



Genetic considerations around forest reproductive material in Europe

Stakeholders' event

Date of the event: 14-15 November 2016

Location: INIA, Ctra. de A Coruña, km 7.5, Madrid, Spain

New and improved strategies and decision support tools are needed for the exchange and use of forest reproductive material (FRM) under changing and uncertain environmental conditions. These could include using novel fitness related traits and phenotypic plasticity in selection programmes, finding a balance between genetic diversity and genetic gain, optimising the use of yet untapped or underused wild resources in well-known commercial species. Understanding the perspective and demands of critical players in production and use of forest reproductive material, such as nurseries and forest owners and managers, is crucial to ensure that research products can respond to practical needs.



The **Gentree stakeholders' event** focused on establishing a dialogue with European stakeholders in the forestry sector in the initial stages of implementation of the project. The theme of the event was the management of forest reproductive material in light of environmental changes, a topic that is addressed by Gentree.

Day 1- 14 November 2016

Presentations - Setting the scene

A series of presentations followed by questions and answers, provided an overview of the current situation across different European countries, and from different institutional perspectives, regarding key aspects in the production and use of FRM in Europe.

Jeremy Cherfas (facilitator) opened the meeting. Welcome remarks were given by the representative of the local hosting institution, Ricardo Alia (INIA), the EUFORGEN coordinator Michele Bozzano (Bioversity), Barbara Vinceti (Bioversity), responsible for the engagement of stakeholders in the Gentree project, and Bruno Fady (INRA), coordinator of Gentree.



From left to right: Ricardo Alia (INIA), Michele Bozzano (Bioversity), Bruno Fady (INRA), Barbara Vinceti (Bioversity).

The first presentation was given by Michele Bozzano (Bioversity). He provided background information on EUFORGEN and also an introduction to the main aspects that have emerged from **past work of EUFORGEN' Working Group (WG)** on forest reproductive material in Europe. He reminded the publications that EUFORGEN developed, providing a useful synthesis of past work: <http://www.euforgen.org/publications/publication/use-and-transfer-of-forest-reproductive-material-in-europe-in-the-context-of-climate-change/>

The main recommendations stemming from past work of EUFORGEN are the following:

- Local FRM is not always best in afforestation, reforestation or ecological restoration projects, particularly under climate change.
- FRM transfer is a valuable option for adapting forests to climate change, but it has its limits: many processes should be taken into considerations, so there is a need to find a way to know what material is available and the right sources.
- Use provenances instead of species in assisted migration schemes.
- Need for FRM documentation increases under climate change, so it is important to trace back where the FRM used originated
- Tree breeding offer opportunities for forestry under climate change
- Knowledge gaps should be filled on the adaptive capacity of forest tree species.
- Revision of transfer recommendations is necessary at the pan-EU level.

- o More stringent control of FRM is needed all along the production chain and marketing.

A newly formed working group in EUFORGEN will continue focusing on FRM development and use. A first sub-group will work on the production of FRM and a second on use of FRM. The **Stakeholders' event organized by Gentree will be an opportunity to feed into EUFORGEN's** long-term work of on FRM.

Csaba Gaspar Programme manager for the Forest Seed and Plant Scheme & Seed Schemes of the Organization for Economic Co-operation and Development (OECD) gave a brief introduction of the OECD and its Forest Seed and Plant Scheme, its principles, objectives, and challenges in current activities related to climate change and international trade of FRM (www.oecd.org/trade/forest). OECD is an inter-governmental organisation, established in 1961, currently with 35 Member countries, working with more than 80 partners (also in developing countries and transition economies, mostly European but also American and North African countries, including some observer countries). It collaborates with more than 30 international organisations (governmental, international, scientific organisations, and also the private sector). It is an active partner of G20, with a mission to promote policies that will improve the economic and social well-being of people around the world

The OECD Forest Seed and Plant Scheme was established in 1967. It is a certification system for forest reproductive material (FRM) adopted for international trade. It provides a certification of origin and of genetic characteristics. It is the only global FRM certification system.

The Forest Seed scheme has been adopted by 27 Member Countries and is implemented by National Designated Authorities in the 27 member countries plus the European Commission. Observer organizations are for examples FAO, ISTA, EUFORGEN, scientific organizations (e.g. IUFRO) and the private sector, which participates in the discussions via representative organizations (e.g. ISF, EFNA).

The objectives of the Scheme are to a) encourage the production and use of seeds, part of plants and plants that have been produced in a manner that ensures their trueness to name (origin and genetic characteristics); b) to make available to foresters fully reliable information on the origin of and the genetic characteristics of the FRM used for planting (certification and traceability); c) facilitate international trade via harmonization of national FRM certification systems. The scheme covers FRM to be used in forestry and agroforestry (including multifunctional forests). It should also assist in addressing climate change issues by characterizing species diversity and genetic diversity within the species, fostering adaptive potential of FRM.

