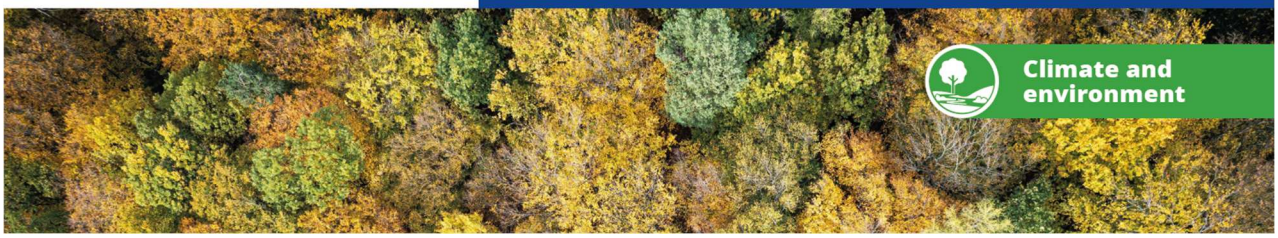
Interreg North-West Europe
Co-funded by the European Union
MigFoRest

Implementing assisted migration to increase forest resilience in North-West Europe.



MigFoRest

Work package 3

A.3.1 Sharing of experience and knowledge between forest owners/managers and nurserymen from the N and S of Europe

Report from study visit to Bulgaria

(D. 3.1.2)

May 2026

Version	Date	Created or modified by
V1	10/06/2026	NDL, DiD

1. Program of the 2-days study visit

The study visit to Bulgaria was organised by the MigFoRest project, which aims to support forest adaptation to climate change through assisted migration and improved knowledge exchange across Europe.

The MigFoRest partners invited key stakeholders of the forest sector, namely forest policy makers, forest managers (public and private), nurserymen and researchers in forest genetics, to learn from the experience of their peers from the South-East.

Bulgaria offers a particularly relevant case study due to its diverse geography and climate gradients. Located in south-eastern Europe, the country lies at the crossroads between continental, Mediterranean and mountainous climatic influences, resulting in a wide range of forest ecosystems. These conditions make Bulgaria an important reference region for understanding how tree species may adapt to warmer and drier climates, which are expected in north-western Europe in the coming decades. In addition, Bulgaria has a long tradition of state-led forest management, with approximately 80% of publicly owned forests, which allows for coordinated strategies in seed sourcing, conservation, and reforestation.

The study visit was an opportunity to exchange knowledge with peers from southern Europe; observe on-site the conduct, growth and use of selected species in Bulgaria and to discuss forest management practices under warmer and drier conditions. It was also the opportunity to visit local state nursery (where the plantlets are grown), seed stands and seed orchards (collection). For instance, the participants learnt on specificities related to pubescent oak (*Quercus pubescens),* sessile oak (*Quercus petraea),* pedunculate oak *(Quercus robur),* silver fir *(Abies alba),* or small-leaved lime *(Tilia cordata),* which are all part of the MigFoRest selection.

Day 0 - 19th of May

Participants arrival. First night is spent in Sofia, the capital city located in a high basin at the foot of the Balkan Mountains.

Day 1 - 20th of May

8.00 – 10.00 Sofia – Drenkovo

10.00 – 13.00 Drenkovo (GPS coordinates: 42.0390 22.9010)

- **Visit of a *Quercus pubescens* stand**
- **Visit of a *Quercus petraea* stand**

13.00 – 14.00 Sandwich lunch

14.00 – 16.00 Drenkovo – Rila Monastery

- **Visit of an *Abies alba stand***
- Quick glance at the Rila Monastery

16.00 – 20.30 Trip Rila Monastery – Plovdiv

20.30 – Plovdiv - Dinner in hotel restaurant “Happy”.

Day 2 - 21th of May

8.00 - 10 :00 Plovdiv – Djulyunitsa

10:00 - 13:00 Djulyunitsa (GPS coordinates: 43.1375 25.8600)

- **Seed stand of *Quercus robur* in Rozhevo Konare**

13.00 - 14.30 short guided tour on the way to our lunch in Veliko Tarnovo

14:30 - 18:00 Veliko Tarnovo – Lokorsko

18:00 - 19:00 Lokorsko (GPS coordinates: 42.770833 23.4400)

- **Visit to a state forest nursery**
- **Visit of a *Tilia cordata* seed orchard**

19.00 – 20.00 Return to Sofia

Night at Sofia

Day 3 - 22th of May

Return to the airport

2. Participants

The group included 30 participants from Belgium, France, Germany and the Netherlands, representing a large variety of profiles and functions.

