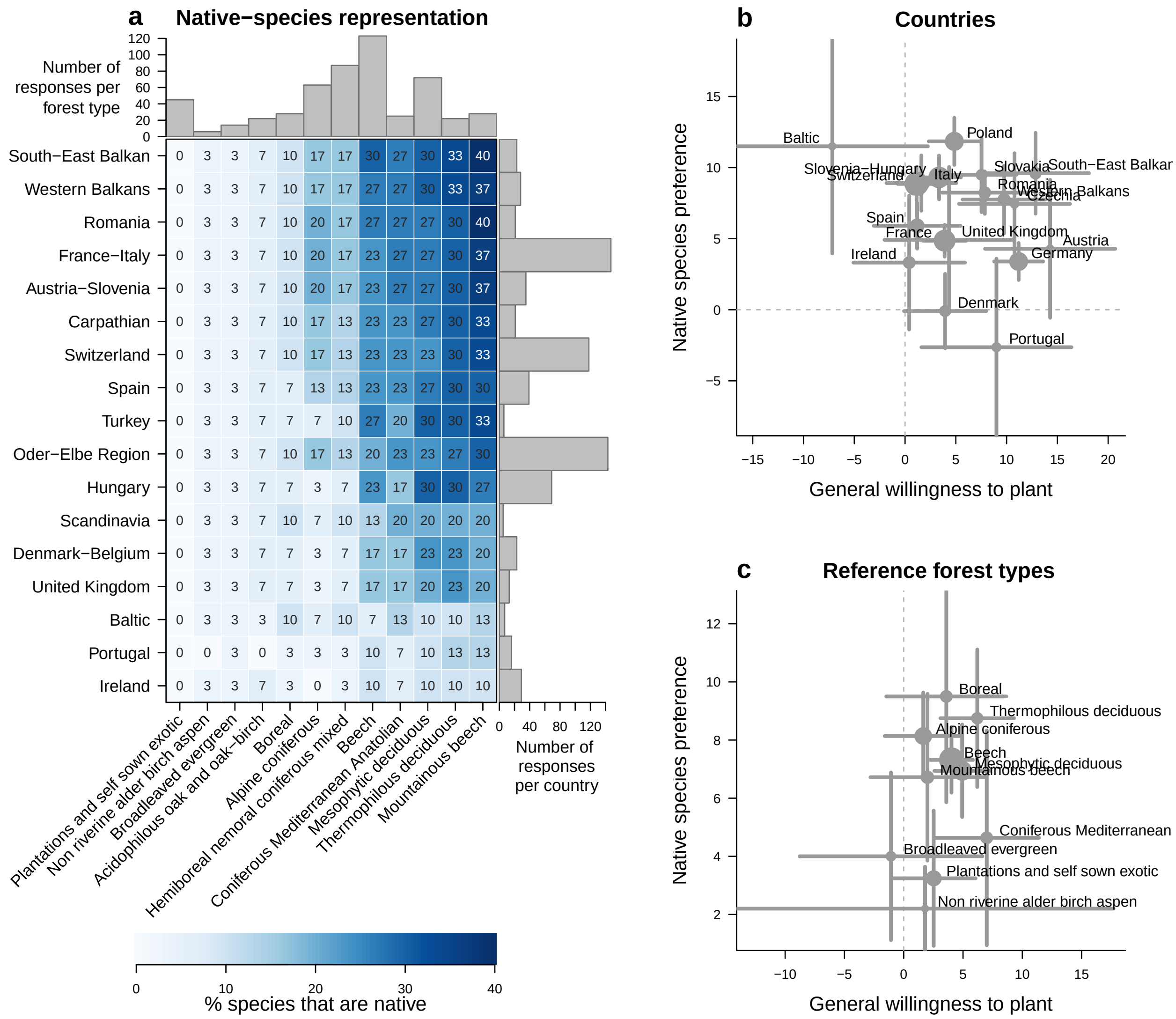

Figure 3: **Sample size, nativeness of the proposed 30 forest tree species across countries and regions, and forest types, and the AM attitude scores.** (a) Percentage of the 30 tree species included in the survey that are both native to a given country and associated with a given forest type across the forest types. Heatmap cells indicate the percentage of the 30 species that were both native to the country and associated with the respective forest type. Darker colors indicate higher proportions of native species. Marginal barplots show the number of respondents selecting each forest type (top) and the number of respondents per country or region (right). Some countries have been grouped into regions based on identical or highly similar native species lists when sample sizes were small (Fig. S3). Forest types are ordered from lower to higher average nativeness across countries, and countries from lower to higher average nativeness across forest types. The figure reflects species nativeness and forest type associations independently and does not indicate whether a given forest type is actually present within a country. (b) The two AM attitude scores – general willingness to plant and Native species preference – of the respondents by country or region, and (c) by forest type. The native species preference is adjusted for the proportion of the proposed 30 species' nativeness to the respondent's country.

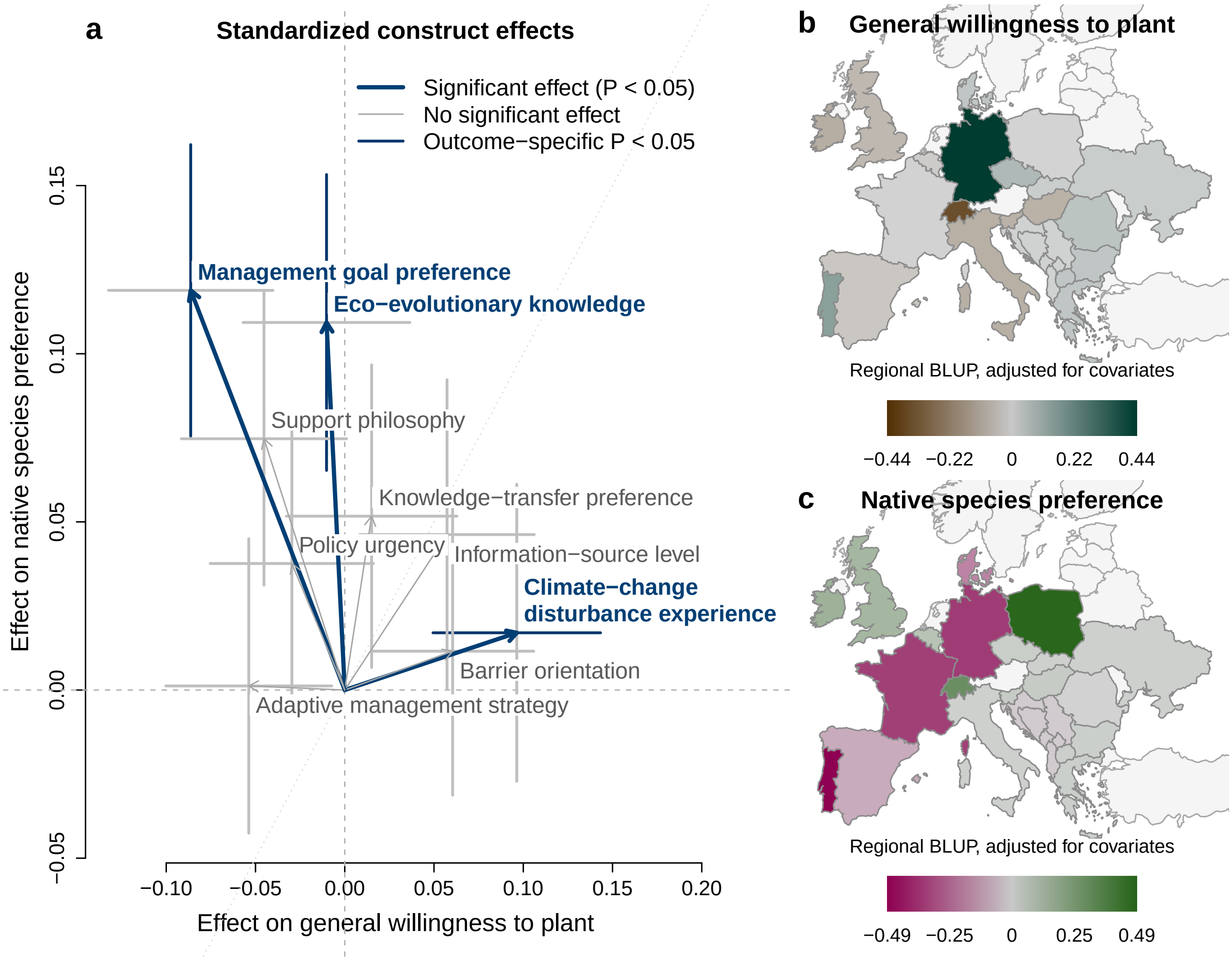

Figure 4: **Bivariate linear mixed-effects model to understand the effect of constructs and regions on the two acceptance scores: general willingness to plant and native species preference of foresters**. (a) Standardized effects of constructs. Arrows indicate the direction and magnitude of the estimated effects, with horizontal and vertical bars showing the standard error for each response. Blue arrows indicate constructs with a statistically supported overall association with the two outcomes (conditional Wald test, ($P < 0.05$); constructs with statistical support for an individual outcome only are indicated separately. Grey arrows indicate non-significant constructs. Continuous explanatory variables and both response variables were standardized before analysis. Positive values indicate increased planting acceptance or stronger preference for native species, respectively. (b, c) Regional best linear unbiased predictions (BLUPs) after accounting for all fixed effects. Colors indicate standardized regional deviations from the overall fitted mean, with positive values representing higher and negative values lower values of the respective outcome. Countries that did not have sufficient data to estimate their BLUPs are colored in white. See Table S5 for estimates and z-scores for each country.