In 2007, two categories of FRM were available: **"source identified"** and **"selected"**. In recent years, OECD members agreed on the inclusion of the two advanced categories into the Scheme: **"qualified"** and **"tested"**. Thus currently four categories are available and these are associated to the different types of basic materials available as shown in the table.

CATEGORY OF FOREST REPRODUCTIVE MATERIAL (Label colour according to Appendix VIII)				
<i>TYPE OF BASIC MATERIAL</i>	SOURCE IDENTIFIED (Yellow)	SELECTED (Green)	QUALIFIED (Pink)	TESTED (Blue)
Seed Source	X			
Stand	X	X		X
Seed Orchard			X	X
Parents of Family(ies)			X	X
Clone			X	X
Clonal Mixture			X	X

The certificate has to be issued for all FRM lots, and includes the following: a) certificate of provenance, b) certificate of identity. Each certificate has an individual certification number issued by the National Designated Authority (EN or FR).

OECD works on climate change influence on certification systems (FRM production and international trade) rather than on climate change per se. Climate change poses challenges to FRM production and international trade:

- o Climatic changes may be faster than trees could be adapt or migrate,
- o Trees planted today may need to be adapted to quite different climatic conditions from the current ones, so climate scenarios should be developed for 50 -100 years into the future;
- o International trade may increase in the future, therefore there is a need for a reliable global FRM certification system, certifying origin of FRM and its genetic characteristics;
- o A possible solution to address changes in climate could be the mixing of seed from different origin, adapted to different climatic conditions and develop certification of mixtures. There is still no consensus on this option.
- o There may be need to revise the OECD regions of provenance, adopting a different concept (different from deployment area). However, the well-established administrative system based on regions of provenance is an impediment to revisions. Furthermore, additional complementary information would be necessary together with the existing OECD certificate or label; for example, information on the climatic zone of origin and indication of deployment area.

One of the objectives of the OECD Forest Scheme is trade facilitation. The International Seed Federation has highlighted several potential trade barriers at OECD meetings. A survey on this issue was implemented in 2014 and gave the following results. The trade barriers identified at international level were:

- o phytosanitary measures were the main concern. The OECD Forest Scheme deals only with FRM certification issues and not plant health related problems.

- Non-members may face difficulties if they want to trade with certain regions without OECD certification.

Trade barriers identified at national level were:

- National regulations can cause problems to international trade:
- Horizontal legislations (e.g. Biodiversity Act)
- Specific legislations (e.g. list of regulated species, priority lists, transfer of FRM)
- Grants and subsidies

What can be done to address the issues highlighted above? Various measures could be put in place:

- Extend the membership to the Scheme,
- Collect and share information on national regulations regarding FRM certification systems, trade rules: e.g. list of regulated species; guidelines for FRM Traders (under development),
- Harmonize national certification systems through capacity building and common guidelines,
- Further develop the OECD certification system improving traceability, rules and guidelines.

Finnvid Prescher provided a presentation in his capacity (in this meeting) as representative of the European Forestry Nursery Association (EFNA).

EFNA is an association representing the private nursery sector. It functions as a lobby organization to defend the interest and importance of the private nursery sector. Its members are private nurseries and professional forest nursery trade associations. Currently, the membership covers 12 European countries, where forest trade associations exist. Non-members are invited as observers to EFNA meetings. Main concerns of members related to the following aspects:

- Adhering to the new EU legislation on FRM and plant health regulations poses more or less problems in trade. Domestic legislations might also have an influence.
- Forest certification schemes are often a problem for EFNA, especially due to legislation regarding requirements of local production and origin (it is known that local is not always the best, but certain certification schemes sometimes impose use of locally produced FRM, which means it should come from a radius of 100 km from the site of use).
- The need to use a reduced amount of chemicals for plant protection; this may lead to FRM of lower quality and higher production costs.
- Subsidies for regeneration are important in many countries, but are declining thus discouraging purchase of seedlings from nurseries
- It is difficult to access the best genetic material. Genetically improved material is not largely available and often only accessible by state owned nurseries and not by private nurseries.

How can GenTree help addressing the concerns listed above? A set of main knowledge gaps and priority actions to be implemented were listed:

- There is need for more knowledge about genetic properties of different species in order to adequately undertake a well-informed dialogue with officials from different institutions (European Commission, National Authorities, certification organisations).
- Additional knowledge is needed on what we should grow in future and on how to adapt to climate change.

- A dialogue with forest certification bodies is necessary to influence their views around forest regeneration approaches to be adopted.
- We should eliminate country borders in our consideration of where to find the best FRM for the purpose
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Fabio Gorian (International Seed Testing Association -ISTA) presented a handbook about seed testing and nursery practices (developed in cooperation with OECD). ISTA is the most important international organisation of seed testing, representing more than 80 countries. The handbook is a database which includes protocols for sampling, testing for purity, germination and tetrazolium, for a first list of around 200 species already available in the ISTA Rules. The description for each species is divided in three parts: seed testing, nursery practices, general information (references and links). This project is still in progress. Data can be uploaded by nurseries and/or laboratories, but they need first to be validated by a scientific board. Users interested, can access the information by registering to the portal. New species can continuously be added to the handbook, which will cover conifers, broadleaves and shrubs and will include also cultivated species.