Name	Function
Adéodat D'AVIAU DE TERNAY	Project expert Néosylva
Adrien GOLINVEAU	UAP (Nursery union)
An VANDEN BROECK	Scientist INBO
Annelore DE RO	Scientist INBO
Arjan MOSTERT	Public forest manager (Staatsbosbeheer - The Netherlands)
Aurélien BLOND	Project expert Néosylva
Charalambos NEOPHYTOU	Scientist FVA
Diane DOUCET	Project manager SRFB
Eléonore SCHOLZEN	Public forest manager (SPW/comptoir forestier)
Eline ROELANDT	Forest policy advisor (ANB)
Emmanuel HANSSEN	Nursery (Shepers (info@boomkwekerijschepers.be))
Felix MOSER	Seed company - PlusBaum Samen GmbH
Florian GROSJEAN	UAP (Nursery union)
Guilhem OLIVE	Forest expert
Hubert Lukas SAILER	Nursery - Sailer Baumschulen GmbH
Igor BLERVAQUE	Project expert SRFB
Igor LATTENIST	Scientific collaborator CRA-W
Jan COUSEMENT	Nursery (Sylva - Van Hulle)
Karl MOSER	Seed company - PlusBaum Samen GmbH
Kristine VANDER MIJNSBRUGGE	Scientist INBO
Lieven DE BACKER	Nursery (Sylva - Van Hulle)
Manuel KAROPKA	head of the nursery and garden FVA
Maxime LANTIN	Scientific collaborator CRA-W
Nicolas DASSONVILLE	Project expert SRFB
Philippe BESSEAU	Project expert Néosylva
Rebekka STÜWE	AWG
Silvija BILELA-ECKERT	Scientist FVA
Stefan SCHWEIZER	Technical director of the seed provider from Nagold
Johan VERSWIJVEL	Scientific collaborator (CRA-W)
Willy VERBEKE	Public forest manager (Koninklijke Schenking & Arboretum Tervuren)

Two **interpreters**, one translating from Bulgarian to French and one from Bulgarian to German, were also present to ensure a full translation of the explanations for the visitors who were not speaking English.

General project presentation

Before moving to the actual site visits, the program started with a seated presentation on assisted migration in the context of the MigFoRest project:

- Objectives
- Pilot territories
- Risks and opportunities
- Species and provenances
- Planting methods
- Zooms on chosen territory specificities
    - Flanders
    - Northern France
    - Baden-Württemberg
    - Wallonia

We were guided by Prof. dr. **Petar Zhelev**, professor at the University of Forestry, Sofia. His scientific interests are population and evolutionary genetics, dendrology and botany. He contributed to different publications related to assisted migration and adaptive forestry:

- https://www.sciencedirect.com/book/edited-volume/9780443340864/guidelines-for-climate-adaptive-forest-restoration-and-reforestation-projects#about-the-book
- Are_there_hybrid_zones_in_Fagus_sylvatica_L_sensu_.pdf
- Native_Trees_of_the_Mediterranean_Region_Distribut.pdf

He was seconded by K**rasimira Petkova**, PhD during both days, and by **Nikola Kavardzhikov,** forestry engineer on the second day.



Figure 1 – The group of participants to the Bulgaria study trip

Day 1

Site 1 : Strymón valley (South-West of Sofia): Visit of a *Quercus pubescens* stand

The Strymón valley (called Struma in Bulgaria) is one of the main ecological corridors in the Balkans.

The valley has a predominantly mountainous character, especially in its Bulgarian section.

It alternates between narrow gorges and slopes and wider intermontane basins and plains.

The Strymón valley represents a transition zone between continental (north) and Mediterranean (south) climates with cold winters and spring precipitation maxima and with hot, dry summers and periodic droughts.

Precipitation is moderate and uneven, with summer dryness increasingly pronounced.

The strong topographic variability and the presence of the continental and mediterranean influences create microclimatic gradients over short distances, which explains the coexistence of Mediterranean-type and continental forest ecosystems.

Quercus pubescens (pubescent oak) is one of the dominant tree species in the driest parts of the Strymón valley. This species is highly xerophilous (drought-tolerant) and thrives on calcareous and shallow soils, south-facing slopes, low precipitation (<400 mm during growing season).
Its typical altitude range is between 200 to 1500 m.

Thanks to a deep and efficient rooting system, its ability to maintain physiological activity under water stress and tolerance to poor soils, *Q. pubescens* dominates marginal, dry, and degraded sites where other oak species cannot compete.