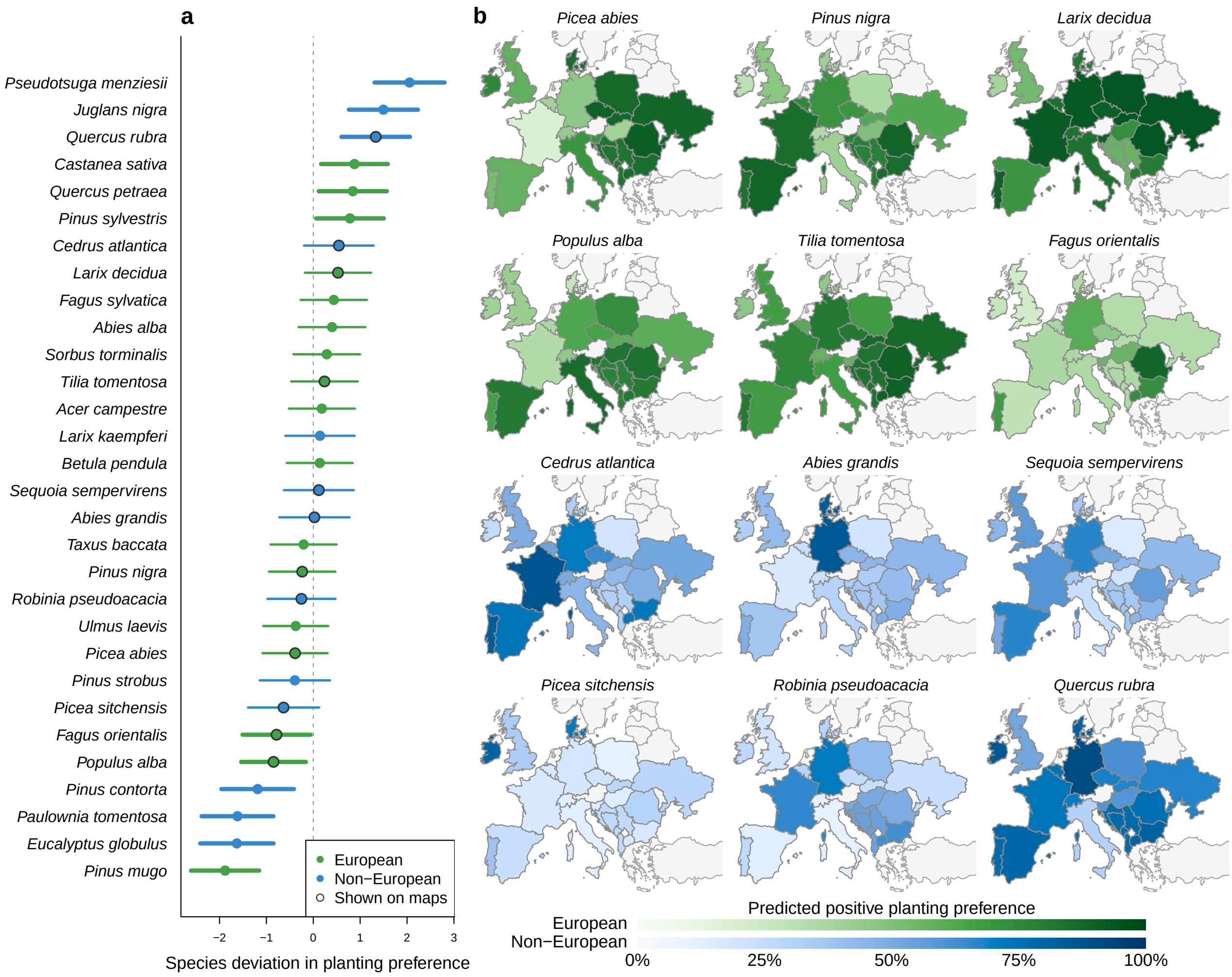

Figure 5: **Species preferences vary among species and geographically across Europe.** **a**, Species-specific deviations in planting preference estimated from the forestry-practitioner mixed model after accounting for species origin and geographical effects. Points show species random effects on the log-odds scale and lines their approximate 95% intervals; thicker lines indicate intervals excluding zero. Green and blue distinguish species native to at least part of Europe and non-European species, respectively, and open circles identify the species shown in panel **b**. **b**, Predicted probabilities of positive planting preference for selected species across European countries. Predictions combine the fitted effects of species origin, region, species, and region-by-species combination, with the respondent effect set to zero. Species origin was defined at the country level, so predictions can differ among countries within the same region according to local nativeness. The first two rows show European species and the last two rows non-European species; green and blue gradients, respectively, indicate predicted probabilities on a common 0–100% scale. Countries without model predictions are shown in grey.

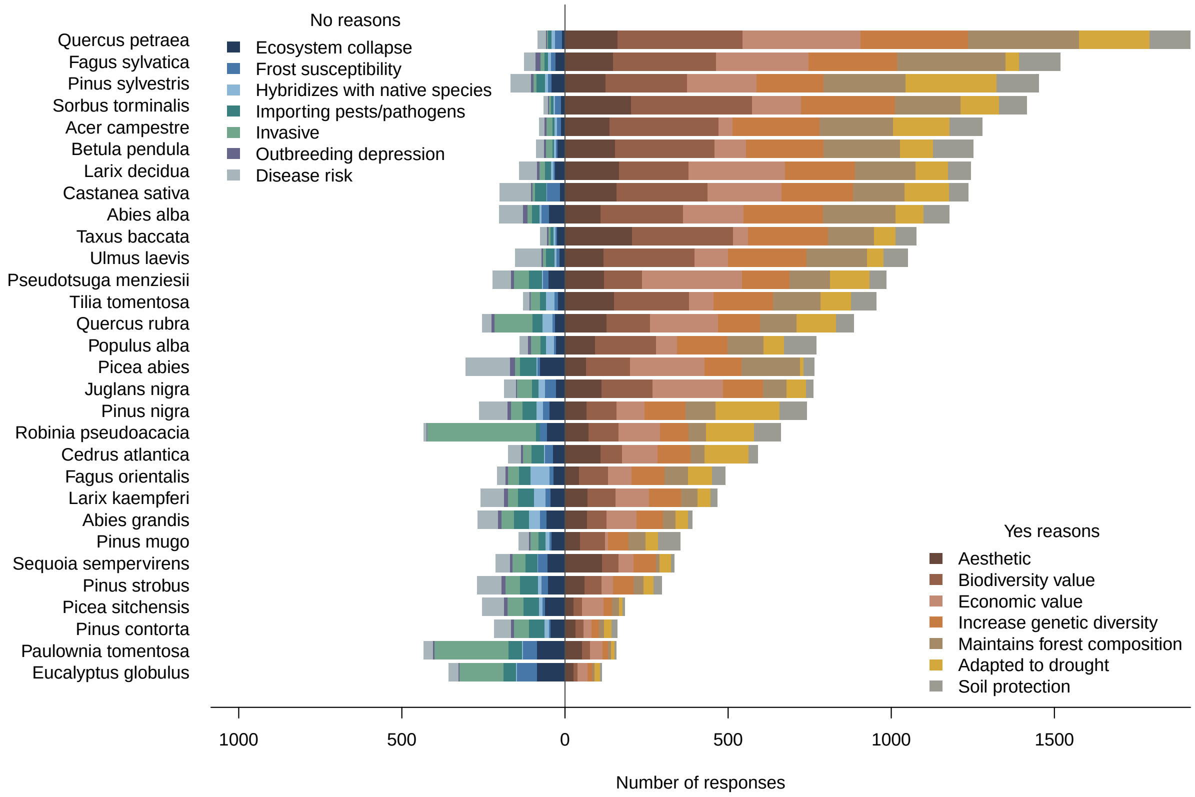

Figure 6: **Reasons underlying species-specific planting decisions.** Number of times respondents selected different reasons for accepting (right) or rejecting (left) each of the 30 tree species proposed in the survey. Bars are stacked by reason, and species are ordered by the total number of reasons reported. Respondents could select multiple reasons for each species.

Supporting Information for

Climate change experience, knowledge and management goals shape native and non-native tree species choices among European foresters

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Supplementary Tables

Table S1: **Questionnaire items and response formats.** Questions are shown in the order presented. The informed consent and administrative screens are omitted. Conditional questions were displayed according to respondents' previous answers. For matrix questions, the response-options column lists both the evaluated items and the response scale. SC = single choice; MR = multiple response; M = matrix; R = rating scale; LWC = list with comment; FT = free text.

QID	Question	Response options / subitems	Format
Respondent characteristics			
G01Q01	Please select the country where you work.	Austria; Albania; Belgium; Bosnia & Herzegovina; Bulgaria; Croatia; Cyprus; Czechia; Denmark; Estonia; Finland; France; Georgia; Germany; Greece; Hungary; Ireland; Italy; Kosovo; Latvia; Liechtenstein; Lithuania; Luxembourg; Malta; Moldova; Monaco; Montenegro; Netherlands; North Macedonia; Norway; Poland; Portugal; Romania; Serbia; Slovakia; Slovenia; Spain; Sweden; Switzerland; Turkey; Ukraine; United Kingdom.	SC
G01Q02	How old are you?	< 20; 20–30; 31–40; 41–50; 51–60; > 60.	SC
G01Q03	What is your highest degree (irrespective of the field of education)?	Completed mandatory school; Technical training/apprenticeship (2–3 years); Bachelor (or equivalent 3–4 year university degree); Master; Doctorate.	SC
G01Q04	What is the field of your highest degree?	Forest technician; Forestry; Agronomy/Agricultural Sciences; Ecology/Evolution; Public Administration; Other.	SC
G01Q05	Is your primary occupation related to:	Forestry sector; Research; Other.	SC
G01Q06	If in research. What is your work sector?	Private; Not-for-profit; Consulting; Academia; Government. *Shown to respondents selecting Research in G01Q05.*	SC
G01Q66	If you work in forestry, are you:	A forest owner; A forest manager; A forest administrator; Both forest owner and manager. *Shown to respondents selecting Forestry sector in G01Q05.*	SC
G01Q07	Please select the range that corresponds to your years of working experience in forestry (practice or research).	< 5; 5–10; 10–20; > 20 years.	SC
Defining the reference forest			