Kurt Ramskogler (LIECO, Austria)

Kurt Ramskogler (LIECO, Austria) provided an introduction to the small enterprise he coordinates and reflected on issues related to the situation in Central Europe with regard to FRM production and use. LIECO produces containerised forest tree seedlings and grounds firmly its experience on research evidence, with 30 years of experience. LIECO is a partner in the Gentree project and brings the practical experience about seedlings production, the demand of practitioners in the forestry sector for what relates to the conservation of genetic resources and future breeding demands.

Ramskogler explained how forest regeneration is regulated by standards defined by EU FRM guidelines and the Forest and FRM legislation in place in each European country. He stressed the importance of considering genetic aspects in FRM production and use because genetics strongly affects quality, stability and vitality of future forest stands. In Austria, seeds for the seedlings production are mainly coming from seed stands, approved by experts according to the various provenance maps and phenotype. Seed orchards were mainly established to secure gene resources for conservation purposes and did not focus on increasing the availability of higher quality FRM to enhance biomass production and improve key traits.

The know-how related to seedlings production in forest enterprises is declining. A considerable part of the production nowadays is taking place in large European nurseries that ship seedlings over long-distance to other end producers (e.g. distributed nurseries in Northern Germany, Netherlands, Hungary). Northern Europe constitutes an exception to this pattern. Traditionally seedlings are planted bare-root (in Austria about 75%, in Germany more than 90%, in Poland approximately 85%). In Northern Europe, the use of containerised forest seedlings was established back in the **1970's**.

Future needs are:

- a larger, more adequate supply of high quality, improved FRM, especially for the main tree species. This can be achieved by increasing breeding efforts, establishing adequate breeding zones and using new breeding technologies;
- Seedling production should be guided by the best available genetic knowledge and attention should be paid to the root system that secures survival and better performance even in case of droughts. Research and development should be directed towards addressing aspects of diversity, seed quality, provenances in general, drought resistance, cuttings, somatic embryogenesis. Recommendations on provenance use should be periodically revised and breeding zones definition should be adapted to evolving needs based on the latest, best scientific information (eg. in Austria www.herkunftsberatung.at);
- Seedlings supply and planting should be well planned by forest experts and the performance of the regeneration should be strictly monitored. Reforestation should be a closed cycle, with various phases, from seed harvesting, seed processing, seedlings production based on demand, to logistics for seedlings delivery, planting taking into consideration seedlings and site characteristics (e.g., with or without soil preparation). Natural and artificial regeneration should be balanced, depending on the individual company goals.
- Seeds harvesting, seed procurement and seedling sale are a matter of trust. Transparency could be increased through adoption of verification systems (examples of existing schemes are Züf, FfV in Germany).
- Availability and trade flow in seeds and seedlings through Europe should be always monitored and standards should be respected regarding seedlings age, quality, and production methods. Purchasing seedlings should be always based on considerations about the compatibility of root development and protection with the purposes of characteristics of the planting site and the reforestation approach used. Site adapted planting approaches are essential.
- Quality and associated costs should reflect more than just the costs of the material, but also the likelihood of a secured regeneration. Quality control of regeneration is very important.

The use of improved FRM increases the demand for high quality containerised forest seedlings.

Forestry in middle European countries needs to be supported by more seed orchards, more availability of improved FRM of the main tree species, through more R&D support and improved knowledge about genetics, about management practices for gene conservation and breeding technologies. In order to achieve a substantial yield increase in some countries (eg North European countries like Sweden), factors like drought tolerance, drought resistance should be considered in targeted breeding, best available FRM should be used in combination with the adoption of appropriate silvicultural treatments. Gentree can help achieving the goals of conservation of the genetic resources, stimulating also the development of high quality FRM through breeding targeting key species and the objective of fostering adaptation to climate change.

- Key remarks that emerged from the discussion following the presentation were the following: genetic aspects should not be considered in isolation but also growing conditions and silvicultural aspects also play a major role in determining the performance of FRM;
- Forest certification schemes are very bureaucratic systems and may not be sufficiently dynamics to follow new demands (eg., needs defined by changing climatic conditions);
- Environmental organizations play a role in influencing the thinking around how forest regeneration should be implemented;
- There is a tendency to use natural regeneration and to use artificial regeneration only in absence of the former;
- Improved FRM offers a lot of benefits but the choice of FRM poses also some risks; in general, the situations of central and northern European forestry sector are very different and present different challenges.

Hans Verkerk, from the European Forest Institute (EFI), presented the preliminary results from **an international Stakeholders' survey on genetic considerations in relation to forest reproductive material**, implemented collaboratively by Bioversity International and EFI in the framework of Gentree. The survey, available in different languages (<http://www.gentree-h2020.eu/news/article/international-survey-on-conservation-and-sustainable-use-of-forest-resources/>), targeted various types of respondents: forest owners and managers, breeders, nurseries, the forest industry sector and policy-makers.