The stand visited is managed as coppice (rotation of about 40 years for energy production). The soil is a squeletic calcareous soil. Because of the soil and of the management applied, the trees are small and not straight. However, they are healthy and green despite the harsh conditions. *Quercus pubescens* stands managed as high forest exist in Bulgaria nearer to the Black Sea coast (close to Turkey).



Figure 2 – Quercus pubescens *stand managed as coppice, on the right below, a detail on the velvety twig characteristic from* Q. pubescens

The stand is largely dominated by *Q. pubescens,* but some other tree species are present: *Sorbus domestica, Carpinus orientalis, Fraxinus ornus, Sorbus torminalis, Ulmus minor, Quercus cerris, Pyrus amygdaliformis*… The shrub layer is composed of *Coronilla emerus, Crataegus sp*… and the herb layer by a high diversity of chalk grassland species (*Polygala sp., Ajuga laxmani, Geranium sanguineum, Lathyrus nisolia, Melampyrum arvense, Orchis purpurea*…).

A massive acorn mast year is expected every 3-4 years. In this region, *Q. pubescens* is not in contact with other white oak species, so no hybridization is observed. Hybrids of *Q. pubescens* and *Q. petraea*

are rare but exist in eastern parts of the country. There is no hybridization between *Q. robur* and *Q. petraea* as they are not present at the same locations, thus they don't meet and can't hybridize.

In addition to Forematis, a national database of seed stands exists (ask access to Petar) where seed stands for *Q. pubescens* and *Q. frainetto* are referenced.

Site 2: Rila Mountains- Visit of a *Quercus petraea* stand

The Rila Mountains (SW Bulgaria) are the highest range in the Balkans, reaching 2,925 m at Musala.

They show a strong altitudinal zonation from low hills to alpine zones with glacial relief, lakes, and steep valleys. At low altitudes (≤ ~1000 m) oak forests are found, at mid-mountain (~800–1500 m) it will be beech, higher (1300–2000 m) conifers (spruce, fir) and the subalpine/ alpine levels are covered by shrubs and meadows.

Oak forests typically dominate the lower mountain belt, while beech and conifer forests dominate Rila's core. In Rila itself, much of the current forest cover is beech–fir–spruce, especially in protected areas.

Sessile oak is not dominant in high Rila but occurs in foothills and lower slopes and / or in mixed oak–hornbeam or oak–beech transitions. Rare oak formations (e.g. Rila endemic oaks) may occur higher than usual due to local inversions, on south-facing slopes ~1300–1450 m.

So, in Rila, *Quercus petraea* is mainly part of the lower montane–submontane ecosystems, not the alpine core. This species is typical of upland, well-drained soils, often acidic to neutral. It is a light-demanding species (shade-intolerant at later stages) more drought-tolerant than pedunculate oak (*Q. robur*) and is often found in mixed stands (with beech, hornbeam, other oaks).

The stand visited is approximately 80 years old and is located on a south facing slope at 1400 m elevation. Budburst is just beginning, and some late frost damages are observed.



Figure 3 - On the left, the Quercus petraea *stand; on the right, frost damages on beech tree which appears brown red.*

Rainfall on the Rila mountains is abundant and equally distributed during the year. Mix stands of spruce, silver fir and beech are found (on north facing slopes) and show to be very productive (1000m³/ha).

Acer hyrcanum (Balkan maple) and *Pinus peuce* (Balkan pine) can be seen on the location.

For assisted migration, this is not what is looked for. *Quercus petraea* stands in the eastern part of the country which experiences drier conditions, could be more suitable for AM.

Site 3: Forest of Rila monastery – Visit of an *Abies alba* stand

In the Rila Mountains, *Abies alba* is a key species of the montane forest belt. It is typically found between ~800–1700 m altitude and forms mixed forests with European beech (*Fagus sylvatica*) and Norway spruce (*Picea abies*) that are found on north-facing slopes (cooler, more humid) and/or on deep, well-drained, fertile soils. Rainfall on the Rila mountains is abundant and equally distributed during the year. This explains why mix stands of spruce, silver fir and beech (on north facing slopes) are generally dense, stable and be very productive (1000m³/ha).