Continued on next page

Table S1 continued

QID	Question	Response options / subitems	Format
G02Q001	Please indicate which forest(s) you will be considering when you reply to the survey.	I own or manage a forest, so I will be thinking of the forest(s) I own or manage; I work in forest administration and I will be thinking of the forests of my region as a whole; I do not have any particular relationship with specific forests but I can think about a forest type in my country (e.g. because I am a researcher).	SC
G02Q30	Please select to which forest category your reference forest mainly belongs.	Twelve forest categories based on the European Environment Agency classification (Table S2), plus "None applies or do not know". *Shown to respondents referring to an owned/managed forest or forests within their administrative region.*	SC
G02Q31	Please select to which forest category the reference forest you will be thinking about when replying to this survey mainly belongs.	The same twelve European Environment Agency forest categories (Table S2). *Shown to respondents without a particular relationship to a specific forest.*	SC
Experience and forest reproductive material			
G02Q01	I observed the following events increasing in my reference forest in the past years.	Storm damage; Drought related stress; Pathogen damage; Bark beetle outbreaks; Fires that can be easily controlled; Fires that are difficult to control; Amount of dead wood; Crown decline; None of the above; Other.	MR
G02Q02	Please select all forest management actions you have conducted so far in your reference forest to adapt or mitigate the negative effects of climate change.	Forest rejuvenation by planting seedlings in general; Planting individuals of existing species but different provenances to increase genetic diversity; Young forest management (management of natural regeneration); Increasing structural diversity; Increasing the resistance of individual trees to disturbances; Reducing the rotation period or target diameter through forestry early utilization; Monitor and control pests and pathogens; None of the above; Other.	MR
G02Q03a	Which of the following forest reproductive material sources have you used?	*Items:* Natural regeneration (autochthonous); Forest reproductive material originating in the same region of provenance as the reference forest; Forest reproductive material originating in a different region of provenance. *For each item:* Native species — Yes/No; Non-native species — Yes/No.	M

Continued on next page

Table S1 continued

QID	Question	Response options / subitems	Format
G02Q04	If you used native species reproductive material originating in a different region of provenance: what was your overall experience? Please provide details about the regions of provenance you have sourced from.	Mainly positive; Mainly negative; optional free-text comment. *Shown when use of native reproductive material from a different provenance was reported.*	LWC
G02Q05	If you used reproductive material from non-native species: what was your overall experience? Please provide details about the region of provenance of these non-native species.	Mainly positive; Mainly negative; optional free-text comment. *Shown when use of non-native reproductive material was reported.*	LWC
G02Q06	If you tried to introduce forest reproductive material not coming from natural regeneration, in your reference forest in the past, what challenges or barriers have you experienced?	Lack of available forest reproductive material from different regions of provenance; High costs associated with tree planting; Lack of knowledge on appropriate regions of provenance from which to select forest reproductive material; Legislative barriers; I have never tried introducing new forest reproductive material; Other.	MR
Knowledge and information			
G03Q01	Please indicate if you agree or not with the following statement.	*Statement:* "I feel well informed about the threats climate change is imposing on my reference forest." Responses: Yes; Uncertain; No.	M
G03Q02	I feel well informed about how the following topics can affect forest management decisions.	*Topics:* Species; Provenance; Hybrid; Genetic diversity; Local adaptation; Gene flow. *For each topic:* Yes; Uncertain; No.	M
G03Q04	Which source(s) of information related to adaptive forest management do you use (mark all that apply)?	Internet (i.e. social media such as LinkedIn); Reports or news blogs from forest associations; Scientific forestry journals; Advice from government extension agencies/researchers; Government reports; Radio programmes; Advice from other foresters/forest owners; None of the above; Other.	MR
G03Q03	In your opinion, which of the following aspects will help improve our knowledge about potential adaptive forest management strategies?	More or improved communication between researchers and foresters via written media (i.e. magazines, social media posts); Increase events where researchers and foresters can exchange (i.e. workshops); Increase formal and informal training opportunities; Improved collaboration between academic researchers and practitioners; Other.	MR
Tree-species selection			

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Table S1 continued

QID	Question	Response options / subitems	Format
G06Q02d	Would you plant or continue to plant the following coniferous species in your reference forest?	Fifteen predefined coniferous species (Table S4) and an *Other* species field. For each species, *Your choice*: “Yes in pure stocks”; “Yes in mixed stocks”; “Yes, but sporadically”; “No”; “Not applicable for my reference forest”; “I don’t know”. Respondents could additionally select multiple predefined reasons under *why yes* and *why no*.	M
G06Q03d	Would you plant the following broadleaved species in your reference forest?	Fifteen predefined broadleaved species (Table S4) and an *Other* species field. For each species, *Your choice*: “Yes in pure stocks”; “Yes in mixed stocks”; “Yes, but sporadically”; “No”; “Not applicable for my reference forest”; “I don’t know”. Respondents could additionally select multiple predefined reasons under *why yes* and *why no*.	M
Planning and legal aspects			
G05Q01	How is forest management organized in the country where you work?	Rather centralized (decisions are largely made at the central, national level); Rather decentralized (forests are managed at a local level and owners have relative freedom to decide); I do not know.	SC
G05Q00	Which goals do you think should be pursued when managing a forest (1 = not important, 5 = highly important)?	*Goals:* Maximize production of wood for material use; Maximize carbon sink capacity; Maximize recreational use; Maximize biodiversity; Maximize production of energy and industrial wood (i.e. pulp); Maximize forests’ protective capacity towards natural hazards; Maximize forests’ provision of drinking water. Each rated from 1 (not important) to 5 (highly important).	R
G05Q02	Do you agree with the following statements (1 = strongly disagree, 5 = strongly agree)?	*Statements:* The national government is doing enough to support forest adaptation to climate change; The EU is doing enough to support forest adaptation to climate change; Current national policies support the introduction of species from different regions of provenance for the adaptation of forests to climate change; National policies should only support natural regeneration as a strategy to adapt forests to climate change. Each rated from 1 (strongly disagree) to 5 (strongly agree).	R
G05Q03	Which of the following measures would more effectively support the adaptation of forests to climate change, in the country where you work?	Monetary incentives (i.e. subsidies and/or tax deductions); Public support for increased forester–researcher collaboration; Changing legislation concerning forest reproductive material from different provenances and species; None of the above; Other.	MR
End questions			

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Table S1 continued

QID	Question	Response options / subitems	Format
G10Q35	Are you a member of an existing research project/network or have you ever participated in research? If yes, please provide details in the comment box.	Yes; No; optional free-text comment.	LWC
G07Q32	Please mark which of the following applies to you.	I am a *MyGardenOfTrees* participant; I help to collect data from a micro-garden of the *MyGardenOfTrees* project; I have been approached by a recruiter of *MyGardenOfTrees*, but I am not a participant; I have never been approached.	SC
G07Q33	If yes, please provide your garden ID.	Free-text garden identifier. *Displayed conditionally following the relevant MyGardenOfTrees response.*	FT
G10Q36	Please tell us how did you hear about the survey?	Free text.	FT
G09Q27	If you would like to be informed, via Email, about the results of this survey please enter your Email address in the comment box.	Email address (free text).	FT

Table S2: Forest categories provided for respondents to select from in the question G02Q31 "Please select to which forest category the reference forest you will be thinking about when replying to this survey mainly belongs". The forest types and their definitions have been extracted from Barbati et al. [2006]. Respondents were limited to one choice and the definitions were provided upon hover.

Forest type	**Definition provided**
Boreal forest	Spruce and spruce-birch boreal forest, Pine and pine-birch boreal forest
Hemiboreal forest and nemoral coniferous and mixed broadleaved coniferous forest	Hemiboreal forest, Nemoral Scots pine forest, or, spruce forest, or Black pine forest, Mixed Scots pine-birch or oak forest
Alpine coniferous forest	Subalpine larch-arolla pine and dwarf pine forest, Subalpine and mountainous spruce and mountainous mixed spruce-silver fir forest, Alpine Scots pine and Black pine forest
Acidophilous oak and oak birch forest	Acidophilous oakwood, Oak-birch forest
Mesophytic deciduous forest	Pedunculate oak–hornbeam forest, Sessile oak–hornbeam forest, Ashwood and oak-ash forest, Maple-oak forest, Lime-oak forest, Maple-lime forest, Lime forest, Ravine and slope forest, Other mesophytic deciduous forests
Beech forest	Lowland beech forest of southern Scandinavia and north central Europe, Atlantic and subatlantic lowland beech forest, Subatlantic submountainous beech forest, Central European submountainous beech forest, Carpathian submountainous beech forest, Illyrian submountainous beech forest, Moesian submountainous beech forest
Mountainous beech forest	South western European mountainous beech forest, Central European mountainous beech forest, Apennine-Corsican mountainous beech forest, Illyrian mountainous beech forest, Carpathian mountainous beech forest, Moesian mountainous beech forest, Crimean mountainous beech forest, Oriental beech and hornbeam-oriental beech forest
Thermophilous deciduous forest	Downy oak forest, Turkey oak, Hungarian oak and Sessile oak forest, Pyrenean oak forest, Portuguese oak and Mirbeck's oak Iberian forest, Macedonian oak forest, Valonia oak forest, Chestnut forest

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Table S2 – continued from previous page

Forest type	Definition provided
Broadleaved evergreen forest	Mediterranean evergreen oak forest, Olive-carob forest, Palm groves, Macaronesian laurisilva
Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	Mediterranean pine forest, Mediterranean and Anatolian Black pine forest, Canarian pine forest, Mediterranean and Anatolian Scots pine forest, Alti-Mediterranean pine forest, Mediterranean and Anatolian fir forest, Juniper forest, Cypress forest, Cedar forest, Tetraclinis articulata stands, Mediterranean yew stands
Non riverine alder, birch, or aspen forest	Alder forest, Italian alder forest, Boreal birch forest, Southern boreal birch forest, Aspen forest
Plantations and self sown exotic forest	Plantations of site-native species, Plantations of not-site-native species and self-sown exotic forest (Robinia, Eucalyptus, Picea sitchensis, Pinus contorta, Pseudotsuga menziesii, Ailanthus altissima, Prunus serotina)

Table S3: Definitions regarding forest reproductive material sources provided to the participants alongside the answers to question G02Q03a, "Which of the following forest reproductive material sources have you used?"

Provided option	**Definition**
Natural regeneration	Autochthonous
Forest reproductive material originating in the same region of provenance as your reference forest	Planting using indigenous material
Forest reproductive material originating in a different region of provenance to the one of your reference forest	Typically another country or several hundreds of km away

Table S4: List of 30 species proposed in the questionnaire by default and species proposed by the respondents that they would plant in their reference forest, and the nativeness status of these species per country. 1 means native and 0 means non-native. We classified species as native or non-native based on species-distribution information from EUFORGEN, Caudullo et al. [2017] and the Royal Botanic Gardens (Kew) database, supplemented by additional species-specific sources where necessary.