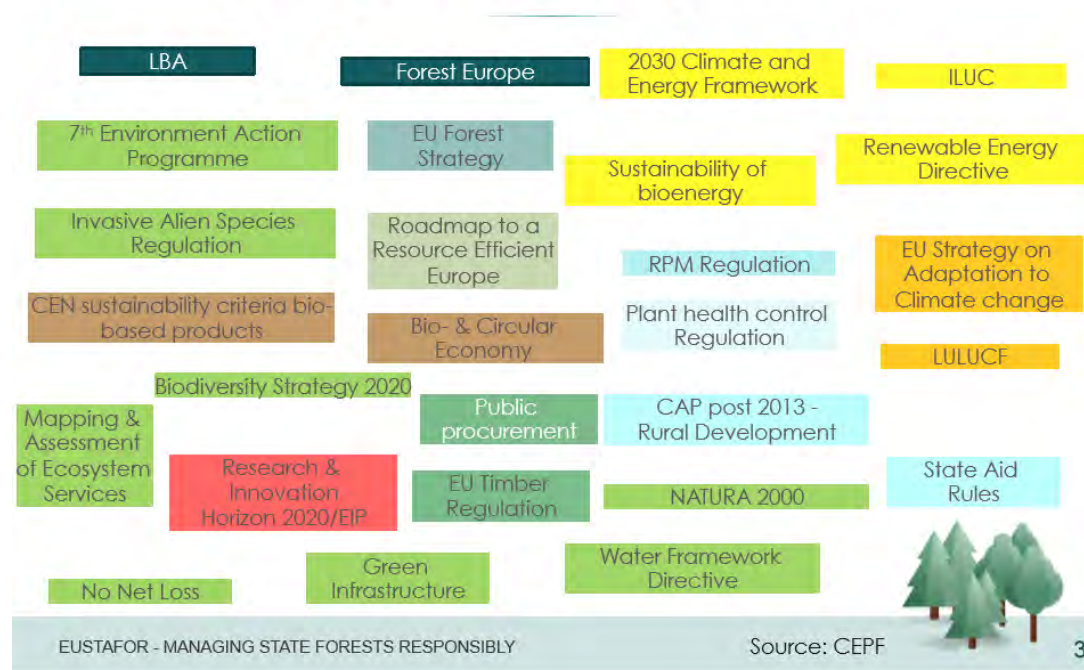
Intermediate results, as of 2 November 2016, were illustrated. A large number of respondents provided feedback (216), but not all respondents filled the questionnaire completely. In addition, answers were not well balanced in terms of geographic representation and profile of respondents, so some corrective measures will be introduced before finalizing the survey. With regard to the most important threats perceived by respondents currently and for the future, the majority of respondents mentioned pests and diseases, followed by wind storms and drought. Unexpectedly, fire was not reported as a major threat not even in South European countries. Using appropriate FRM is seen, in general, as a strategy to mitigate future threats. There seems to be a positive perception regarding use of non-local FRM. More scientific information is requested by respondents despite the availability of technical guidelines.

The survey is still open so additional responses can be provided. The next steps will include the following actions: actively seek responses from the groups of respondents poorly represented; detailed analysis of responses, dissemination of results, integration of the main findings into subsequent activities in Gentree. The presenter invited the participants to further distribute the survey to ensure a good representation of the European context. Gaps in the survey will be addressed through complementary actions such as, for example, interviews with targeted stakeholders in the categories least represented among the respondents.

Round of interventions

The presentations were followed by a round of short interventions. The first contribution was provided by Salvatore Martire, Policy and Communications Advisor at the European State Forest Association (EUSTAFOR). He presented EUSTAFOR, which was established in 2006 and is based in Brussels. The membership is open to all European countries. Currently it gathers 31 Members from 22 countries. He then illustrated the complexity of EU policy frameworks with a direct and indirect influence on forest genetic resources (FGR) (see diagram below).

Complex EU Policy set-up



EUSTAFOR manages ca. 49 Mha, that is, ca. 30% of EU forests. The total forest area under sustainable management is ca. 42 Mha (including French overseas departments). Protected and protective forests represent ca. 16 Mha (8 Mha of Natura2000). Certification is adopted in ca. 43,6 Mha (23,6 Mha PEFC, 19 Mha FSC). He reminded the guiding principle of sustainable forest management that include also consideration for FGR. FGR management is guided by an international framework that includes the European Forest Genetic Resource Programme (EUFORGEN), recognition by the Ministerial Conferences on the Protection of Forests in Europe, recognition by the 9th COP of the Convention on Biological Diversity (CBD) (2008). FGR

management it is also defined by national and local legislations and guidelines. A limiting factor in appropriate implementation of action is a lack of financial resources.