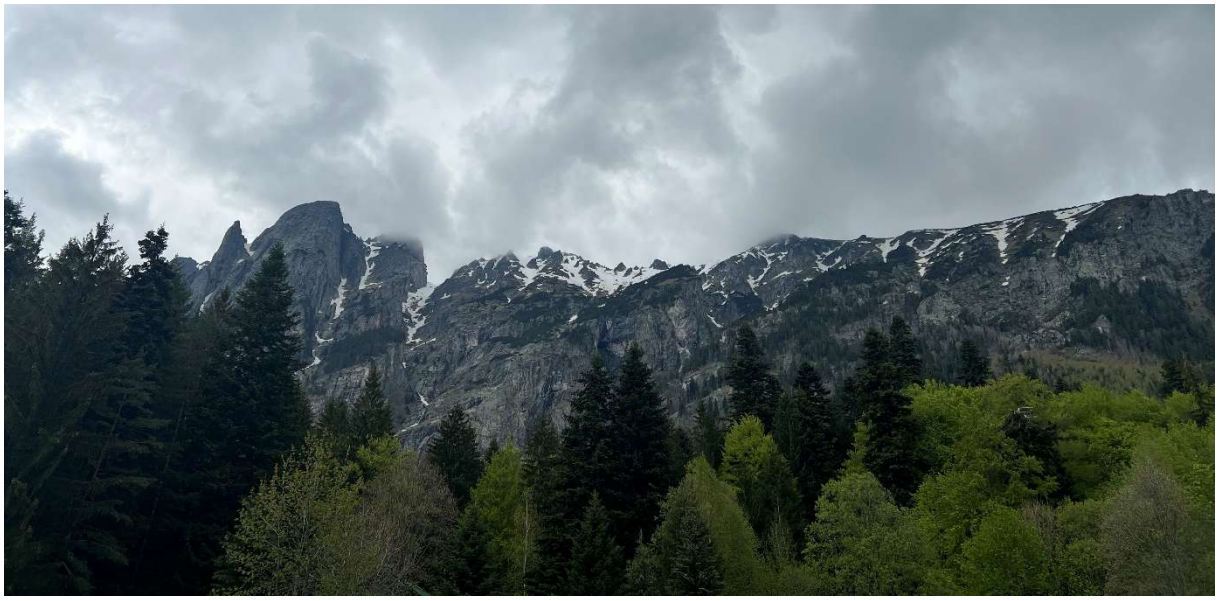


Figure 4– Rila mountains

While the Rila mountain reaches 2925m altitude at its peak, the forest stand visited is located at 1500 m elevation. It is composed of silver fir, spruce and beech. An intensive exploitation was carried out 100 years ago and since then very few disturbances have occurred. The current management technique is a type of continuous cover forestry (Plenterwald). Secondary tree species are *Populus tremula, Alnus incana, and Acer pseudoplatanus*.



Figure 5 - Mixed beech, spruce and silver fir stand in Rila Mountains

The rotation is done every 6-8 years. Rainfall is abundant and regularly distributed, which means that species from this area are not interesting as a provenance source for AM in NWE.

It must be noted that *Quercus protoroburoides* is endemic in the Rila forest. This species is quite similar to *Q. robur*. *Pinus peuce*, found in Bulgaria as well, is very tolerant to drought.

Day 2

Site 4: Seed stand of *Quercus robur* in Rozhevo Konare

Rozhevo Konare is located in central southern Bulgaria, in the Plovdiv region, within the Upper Thracian Plain, one of the country's most fertile lowland areas. The elevation of this flat alluvial plain is around ~200 m. It is a part of the Maritsa River basin, the largest river system in southeastern Bulgaria. The Maritsa River flows eastward across this plain between the Balkan and Rhodope Mountains, forming a wide agricultural corridor. This geographical setting strongly contrasts with the mountainous sites visited earlier (Rila, Strymón valley). The climate is a warm temperature to humid subtropical climate, it presents a mean temperature of 13.7°C, hot summers (often >30°C) and moderate precipitation with spring peak and dry summer period.

The *Quercus robur* stand is located in the wide alluvial plain of the Maritsa river. The soil is deep and fertile, often loamy to silty. It has a natural origin but is managed for seed production (cut understory). The stand is 8.2 ha but was bigger in the past. As most of the oak stands from the plain, it became fragmented and is now an isolated remnant in an open field agricultural landscape. The stand is about 160 years old and has been widely used for afforestation operations in Bulgaria.



Figure 6 – Some trees from the seed stand are healthy and seeds producers; on the right, tree decay consequently to the irrigation disruption.

The sanitary state of the stand is worrying as several diebacks can be observed. The main reason is that the fields around were formerly irrigated but not anymore in the last 15 years. Nowadays, while its growth in spring can be driven by rainfall, in summer it only relies on groundwater availability. Therefore, any change in water irrigation, groundwater level, or flooding regime affects strongly the tree's vitality and leads to decline or dieback. However, it is noticeable that several trees from the stand can withstand drought even if having been dependent on irrigation in the past.