Species	**Albania**	**Austria**	**Belgium**	**Bosnia & Herzegovina**	**Bulgaria**	**Croatia**	**Czechia**	**Denmark**	**Finland**	**France**	**Germany**	**Greece**	**Hungary**	**Ireland**	**Italy**	**Kosovo**	**Latvia**	**Montenegro**	**North Macedonia**	**Norway**	**Poland**	**Portugal**	**Romania**	**Serbia**	**Slovakia**	**Slovenia**	**Spain**	**Sweden**	**Switzerland**	**Turkey**	**Ukraine**	**United Kingdom**
Proposed by default																																
Abies alba	1	1	0	1	1	1	1	0	0	1	1	1	0	0	1	1	0	1	1	0	1	0	1	1	1	1	1	0	1	0	1	0
Acer campestre	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1
Betula pendula	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Castanea sativa	1	0	0	1	1	1	0	0	0	1	0	1	1	0	1	1	0	1	1	0	0	1	0	1	0	1	1	0	1	1	0	0
Fagus orientalis	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0
Fagus sylvatica	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Larix decidua	0	1	0	0	0	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	1	0	1	0	1	1	0	0	1	0	1	0
Picea abies	1	1	0	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	1	0
Pinus mugo	1	1	0	1	1	1	1	0	0	1	1	1	0	0	1	1	0	1	1	0	1	0	1	1	1	1	1	0	1	0	1	0
Pinus nigra	1	1	0	1	1	1	0	0	0	1	0	1	0	0	1	1	0	1	1	0	0	0	1	1	0	1	1	0	0	1	0	0
Pinus sylvestris	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Populus alba	1	1	0	1	1	1	1	0	0	1	1	1	1	0	1	1	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1	0
Quercus petraea	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Sorbus torminalis	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1
Taxus baccata	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Tilia tomentosa	1	0	0	1	1	1	0	0	0	0	0	1	1	0	0	1	0	1	1	0	0	0	1	1	1	0	0	0	0	1	1	0
Ulmus laevis	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	0	1	1	1	1	1	1	0	1	1	0
Abies grandis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Larix kaempferi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinus strobus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sequoia sempervirens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga menziesii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Continued on next page

Species	Albania	Austria	Belgium	Bosnia & Herzegovina	Bulgaria	Croatia	Czechia	Denmark	Finland	France	Germany	Greece	Hungary	Ireland	Italy	Kosovo	Latvia	Montenegro	North Macedonia	Norway	Poland	Portugal	Romania	Serbia	Slovakia	Slovenia	Spain	Sweden	Switzerland	Turkey	Ukraine	United Kingdom
Cedrus atlantica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea sitchensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinus contorta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Robinia pseudoacacia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quercus rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juglans nigra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paulownia tomentosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus globulus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proposed by the respondents																																
Abies concolor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies nordmanniana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Acer monspeliensis	1	0	0	1	1	1	0	0	0	1	1	1	0	0	1	1	0	1	1	0	0	1	1	1	0	1	1	0	1	1	0	0
Acer opalus	1	0	0	1	0	1	0	0	0	1	1	1	1	0	1	1	0	1	1	0	0	0	0	1	0	1	1	0	1	1	0	0
Acer spicatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Araucaria araucana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calocedrus decurrens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carya spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cedrus libani	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Celtis tournefortii	1	0	0	1	1	1	0	0	0	0	0	1	0	0	1	1	0	1	1	0	0	0	0	1	0	1	0	0	0	1	1	0
Cryptomeria japonica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cupressus sempervirens	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Cupressus sp.	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Eucalyptus nitens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus pennsylvanica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ginkgo biloba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniperus virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Species	**Albania**	**Austria**	**Belgium**	**Bosnia & Herzegovina**	**Bulgaria**	**Croatia**	**Czechia**	**Denmark**	**Finland**	**France**	**Germany**	**Greece**	**Hungary**	**Ireland**	**Italy**	**Kosovo**	**Latvia**	**Montenegro**	**North Macedonia**	**Norway**	**Poland**	**Portugal**	**Romania**	**Serbia**	**Slovakia**	**Slovenia**	**Spain**	**Sweden**	**Switzerland**	**Turkey**	**Ukraine**	**United Kingdom**
Larix x eurolepis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liquidambar spp.	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Liriodendron tulipifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paulownia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinus brutia	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Pinus caribaea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinus ponderosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinus radiata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinus taeda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prunus spinosa	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Quercus castaneifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quercus dalechampii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quercus polycarpa	0	1	0	1	1	1	1	0	0	0	0	1	1	0	0	1	0	1	1	0	0	0	1	1	1	1	0	0	0	1	0	0
Quercus pyrenaica	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
Quercus virgiliana	1	1	1	1	1	1	1	0	0	1	1	1	1	0	1	1	0	1	1	0	0	0	1	1	1	1	1	0	1	1	1	0
Quercus zeen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
Sequoiadendron giganteum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxodium distichum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thuja plicata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tsuga heterophylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tsuga spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ziziphus jujuba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies bornmuelleriana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Abies cephalonica	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies cilicica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Abies equi-trojani	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Abies nebrodensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abies numidica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Species	**Albania**	**Austria**	**Belgium**	**Bosnia & Herzegovina**	**Bulgaria**	**Croatia**	**Czechia**	**Denmark**	**Finland**	**France**	**Germany**	**Greece**	**Hungary**	**Ireland**	**Italy**	**Kosovo**	**Latvia**	**Montenegro**	**North Macedonia**	**Norway**	**Poland**	**Portugal**	**Romania**	**Serbia**	**Slovakia**	**Slovenia**	**Spain**	**Sweden**	**Switzerland**	**Turkey**	**Ukraine**	**United Kingdom**
Abies pinsapo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Acer pseudoplatanus	1	1	0	1	1	1	1	0	0	1	1	1	1	0	1	1	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1	0
Arbutus unedo	1	0	0	1	1	1	0	0	0	1	0	1	0	0	1	1	0	1	1	0	0	1	0	1	0	1	1	0	0	1	0	0
Carpinus spp.	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1
Cornus spp.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Ilex aquifolium	1	1	1	1	1	1	0	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	0	1	0	0	1
Juglans regia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Juniperus communis	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Malus sylvestris	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Picea omorika	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Pinus cembra	0	1	0	1	0	1	1	0	0	1	1	0	0	0	1	1	0	1	1	0	1	0	1	1	1	1	0	0	1	0	1	0
Pinus halepensis	1	0	0	1	0	1	0	0	0	1	0	1	0	0	1	1	0	1	1	0	0	0	0	1	0	1	1	0	0	1	0	0
Pinus nigra salzmannii	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Pinus nigra subsp. laricio	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinus pinaster	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
Pinus pinea	1	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0
Pinus uncinata	0	1	0	0	0	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0
Populus tremula	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Prunus avium	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Quercus cerris	1	1	0	1	1	1	1	0	0	1	0	1	1	0	1	1	0	1	1	0	0	0	1	1	1	1	0	0	1	1	0	0
Quercus pubescens	1	1	1	1	1	1	1	0	0	1	1	1	1	0	1	1	0	1	1	0	0	0	1	1	1	1	1	0	1	1	1	0
Quercus robur	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Quercus spp.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Quercus suber	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
Tilia cordata	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Tilia platyphyllos	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1
Acer platanoides	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0
Acer tataricum	1	1	0	1	1	1	1	0	0	0	0	1	1	0	0	1	0	1	1	0	0	0	1	1	1	1	0	0	0	1	1	0

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Table S4 continued

Species	**Albania**	**Austria**	**Belgium**	**Bosnia & Herzegovina**	**Bulgaria**	**Croatia**	**Czechia**	**Denmark**	**Finland**	**France**	**Germany**	**Greece**	**Hungary**	**Ireland**	**Italy**	**Kosovo**	**Latvia**	**Montenegro**	**North Macedonia**	**Norway**	**Poland**	**Portugal**	**Romania**	**Serbia**	**Slovakia**	**Slovenia**	**Spain**	**Sweden**	**Switzerland**	**Turkey**	**Ukraine**	**United Kingdom**
Alnus glutinosa	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Alnus spp.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Betula celtiberica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1
Betula pubescens	0	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Carpinus betulus	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1
Corylus avellana	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Corylus colurna	1	0	0	1	1	1	0	0	0	0	0	1	0	0	0	1	0	1	1	0	0	0	1	1	0	1	0	0	0	1	0	0
Fraxinus angustifolia	1	1	0	1	1	1	1	0	0	1	0	1	1	0	1	1	0	1	1	0	0	1	1	1	1	1	1	0	0	1	1	0
Fraxinus angustifolia subsp. pannonica	1	1	0	1	1	1	1	0	0	1	0	1	1	0	1	1	0	1	1	0	0	0	1	1	1	1	1	0	0	1	1	0
Fraxinus excelsior	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Fraxinus ornus	1	1	0	1	1	1	1	0	0	0	0	1	1	0	1	1	0	1	1	0	0	0	1	1	1	1	1	0	1	1	0	0
Pyrus spp.	1	1	1	1	1	1	1	0	0	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	0
Quercus faginea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
Quercus frainetto	1	0	0	1	1	1	0	0	0	0	0	1	1	0	1	1	0	1	1	0	0	0	1	1	0	1	0	0	0	1	0	0
Quercus ilex	1	0	0	1	0	1	1	0	0	1	0	1	0	0	1	1	0	1	1	0	0	1	0	1	1	1	1	0	1	1	0	0
Quercus lusitanica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
Quercus palustris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix caprea	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Sambucus spp.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sorbus aria	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	1	1	0	1	1	1	1	1	1	1	0	1	0	0	1
Sorbus aucuparia	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sorbus domestica	1	1	1	1	1	1	1	0	0	1	1	1	1	0	1	1	0	1	1	0	0	0	1	1	1	1	1	0	1	0	1	0
Sorbus montanus	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	1	1	0	1	1	1	1	1	1	1	0	1	0	0	1
Ulmus glabra	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Ulmus minor	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1

Table S5: Regional best linear unbiased predictions (BLUPs) for general willingness to plant and native species preference from the bivariate mixed-effects model. Values represent region-specific deviations from the overall fitted mean after adjustment for the fixed explanatory variables. Standard errors and Wald z-ratios are shown. Bold values indicate regional effects whose approximate 95% interval excludes zero ($|z| > 1.96$).