The expectation of EUSTAFOR from a dialogue with Gentree scientists is to participate to an information exchange about best practices and also to hear about the effectiveness of FGR management in view of enhancing resilience of forest ecosystems and adaptation to climate change. From a policy perspective, EUSTAFOR is interested in understanding how policies are affecting adaptation to climate change, by influencing forest managers and owners. He highlighted how the management and use of forest genetic resources is undertaken within the framework of Sustainable Forest Management and he reported examples of best practices in management adopted in from European state forests by Bayerische Staatsforsten (Bavaria, Germany), Metsähallitus (Finland), and ONF (France).

A remark emerged from discussion about the impact of forest certification schemes. These are seen primarily as market driven tools and they encourage natural regeneration therefore limit the possibilities to manage FRM to foster adaptation to climate change in forest stands. The topic was recognized as important for a dialogue with forest certification schemes. It was also remarked that forest certification schemes impose slightly different standards in various parts of the world and this create market disadvantages.



Edurne Lacalle (USSE)

Edurne Lacalle, from the Union of Foresters of Southern Europe (USSE), brought the perspectives of forest owners from southern Europe, involved in management of 10% of EU forest cover, including a region across France, Spain and Portugal, mainly characterized by plantation of non-native species.

Main messages from **an internal survey carried out within USSE to prepare for the Stakeholders' event** indicated that there are large differences among regions. France has a more advanced management of FRM in contrast with Portugal and Spain. FRM of non-native species is only made available by nurseries.

In general members of USSE from Spain and Portugal indicated a lack of technical information and scientific information on genetic aspects and that there is no system in place to track where FRM is planted and its performance based on different the provenances used. A tracking systems would be needed. Furthermore, there is a lack of resources to train forest owners on these matters and the members of USSE expressed the need for a closer collaboration between **research institutes and forest owners' associations**.

Lennart Ackzell, from the Federation of Swedish Family Forest Owners, provided a perspective from small private owners. Europe has about 16 million forest owners. Cutting trees is seen from part of the EU Commission as an action that leads to carbon emissions and therefore may not be sustainable. However, the best way to overcome climate change is to plant trees. Family forest owners have a long-term perspective with regard to their forest management. The choice of appropriate FRM and the survival of young seedlings is crucial for adaptation to the present climate.

Scientific evidence is needed to understand plasticity in species and provenances to changes in seasons in northern countries. In that contexts, the start of the growing season is temperature dependent, whereas the end of the growing season is mainly light regulated. Problems with late spring frost or warm winter periods may increase tree mortality. We are planting in this climate but the trees have to survive in another climate and this is a challenge. There is interest in testing mixed stands, with different species, though exotic species, even those that have been used in Europe for centuries, today are seen as a taboo, so more knowledge is needed on this subject to be able to justify such a choice. Sharing experiences and knowledge is the way forward. Producing scientific knowledge about how exotic species are performing in different environments is a task for scientists, which would support policy making.

Camille Loudun-Hamon, representing the French Regional Centre of forest Estates (CRPF, France), discussed the perception of French forest owners with regard to management of FRM in the face of climate change, in Mediterranean and Alpine forests. The primary uses of forests managed by CRPF are firewood, pulpwood or biomass, and to a very limited extent timber production (mainly softwood). Forests provide multiple services and are important for recreation and environmental services. CRPF provide advice and capacity building opportunities to private forest owners on sustainable management, forest management planning.

The context is characterized largely by private forests, with fragmentation of properties, limited income derived from forests, and, as a consequence, limited concern about forest resources and limited planting, which is seen as risky and unprofitable investment.

A survey on the perception of forest owners was carried out before this Stakeholders' event (along the lines of the main Gentree survey, still ongoing), involving 40 private forest owners, and it gave the following results:

Regarding the perception of the effects of climate change on forests, about half of the respondents indicated that they see some changes, but 23% said they observed some changes but were not sure if these were attributable to climate change. In relation to climate change, 32% observed dieback, 26% expressed concern for pests, 16% for increased risk of fire, 15% observed increasing problems with regeneration. Looking at future conditions, 34% expressed concerns about increasing occurrence of forest fires, pests and storms; 18% indicated concerns about biodiversity loss. About a third of the forest owners interviewed said they were not adopting management measures to foster adaptation to climate change; 16% indicated that they were using species mixtures as a measure to contract climate change, while 15% indicated they were taking measures against forest fires.

The main problem in relation to forest management to foster adaptation are the uncertainties about the future climatic conditions; 17% indicated that they lacked knowledge, and another 15% indicated they had a too small area to manage and 13% put the emphasis on adaptation costs.

The main questions and demands from science posed by private forest owners covered the following themes:

- Would it be more appropriate to substitute species or to use different sources of FRM for the same species (if climate is changing very quickly)
- What provenances should be used inside protected areas (Natura 2000)
- What about the management of sites with more difficult conditions?
- How about costs? Are there subsidies for adaptation?
- Would it be preferable to use enriched planting or to promote complete planting?
- Should plantations be monitored?
- What should be the management approach for forests mainly used for recreation?