An acorn mast year occurs every 3 to 5 years. The amount of acorn produced is enough to cover the forestry needs within the country.

The acorns are hand-picked; only healthy ones are collected. Only acorns that do not float in water are used for germination rates assessment.

One technique which can be used to avoid contamination by *Ciboria batschiana* is to treat them at 41°C for 2 h (cfr Comptoir à graines, Belgium).

This stand (seed stand 363A) is really relictual since most of the stations suitable for *Quercus robur*, growing on good fertile soil, were converted to agriculture.

In the area, two subspecies can be found:

- Ssp. *pedonculiflora* (in dryer areas)
- Ssp. *robur* (in more humid areas)

Some young plantations were done 30 years ago to renew the seed stand on 3ha.

The natural regeneration and artificial regeneration using seeds from the old stand were compared; no clear difference is visible at this stage. The plantations do not look promising in terms of wood technology. Chain annellation has been tried but did not produce the expected results. They need to be thinned.

Despite the mediocre general state of the stand, some trees look healthy. Those trees could be interesting as parent material for seed harvesting or for seed orchards.

Remark: *Fraxinus excelsior* (in NWE) and *Fraxinus angustifolia* (in Bulgaria) seem to show the same susceptibility to chalarosis. Could *F. angustifolia* be planted on demo-sites for assessment?

Site 5: Visit of a state forest nursery

Automated production of plug seedlings of *Pinus nigra*, oaks and *Tilia* sp.

The conifers are grown in small plastics pots with vertical openings allowing self-pruning of the rootlets, while broadleaves are grown in bigger pots without opening on the lateral side.



Figure 7 – Upper left, the automatization of the filling the containers with substrate and sowing the seeds within the seed bed; on the lower left, a detail from the sowing machine; on the upper right, there is the machine used to mix the substrate, and that is supplied to the sowing machine. On the lower right, here is the machine to clean up the containers.

A 0.5-2mm substrate is used with additional substances. The substrate is mixed and filled into containers and compacted. The seed nest can be adapted to one seed or up to 3 seeds per pot.

Broad leaves seeds are planted manually, while coniferous seeds (after getting rid of their wings) are planted mechanically.

The containers are then laid on tables 20 cm from the ground. They are irrigated by automated systems. The germination is done in the green house. The average germination rate is about 90% for seed lots coming from a controlled station (production stand of first quality). When the seedling is out of the seed (coniferous) or when 3 leaves are produced (broadleaves), the seedlings are put in the fields under shadowing structure. The aim is to produce 1-year seedlings.



Figure 7 - On the left, seedlings from Quercus *sp.; in the center, seed germination in containers in greenhouse; on the right, seedlings from* Tilia *sp. showing a low germination rate*

From spring to autumn then they can be planted as they develop a good root system. Plantation can be done at any time in the year, the best period being after October until spring.

Fertilizers can be added except when the temperature is too high.

The stratification substrate will be adapted to the species e.g.: sand and water for broad leaves, wooden ash and water for *Juniperus* sp..

The *Tilia* sp. germination rate was of poor quality the last years. To induce direct germination, the seeds need to be panted directly with seeds presenting a yellow shell, not brown, or green.

The seeds of coniferous are prepared for germination by soaking in water for 24h, then dried, separated and planted. Their germination starts within 2 weeks.

The seeds are pretreated with fungicides; this is not requested for *Pinus nigra.*

The nursery is producing only for the state forest.

Site 6: Visit of a *Tilia cordata* seed orchard

The seed orchard of *Tilia cordata* was established in 2015 with 34 clones (10 repetitions/clone) originating from 4 stands in the region of Sofia. They are planted in an 8m x 8m design, in a 1.5ha plot.

The trees are already bearing fruit, but full production is expected from the 15th year. The clones were grafted in 2024 using the simple English graft. The trees are conducted in goblet/vase shape which favors fruit production.



Figure 8 - 10 years old lime trees already blooming.

The production time of the orchard is planned after 15 years; thus, the trees should be in full seed production within 5 years.

Conclusion

This study visit significantly contributed to bridging northern and southern European forestry practices. By combining field observations, scientific input, and practical demonstrations, participants gained valuable insights into species adaptability, interest of adapted provenance selection and forest management under climate stress.

The Bulgarian context—at the interface of multiple climatic zones and shaped by a strong forestry tradition—offers valuable lessons for future forest resilience strategies in Europe.