	General willingness to plant			**Native species preference**		
Region	**BLUP**	**SE**	z	**BLUP**	**SE**	z
Belgium	-0.047	0.230	-0.203	0.162	0.277	0.583
Czechia	0.148	0.208	0.712	0.057	0.240	0.239
Denmark	0.078	0.186	0.418	-0.369	0.211	-1.753
France	-0.010	0.139	-0.075	**-0.332**	**0.155**	**-2.151**
Germany	**0.436**	**0.139**	**3.148**	**-0.343**	**0.150**	**-2.287**
Ireland	-0.198	0.213	-0.930	0.303	0.255	1.185
Italy	-0.192	0.168	-1.145	0.036	0.186	0.196
Poland	0.005	0.141	0.035	**0.480**	**0.152**	**3.155**
Portugal	0.300	0.209	1.434	**-0.493**	**0.246**	**-2.000**
Romania	0.094	0.184	0.510	0.023	0.208	0.112
Slovakia–Ukraine	0.043	0.222	0.195	0.035	0.263	0.134
Slovenia–Hungary	-0.181	0.144	-1.257	0.081	0.162	0.500
South-East Balkan	0.075	0.218	0.344	0.046	0.256	0.181
Spain	-0.068	0.182	-0.376	-0.189	0.202	-0.936
Switzerland	**-0.353**	**0.124**	**-2.840**	**0.282**	**0.135**	**2.081**
United Kingdom	-0.148	0.208	-0.712	0.266	0.242	1.098
Western Balkans	0.018	0.191	0.097	-0.045	0.216	-0.209

Table S6: **Differences between forestry practitioners and researchers in reasons selected for species-specific planting decisions.** Values are model-adjusted probabilities (%) of selecting each reason among positive or negative planting decisions. Differences are expressed as researcher minus forestry-practitioner percentage points. *P*-values are from Wald contrasts on the logit scale.

Decision	Reason	Forestry practitioners (%)	Researchers (%)	Difference (pp)	*P*
No	Ecosystem collapse	5.7	7.7	2.1	0.267
No	Frost susceptibility	2.4	4.5	2.1	0.009
No	Hybridizes with native species	1.5	1.9	0.4	0.395
No	Importing pests/pathogens	2.9	4.5	1.5	0.160
No	Invasive	4.9	8.5	3.6	0.028
No	Outbreeding depression	0.7	1.1	0.4	0.328
No	Disease risk	5.9	7.8	1.9	0.332
Yes	Aesthetic	24.2	21.5	−2.7	0.475
Yes	Biodiversity value	50.6	53.8	3.1	0.444
Yes	Economic value	38.1	43.7	5.6	0.126
Yes	Increase genetic diversity	43.8	37.9	−6.0	0.183
Yes	Maintains forest composition	31.6	32.7	1.1	0.735
Yes	Adapted to drought	17.3	14.6	−2.7	0.226
Yes	Soil protection	13.2	13.3	0.1	0.945

Supplementary Figures

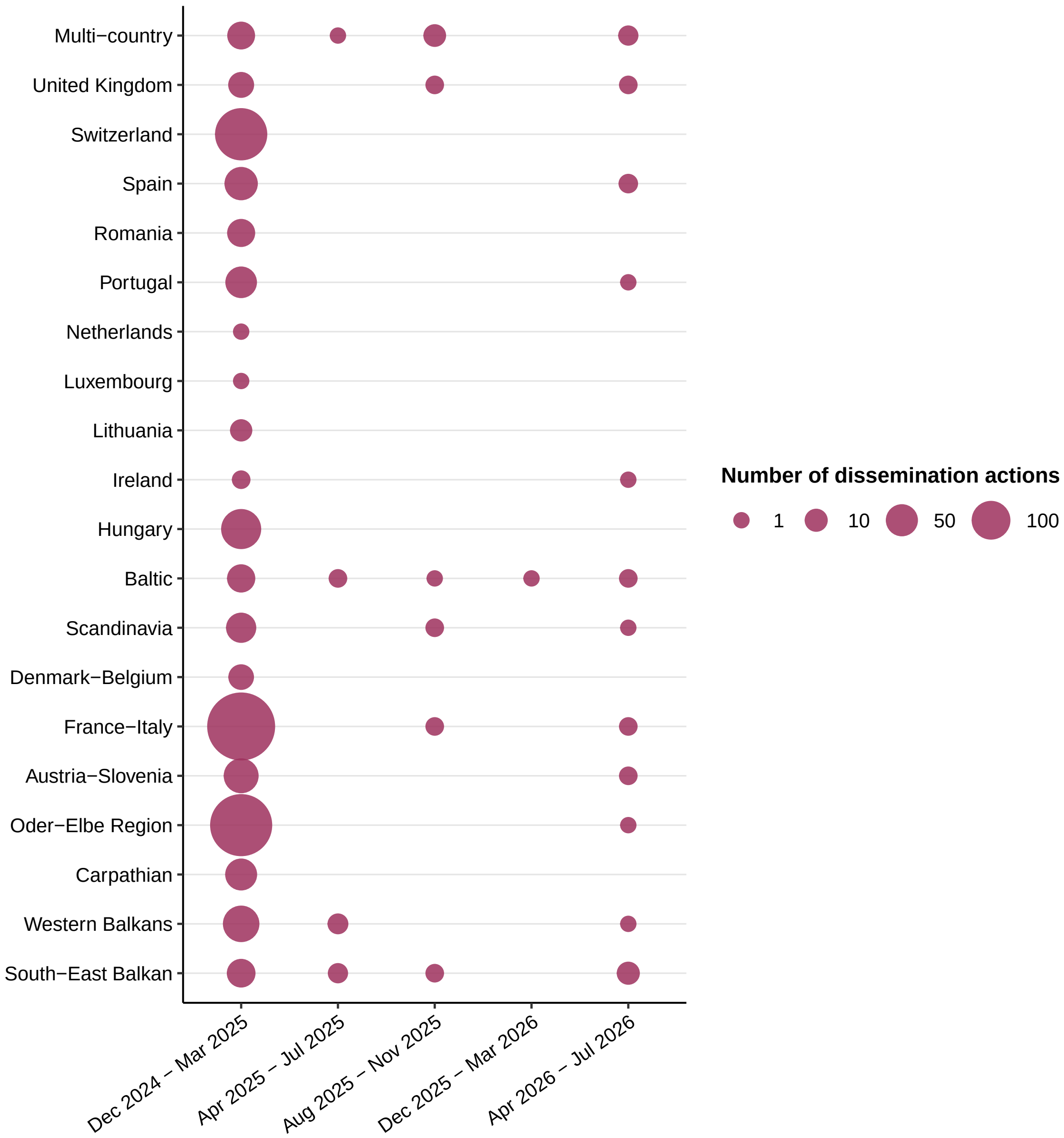

Figure S1: **Geographical and temporal distribution of survey dissemination efforts.** Bubbles show the number of documented dissemination actions across regions and the survey period/ Bubble size is proportional to the number of recorded actions. Countries with relatively few recorded actions were combined into geographical regions: Baltic (Finland and Latvia), Scandinavia (Norway and Sweden), Denmark–Belgium, France–Italy, Austria–Slovenia, Oder–Elbe Region (Czechia, Germany and Poland), Carpathian (Slovakia and Ukraine), Western Balkans (Albania, Bosnia & Herzegovina, Croatia, Kosovo, Montenegro and Serbia), and South-East Balkan (Bulgaria, Greece and North Macedonia); other countries were retained individually. Multi-country represents dissemination across Europe.