The suggestions for interventions included:

- Expand forest management to unmanaged areas, which have the largest share to increase genetic quality of Mediterranean and Alpine forests
- Offer seedlings to forest owners on an experimental basis in small quantities, to enable them to test directly different sources of FRM; provide advice on best practices in planting
- Incentivize wood production through appropriate forest management.

Currently, there are few nurseries and this limits the availability of good FRM on the market and the possibility to choose between different genetic materials for areas in Mediterranean and Alpine forest. On the other side, the demand is scarce, only small quantities are requested. In addition, forest owners do not request specific genetic resources of a particular origin; they rather tend to seek what is available in the nurseries. In general, there are no incentives to plant FRM. The forest cover is also expanding spontaneously and natural regeneration is most commonly used.

Martin Höbarth from the Austrian Chamber of Agriculture (Austria) represented the point of view of forest owners and farmers in Austria, including state-owned forests.

According to Höbarth, climate change and bioeconomy are the main challenges in the forestry sector. **Regarding climate change, a question is how to obtain "climate-fit" forests through active forest management. A central question is "what is more sustainable: to use natural regeneration or to manage forests in an active way to ensure the best to our future generations?"** The subject of natural regeneration deserves a particular attention and should be discussed with certification schemes. Biodiversity will be changed by climate, so which should be our biodiversity targets? With regard to bioeconomy, the key objective is to replace fossil fuels, so we need more availability of wooden materials in future.

Research should focus on breeding in the main forest tree species (spruce, larch, pine, fir), including non-native species (Douglas fir). High quality FRM should be developed with the following objectives:

- Increase resistance to drought, which will be more frequent in future.
- Improve growth performance, as we will need more wood in the future. Rotation should be shortened in order to avoid risks associated with climate change, if long rotation periods are maintained.
- Improve wood quality.

A combination of approaches should be used in managing provenances:

- Management of seed orchards (to be based on private-public partnerships)
- Management of forest stands (seed stands)
- Introduction of fallback systems, finding individuals and plant material that can resist specific diseases (e.g. in the case of ash)

The take home message was that what we plant today, we plant for the next three generations. Gentree can provide some answers to address the key challenges ahead.

General discussion

In general, the contributions of the Stakeholders revealed a large diversity of situations regarding FRM production and use across different sub regions in Europe. The discussion focused on an issue that emerged from various presentations, that is, the fact that forest certification schemes (especially FSC) tend to favour exclusively natural regeneration. This can pose limitations to the possibility of speeding up forest adaptation to climate change by introducing potentially better adapted FRM from other locations. The position maintained by forest certification schemes neglects a reality that is very complex and requires different solutions, based on the local environmental and socio-economic conditions. GenTree should provide policymakers with a more nuanced perception of the benefits and challenges of planting the best FRM vs. natural regeneration.

In relation to this, it was remarked that many forests in Europe have been affected by humans so it is not possible to draw a clear line between what is part of a landscape with planted forests or a natural setting. In reaction to this note, it was observed that in reality for many tree species in Europe we start to have a good understanding of what is the result of natural processes shaping diversity in forests, so what is missing is actually a proper presentation of the scientific knowledge generated, in order to make it widely available and accessible.

Regarding regeneration choices, it may well be that depending on the circumstance, not only natural or artificial regeneration are appropriate but a mix of the two. Finally, high quality breeding material may not be necessarily the best FRM for a particular site.

Regarding the possibility to track and assess the origin of FRM, methods already exist and some tools are already in place so there is need to raise awareness around these options to improve their implementation rather than to develop new approaches. In addition, in order to harmonize procedures, there is a need to adopt one system across European countries, rather than having individual systems implemented in each country. An important issue is that FRM certification is costly and consumers would have to pay for it.

It was highlighted that the implementation of the whole chain of FRM production is costly, particularly the establishment of seed orchards. Of the four recognized categories of FRM, the **category 'tested' is very expensive. It was remarked that private nurseries have problems accessing seeds stands.**

To aim for "climate-fit forests" is an appealing message, that can help orienting opinions, but in practice it is a general concept, difficult to operationalize. The real questions are: how to produce better seedlings? how do seed nurseries know what to produce? How do they know what to produce for various geographic areas? How do forest managers know what material they are actually planting? Trust in nurseries is a fundamental prerequisite.

Decisions regarding forest regeneration and identification of FRM sources cannot be disassociated from consideration about forest management, which can transform tree populations into climate-fit stands in a few generations, by influencing natural selections and modifying tree genetics. Gentree is already responding to the need to better analyse the role of forest management in fostering adaptation to climate change, using model simulations to test the effects of alternative management strategies, which would be realistically applicable, from a financial and ecological point of view.

FRM supply should not only be seen in the context of planting for reforestation or afforestation, but also in the context of other interventions, that are maybe less common but still quite important in some geographic contexts, such as for example forest restoration after fire, restoration of degraded sites, conservation initiatives, landscape restoration, horticulture.