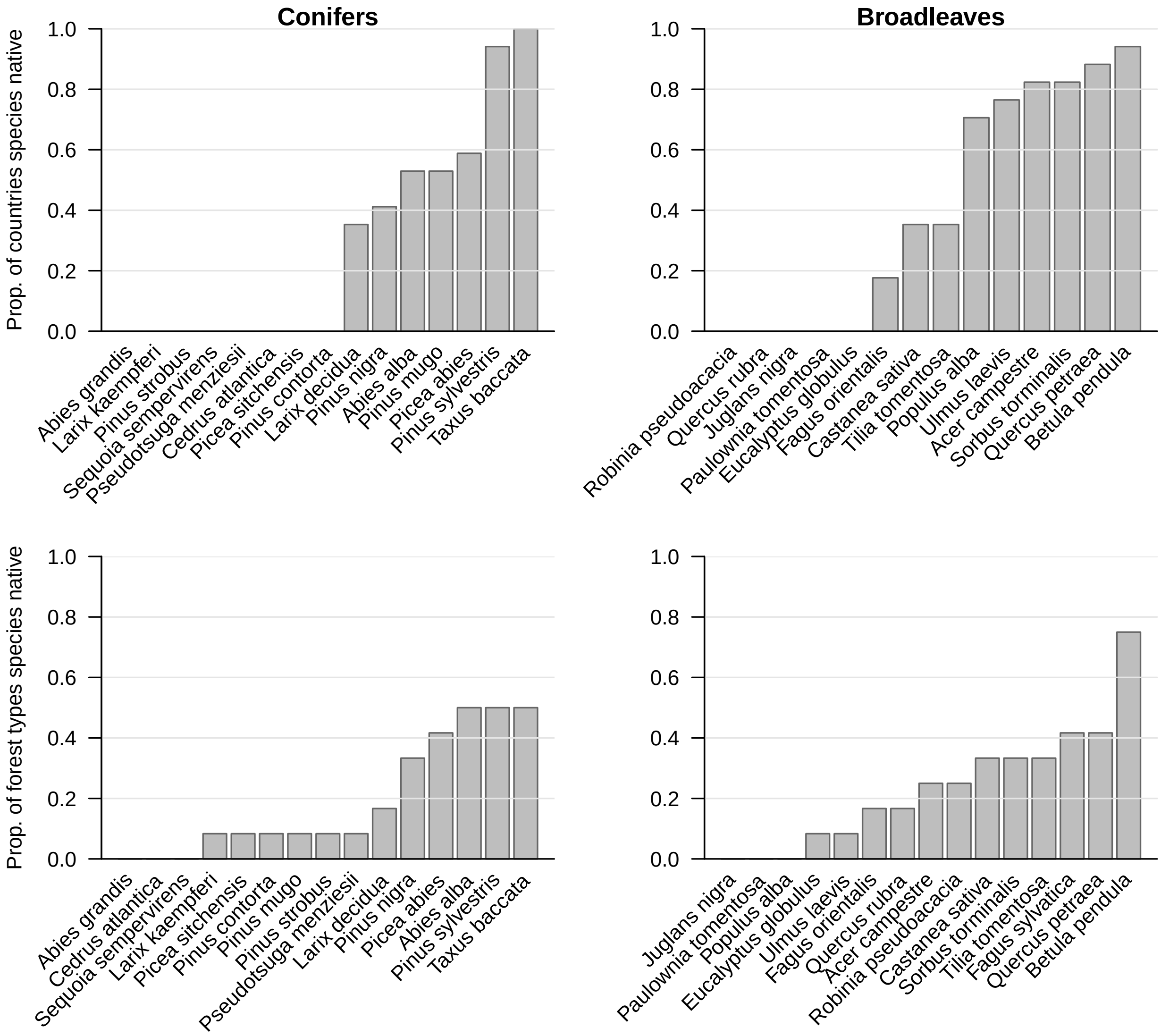

Figure S2: **Nativeness of the tree species included in the questionnaire across countries and forest types.** The upper panels show the proportion of countries in which each proposed species is considered native, while the lower panels show the proportion of forest types with which each species is associated. Coniferous and broadleaved species are presented separately. Species are ordered from least to most native or forest-type association. Values close to 1 indicate species that are widespread and commonly associated with multiple European forest contexts, whereas lower values indicate geographically or ecologically restricted species.

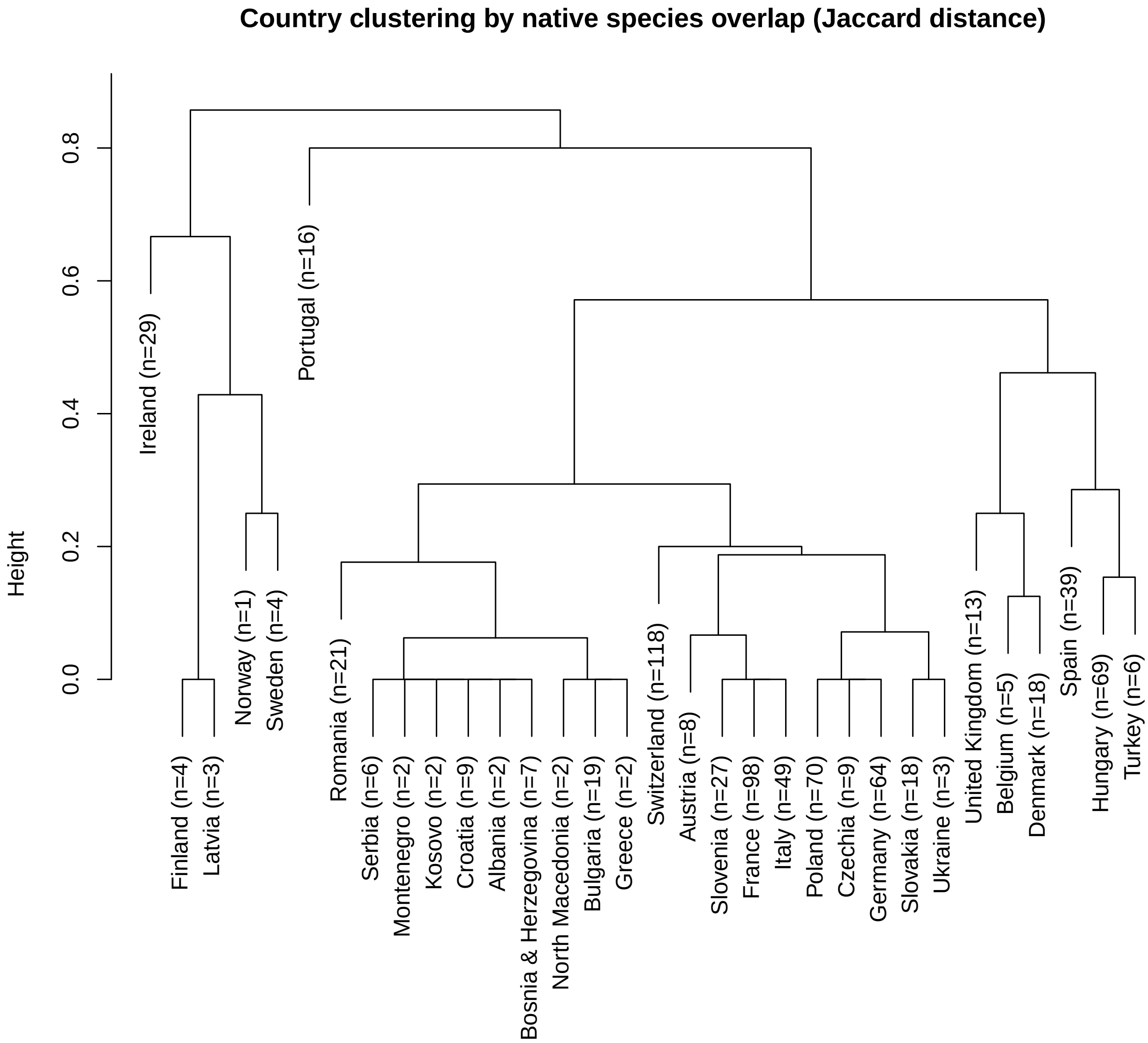

Figure S3: **Hierarchical clustering of the countries based on their native and non-native status of the 30 target species studied herein.** Numbers in parentheses indicate the number of responses obtained from each country.

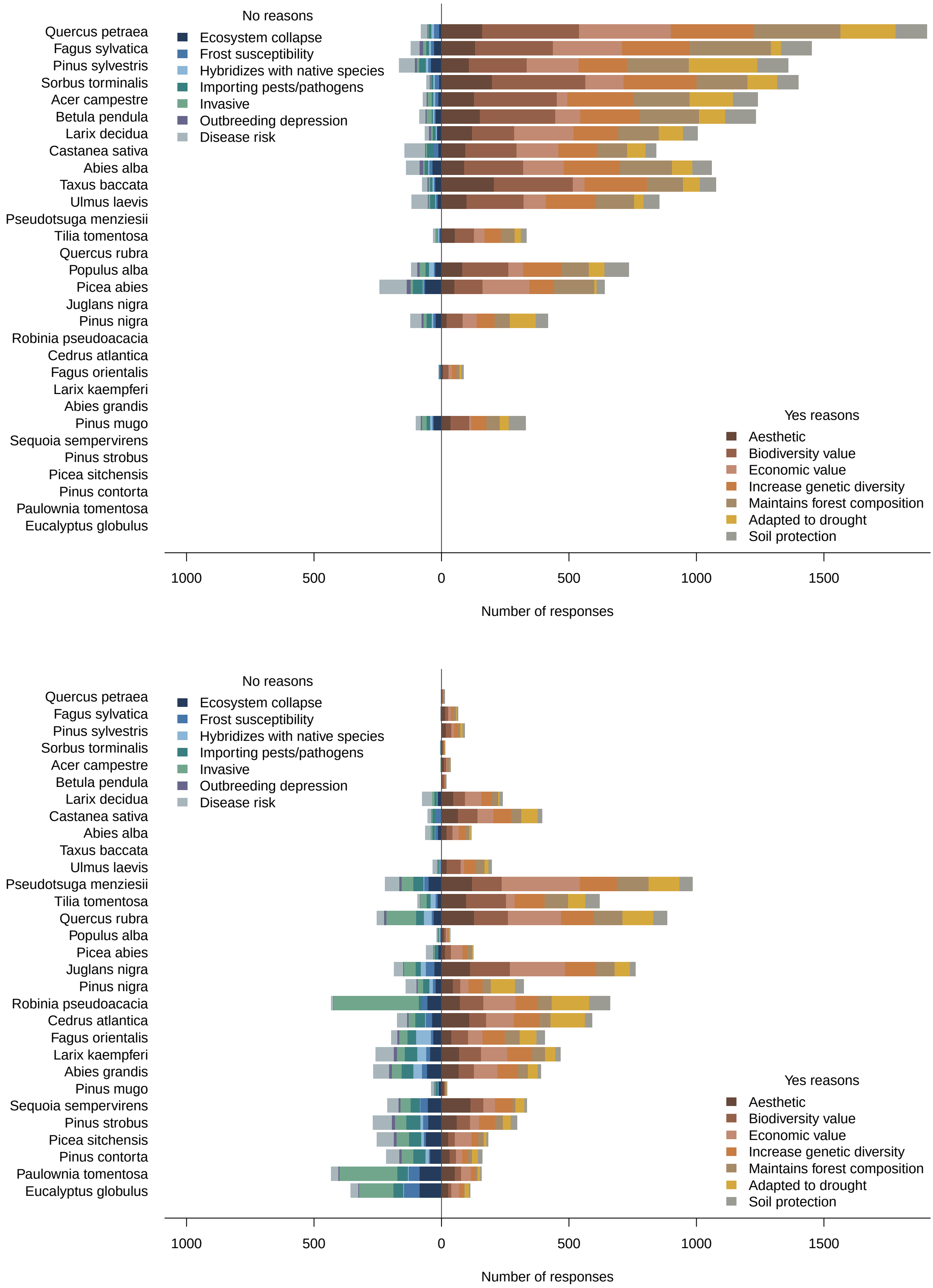

Figure S4: Reasons underlying species-specific planting decisions by native (top) or non-native (bottom) status of the species in the respondent's country. Number of times respondents selected different reasons for accepting (right) or rejecting (left) each of the 30 tree species proposed in the survey. Bars are stacked by reason, and Species are ordered by the total number of reasons reported. Respondents could select multiple reasons for each species.