Jeremy Cherfas wrapped up the session, recalling the key points that emerged and reminding Stakeholders to indicate explicitly what kind of answers they need from the scientific activities carried out in Gentree in order to be able to improve FRM production and use, by affecting current practices and influencing policy making.

Day 2- 15 November 2016

Key points from the previous day were recalled by Jeremy Cherfas at the start of the session. This was followed by brainstorming of Stakeholders on strategic recommendations regarding research needs, regulatory gaps and demands for practical guidelines on genetic consideration in the production and use of FRM in Europe.

The final recommendations of the EUFORGEN WG report **on the "Use and transfer of forest reproductive material"** (<http://www.euforgen.org/publications/publication/use-and-transfer-of-forest-reproductive-material-in-europe-in-the-context-of-climate-change/>) were used as a basis to elaborate additional recommendations from the Stakeholders perspective:

The resulting list of main recommendations from Gentree's Stakeholders are presented below. These will feed into the work of the EUFORGEN WG on Forest Reproductive Material, which will further elaborate the recommendations and carry forward the dialogue at the European level on how to improve existing practices with regard to FRM production and use in the light of climate change.

Use provenances instead of species in assisted migration schemes (derived from EUFORGEN WG report)

General observations

- Replacing a species with another will open questions about what provenances should be used for the new species, like in the case of using alternative provenances
- In some cases, replacing provenances may not be a sufficient measure and only species replacement would be a viable measure to cope with external factors (eg, biotic and abiotic factors affecting species diversity). Climate change goals should be well defined before making choices, as both inter-and intra-specific diversity are necessary
- Assisted migration of ecosystems should be considered and tested
- Scientific evidence should be provided to compare options relying on introduced vs. local species

Recommendations

- Research needs: Future adaptability should be investigated. New provenances and species trials should be established across Europe to improve understanding of local adaptation through provenance research. The future scenarios and conditions should be discussed. A comprehensive approach is necessary.
- Practical guidelines: we are experiencing climatic and economic changes. In this light, the existing guidelines should be constantly revised (e.g every 5 years, if necessary), although continuous change is an impediment for adequate implementation of the guidelines. Gentree should aim at developing long-term guidelines for FRM, with enough flexibility embedded that would enable to cope with change.
- Regional relevance: All regions are involved equally in these issues, although specific solutions will be different amongst regions.

Revision of transfer recommendations is necessary at the pan-European level (derived from EUFORGEN WG report)

General observations

- Policy aspects related to trade between countries play an important role in influencing the movement of FRM. National trade barriers can represent a significant constraint to FRM movement, so there is a need to create awareness at policy level
- National legislation often promotes national sources of FRM. The focus of the legislation should be on promoting use of the best of material and not on limiting FRM use to certain provenances. So a question would be how to ensure quality in the FRM use, in respect of the regulations?
- An interesting initiative would be to develop a seed /provenance zonation at European level, expanding provenance maps beyond the national boundaries. This initiative should be supported by a database with locations of all basic materials available (for Scandinavian countries a database a similar tool has been already developed for Scots pine; in Switzerland a seedlot selection tool has been developed). OECD/EU already provide a framework for this.
- Phytosanitary issues linked to FRM movement are a significant concern
- From a scientific point of view, a crucial question is how to develop climate-appropriate recommendations on FRM transfer?

Recommendations

- Research needs: future scenarios should contemplate use of newly imported provenances, so an early rapid testing of how new provenances could perform in the countries of potential introduction is needed. Monitoring should be implemented and continued in the long run to follow the performance of introduced material. Monitoring should become practice and collection of data should be made more stringent. More transplanting experiments should be initiated (eg, Pan-European experiment with poplar clones). Ring-trials across Europe should be organised to verify how, for example, the same clones are performing in different regions. This kind of experiments would supply very useful data to feed climate change research (climate models). Furthermore, provenance zones should be better characterized from an environmental point of view, including information on microclimatic conditions and genetics (climate analogues tools are already existing). Risk analyses should be carried out to guide provenance transfer.
- Practical guidelines: users of FRM should be obliged to register what material is being planted where, and the information generated should be passed on to researchers. Passport data are existing but there are no regulations that make it compulsory to save these data for future research use. Furthermore, a lot of research is being carried out on phytosanitary issues and results should be taken into account in order to generate more awareness (e.g. through guidelines, risk/benefit analyses).
- Dialogue with national regulation authorities is necessary. The right platform to interface for discussion on phytosanitary issues should be identified
- Regional relevance: the recommendations proposed are valid for all sub-regions in Europe.

More stringent control of FRM is needed at all production and marketing stages (derived from EUFORGEN WG report)

General observations

Means to verify origin of FRM need to be set in place as the current control system is not effective. It is necessary to ensure trueness to type, at the intraspecific level (trueness to population). Major differences exist among countries in the national level of control implemented across the FRM production chain. Tools based on molecular markers already exist that enable control agencies to monitor and trace FRM easily and cost-effectively, so the priority is to improve them to make them fully operational. A central database at European level, should be put in place.