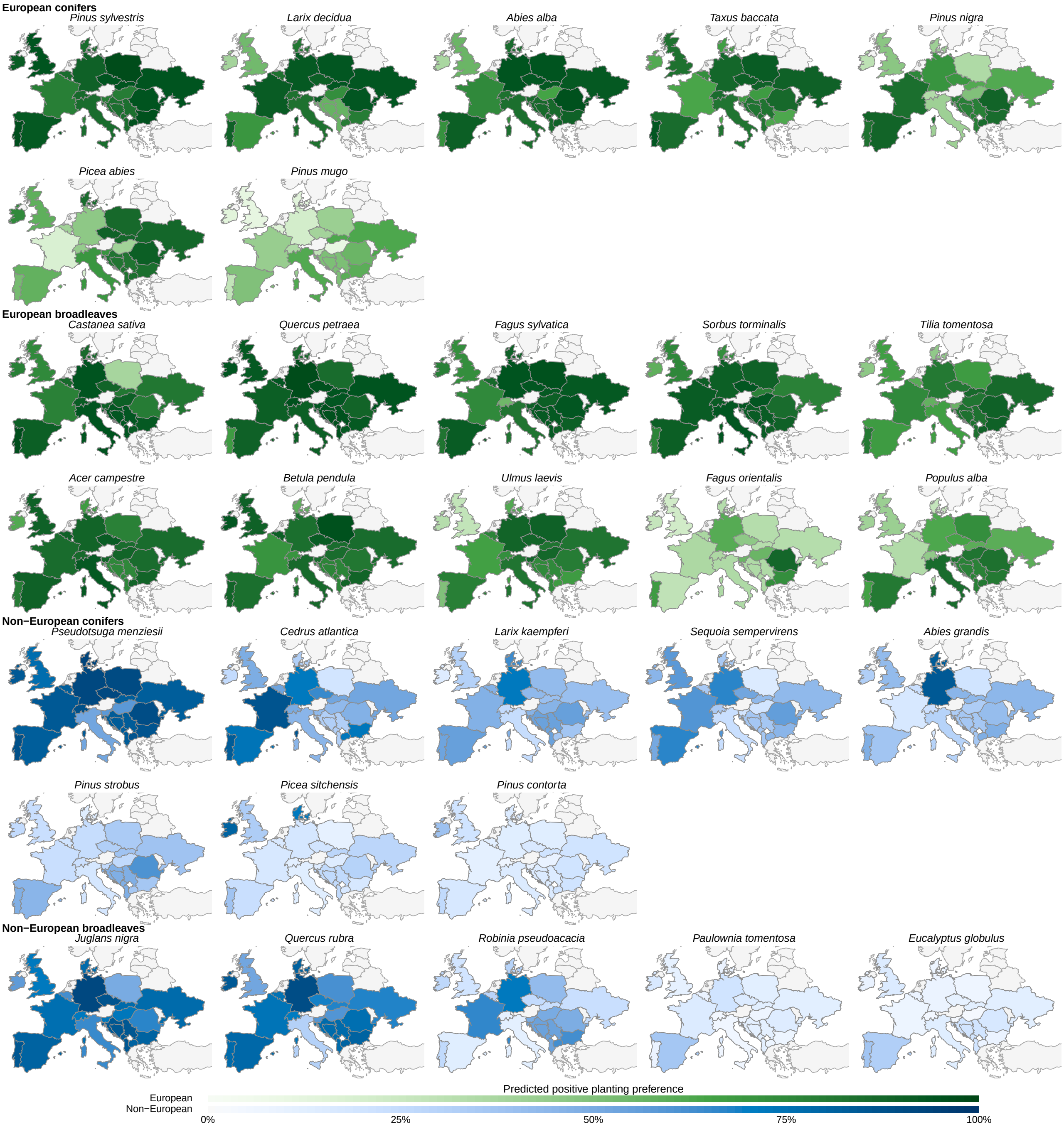

Figure S5: **Predicted planting preferences for all 30 tree species across Europe.** Maps show model-predicted probabilities of positive planting preference for each country–species combination represented in the analysis. Species are grouped as European conifers, European broadleaves, non-European conifers, and non-European broadleaves; green and blue gradients indicate predictions for European and non-European species, respectively. Predictions combine the fitted effects of species origin, region, species, and region-by-species combination, with the respondent effect set to zero. Species origin was defined at the country level, such that European species could be locally native or locally non-native depending on the respondent's country. Countries without model predictions for a given species are shown in grey. All panels use a common 0–100% probability scale.

Supplementary Methods S1: Methodology for the removal of duplicate responses

Email-based and IP-based duplicate checks provide different strengths of evidence and were therefore treated accordingly. A shared, valid personal email address provides strong evidence that responses originated from the same individual, since unrelated respondents are very unlikely to provide the same private email address. For repeated email addresses, only the most complete response was retained. Data completeness was assessed using the questionnaire items included in the response-similarity analysis; metadata, timing variables, identifying fields, and open-text responses were excluded.

A shared IP address provides much weaker evidence of duplication, because multiple independent respondents may access the survey through the same institutional or regional network. In this dataset, some IP addresses were associated with dozens of apparently distinct respondents, with one IP address accounting for 34 submissions. We therefore did not treat shared IP addresses alone as evidence of duplication. Instead, response pairs sharing an IP address were compared with an empirical null distribution of response similarity based on 9,424 randomly paired responses. IP addresses containing response pairs with similarity above the 95th percentile of this null distribution were flagged for further screening. Within these groups, low-completeness responses (below the 10th percentile of completeness across respondents) were removed, whereas sufficiently complete responses sharing an IP address were retained as plausibly independent observations.

Fig. SM1 shows that response pairs sharing an email address generally had higher similarity than expected under the empirical null distribution, whereas the similarity distribution for responses sharing an IP address overlapped strongly with that of randomly paired respondents, apart from a right-hand tail of highly similar responses.

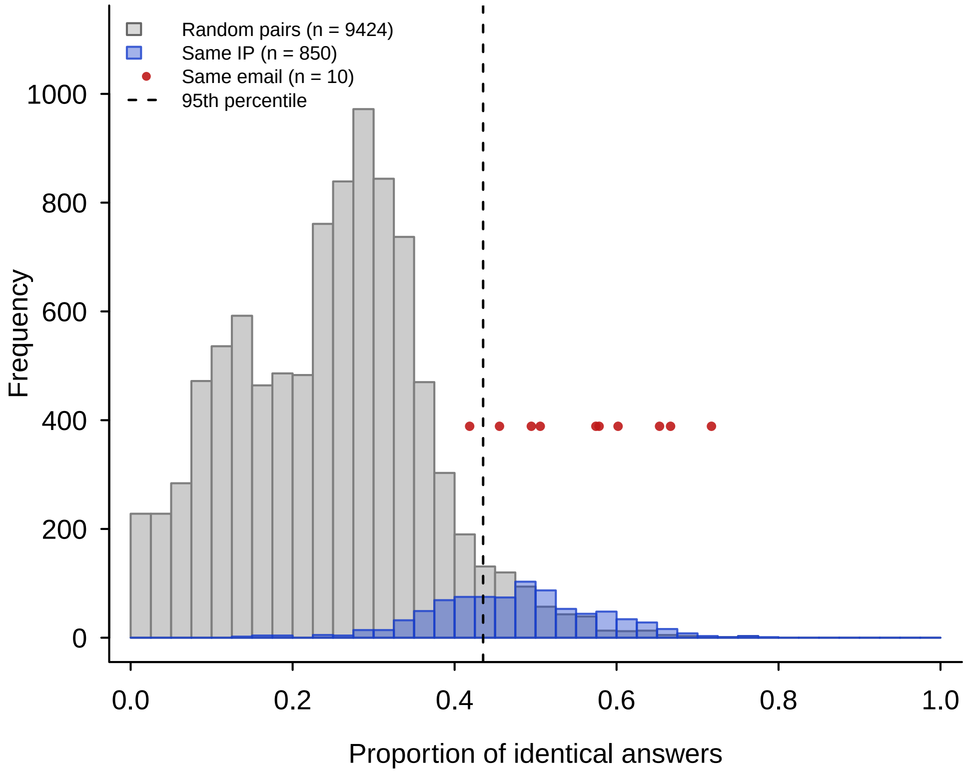

Figure SM1: **Empirical distribution of response similarity used to identify potential duplicate entries.** The distribution of pairwise similarity in responses (proportion of identical answers across comparable items) is shown for randomly sampled respondent pairs (grey; empirical null distribution) and for pairs of responses sharing the same IP address (blue). Red points indicate similarity values for pairs of responses associated with the same private email address. Similarity was computed only for response pairs with a minimum of 30 overlapping non-missing items to ensure robustness to partial responses. The dashed vertical line represents the 95th percentile of the null distribution. Pairs of responses sharing the same email consistently exceed this threshold, indicating a level of similarity unlikely to arise by chance. These cases were therefore considered duplicate submissions, and only the most complete response per email was retained for subsequent analyses.

Supplementary Methods S2: Calculations and conceptual definitions of the constructs

To summarize respondents' adaptive forest-management strategies, we developed an *adaptive management strategy* score spanning a continuum from mitigating external threats to proactively modifying forest composition and management. The score contrasted actions aimed at modifying forest composition and structure, including assisted migration, regeneration by planting or direct seeding, the use of non-local provenances, young forest management, adaptive silviculture, structural diversification, and shorter rotation periods, with actions aimed at reducing biotic pressures, including pest and pathogen control and measures to increase tree resistance to disturbances (e.g., browsing protection). For each respondent, the score was calculated as the difference between the mean proportion of selected forest-modification actions and the mean proportion of selected threat-control actions. Negative values indicate greater emphasis on controlling external threats, whereas positive values indicate greater emphasis on modifying forest composition and management. Responses indicating No action, None of the above, or Research and networking were not included in the score.

The *support philosophy* score contrasted measures emphasizing education and collaboration with researchers against measures emphasizing professional autonomy, financial incentives, and legislative change. For each respondent, the score was calculated as the difference between the mean selection of education- and collaboration-oriented measures and the mean selection of structural or institutional support measures. Negative values indicate greater emphasis on structural or legislative interventions, whereas positive values indicate greater emphasis on capacity building through education and collaboration. Support measures addressing specific management issues (e.g., game control or urbanization) and responses indicating None of the above or Inaction were not included.

We quantified *barrier orientation* as a score spanning a continuum from local implementation barriers to institutional barriers. The score contrasted practical obstacles, including high planting costs, limited availability or quality of forest reproductive material, uncertainty regarding appropriate provenances, browsing pressure, and abiotic or biotic stress, with legislative and regulatory barriers. For each respondent, the score was calculated as the difference between the mean proportion of selected institutional and local barriers. Respondents reporting no barriers, no previous experience with introducing new forest reproductive material, or expressing ethical concerns or a preference for local forest reproductive material were assigned a neutral score of 0. Negative values indicate predominantly practical barriers and positive values predominantly legislative or institutional barriers.

We quantified *climate-change disturbance experience* as the number of disturbance types reported by each respondent. Fixed questionnaire options included dead wood, bark beetle outbreaks, crown decline, drought-related stress, fires that were either easy or difficult to control, pathogen damage, and storm damage. Free-text responses were translated and manually recoded into additional categories, including biotic stresses such as ash dieback, browsing damage, invasive tree species, other insect damage, and *Viscum album*, as well as abiotic impacts such as flooding, late frost and snow damage, and broader indicators of forest change or declining health. "None of the above" was excluded from the sum, so higher values indicate broader direct experience with climate-related forest impacts.

We quantified *eco-evolutionary knowledge* as respondents' recognition of ecological and evolutionary concepts relevant to forest adaptation. The score was calculated as the number of correctly selected concepts from a predefined list including species, provenance, hybridization, genetic diversity, local adaptation, and gene flow. Higher values indicate greater familiarity with eco-evolutionary processes relevant to forest adaptation.

We developed an *information-source level* score to characterize both the diversity and level of information sources used to inform forest-management decisions. Sources were classified into five ordered levels: (0) no external information or own experience only; (1) non-specialized sources such as radio programs and social media; (2) local professional sources such as advice from foresters or forest owners, reports from forest associations, and professional events; (3) institutional sources such as government extension agencies, government reports, and continuous professional education; and (4) scientific forestry journals. Because respondents could select multiple sources, the final score was the sum of the weights assigned to all selected sources. Higher values indicate a broader portfolio of information sources and greater reliance on specialized, evidence-based information.

We developed a *knowledge-transfer preference* score to quantify the importance respondents attributed to improving knowledge exchange between research and practice. The score was calculated as the number of selected measures aimed at strengthening knowledge transfer, including researcher–practitioner collaboration, opportunities for exchange such as workshops, formal and informal training, and improved written communication. Higher values indicate a stronger perceived need for knowledge transfer and communication. Suggestions emerging from free-text responses, such as the need for additional research, policy changes, or wildlife management, were analyzed separately and were not included because they were not predefined options available to all respondents.

We constructed a *management goal preference* score from ratings of forest-management objectives (1 = not important, 5 = highly important). Four conservation-oriented objectives (biodiversity, carbon sink capacity, protection against natural hazards, and drinking water provision) were averaged to obtain a conservation score, while two production-oriented objectives (industrial wood/pulp and wood for material use) were averaged to obtain a production score. The management goal preference score was calculated as conservation minus production, with positive values indicating stronger conservation-oriented and negative values stronger production-oriented management goals. Recreational use was not included in this score.

We quantified *policy urgency* as the perceived need for additional policy support for climate adaptation. The score was calculated as the reverse of respondents' mean agreement that existing EU and national policies sufficiently support forest adaptation. Higher values therefore indicate a stronger perceived need for additional policy support.

To assess relationships among the constructed scores and identify potential redundancy, we conducted a principal component analysis (PCA) on the standardized numerical scores (Fig. SM2). We excluded age and retained years of forestry-related experience because the two were highly correlated. The first two principal components explained 14.6% and 12.9% of the total variance, respectively, and pairwise correlations among retained scores were generally weak to moderate, with no evidence of strong multicollinearity. Two highly correlated variables that were not used in the final models were excluded from the PCA. The retained variables therefore represented complementary dimensions and were included as separate predictors in the multivariate analyses.

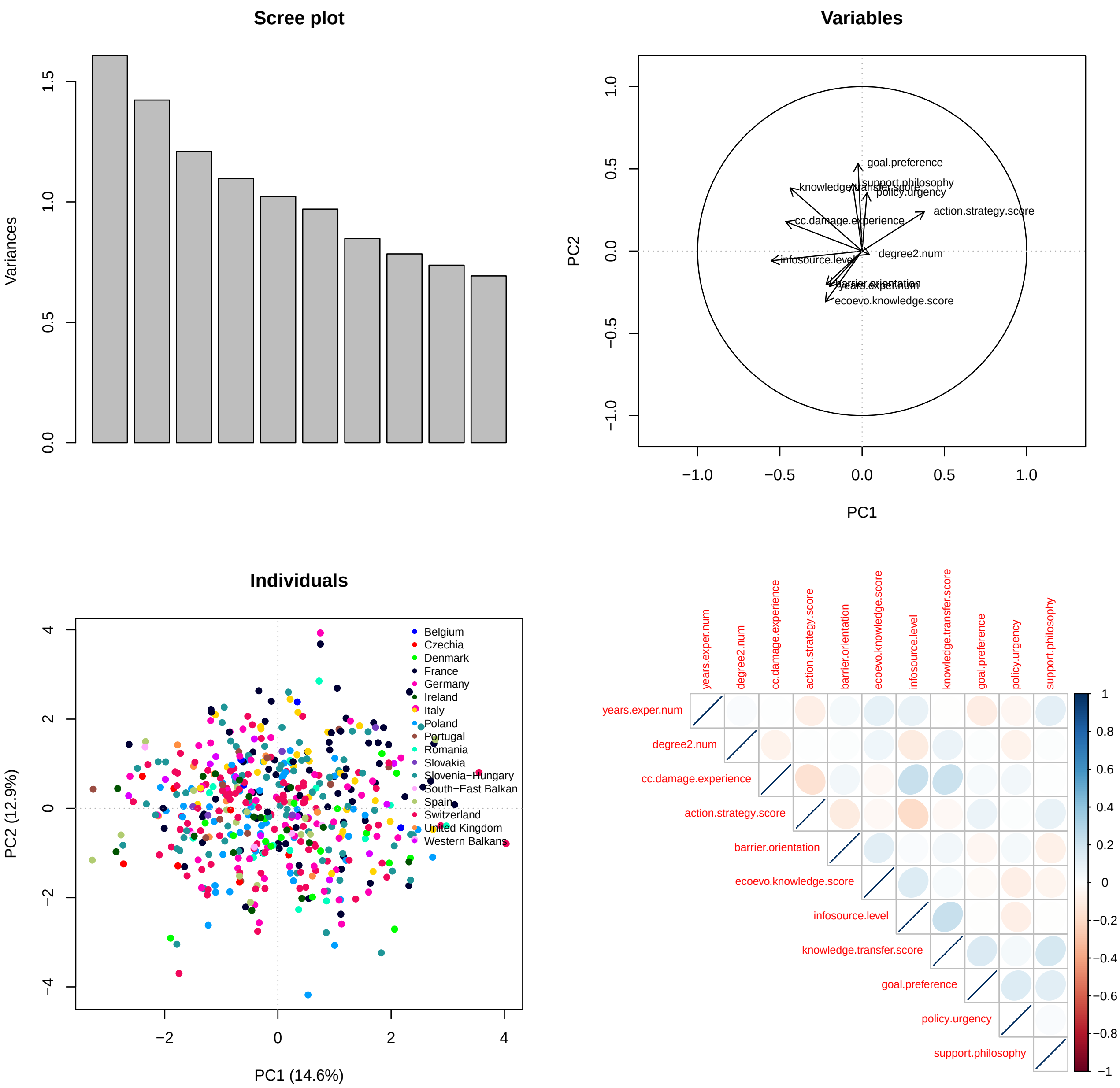

Figure SM2: Relationships among explanatory variables included in the multivariate analyses. Principal component analysis (PCA) of the numerical scores constructed from the responses. The scree plot (top left) shows the variance explained by each principal component. The variable correlation circle (top right) shows each variable's contribution and direction along the first two principal components. The lower-left panel shows PCA scores for individual respondents, colored by region. The lower-right panel shows pairwise Pearson correlations among the explanatory variables, with blue indicating positive correlations, red indicating negative correlations, and ellipse size proportional to the correlation strength. We omitted two variables that were highly correlated, conceptually similar, and not included in the final models from the PCA. The analysis indicates that the retained explanatory variables capture largely independent dimensions, supporting their simultaneous inclusion in the multivariate models.

Supplementary Methods S3: Species-level planting preferences

Species-level planting preferences were analyzed at the respondent–species level. The three affirmative response categories were combined as a positive preference and "No" as a negative preference. "Not applicable for my reference forest", "I don't know", and missing responses were excluded because they did not represent an explicit positive or negative evaluation. The analysis therefore estimates the probability of a positive preference among evaluative responses.

Origin status was defined separately for each country–species combination. Species were classified as locally native when native to the respondent's country, European-native species outside their local range, and non-European when not native to any European country represented in the nativeness dataset. Of the 30 predefined species, 17 were native to at least part of Europe, and 13 were non-European.

For the forestry-practitioner analysis, we fitted

$$Y_{ijk} \sim \text{Bernoulli}(p_{ijk}), \qquad \text{logit}(p_{ijk}) = \beta_0 + \beta_1 E_{ijk} + \beta_2 N_{ijk} + u_i + v_j + w_k + q_{jk}, \tag{4}$$

where u_i, v_j, w_k, and q_{jk} are random effects for respondent, country, species, and country-by-species combination, respectively. Locally native species formed the reference category. Species-specific deviations shown in Fig. 5a correspond to the fitted species random effects after accounting for origin and the other model components; approximate 95% intervals were obtained from their conditional standard errors.

For geographical visualization, predictions combined the fitted origin, region, species, and region-by-species effects while setting the respondent effect to zero:

$$\eta_{cjk} = \beta_0 + \beta_{\text{origin}(c,k)} + v_j + w_k + q_{jk}, \tag{5}$$

with probabilities obtained as $p_{cjk} = \exp(\eta_{cjk})/[1 + \exp(\eta_{cjk})]$. Because origin status was assigned at the country level, countries belonging to the same region could receive different predictions for a species when its native status differed between them. Maps were produced only for country–species combinations represented in the analysis; countries without predictions were shown in grey.