Bruno Fady (INRA, France)

Recommendations

- Research needs: The existing systems based on fingerprinting tools need to be further developed to allow application of very rapid tests on FRM
- Practical guidelines: Fingerprinting of provenances should be implemented. Ways to ensure adoption across European countries should be found and awareness raising is necessary
- Dialogue is necessary with policy authorities in charge of FRM control systems. Adequate rules are in place but are not being effectively followed. Enforcement is necessary rather than development of new tracking systems.
- Regional relevance: with respect to this subject, considerable differences across European countries can be found. Some European regions seem to be performing better in terms of control of FRM origin. Furthermore, in some regions, verifications indicate a generally more correct match between the stated origin and the verified origin of the FRM used. Differences in performance of control systems in place can be found also among regions within countries (e.g. In Italy and Spain). Not all countries have the capacity to perform FRM controls (e.g.

Iceland). It is recommended to use centralised standards for FRM monitoring and tracking, rather than a centralised monitoring service. The definition of these standards require a dialogue between the responsible ministries within countries, the OECD and the European Commission.

Dissemination of information on the value of FRM to forest owners, managers and policy-makers needs to be improved – Awareness raising is needed to create a market for high quality FRM



Mari Mette Tollefsrud (Norwegian Forest and Landscape Institute, Norway)

General observations

It was observed that awareness raising would be crucial to sensitize FRM final users and policy makers on the value of high quality FRM, and thereby creating demand for it based on proper understanding of benefits associated with its use and to explain the higher costs involved. It was remarked that there is a need to better **define what 'quality' means with regard to FRM**, and also to refer always to the ultimate purpose of the planting when discussing choices of different types of FRM. The need to discuss how different types of markets for FRM would operate and what model would be most appropriate to obtain the desirable results (eg., free market vs state market) was also emphasized.

Recommendations

- o Research needs: Case studies of both success and failure cases in using FRM of different quality should be well packaged and widely disseminated to support knowledge sharing across countries and reach a generally higher level of awareness on the consequences of choices around FRM origin and quality. Demonstration plots should be established including also unsuitable provenances to provocatively show the results of poor choices of FRM and

highlight the importance of genetic aspects in FRM development and use. Also information from existing trials should be appropriately made available. Forest owners willing to participate in research could be directly involved in experiments with FRM and should be provided guidelines on how to test and record FRM performance. Many small tests rather than large provenance trials would be best to achieve the goal. With regard to defining a market system that would promote the best use of FRM, more investigation is needed, for example, developing case studies showing how market affects FRM under different systems (eg capitalistic regime vs socialist). Research on fore sighting future scenarios of performance of different sources of FRM, used for different purposes, should be carried out.

- Practical guidelines: the use of seedlots certified according to centrally approved standards (eg by ISTA) was suggested.
- Policy action: it should be undertaken with involvement of Forest Europe and the European Forest Institute.
- Dialogue with Forest Europe should be established, and also with universities, for curricula development, and forest **owners'** associations.
- Regional relevance: the actions proposed are relevant for all countries in Europe

The protocols used in forest certification systems are too restrictive and there is a need to influence forest certification systems for what concerns FRM use

General observations

FRM is the starting point in the establishment of forests adapted to changing environmental conditions, however, also forest management has a key role in improving forest adaptation. High genetic quality of FRM is necessary, but other activities need to be taken into account beyond seedlings production. It has been already highlighted that awareness raising is strategic to create a market for high quality FRM. It was also observed that it is challenging and costly to appropriately incorporate climate change considerations into FRM production (eg, the establishment of selection orchards and seed orchards is expensive).

Recommendations

- Research needs: comparative studies on the advantages and disadvantages of active (artificial) vs. passive (natural) regeneration in light of climate change should be established. Existing evidence should be properly packaged in order to support dialogue with forest certification bodies.
- Dialogue with forest certification schemes (e.g FSC, PFC) at both centralised level and national level will be necessary. Natural regeneration is usually a priority for such schemes. However, natural regeneration and local provenances may not always perform best. In order to influence PEFC, a dialogue on these themes should be started with Forest Europe first. PEFC is now revising its criteria & indicators so the timing would be appropriate.

The timeframe and funding for FRM production are often limited to a few years, while proper planning requires a longer time span and greater availability of resources

- Dialogue with policy makers is necessary, to convince them that a longer timeframe and appropriate planning are critical. Awareness raising and strong communication are needed at all levels.

Annexes

Annex 1 – Agenda

Monday 14 November	
12.30	Transport from Hotel Leonardo Madrid City Center to INIA "Puerta de Hierro"
13:00 – 14:00	Welcome buffet and registration of participants
14:00-14:15	Opening of the meeting <ul style="list-style-type: none"> • Welcome opening from INIA (Ricardo Alia) • Welcome opening from GenTree (Bruno Fady) • Welcome opening from the EUFORGEN Programme (Michele Bozzano) • Presentation of the agenda (Barbara Vinceti)
14:15-16:15	Setting the scene – Presentations followed by Q & A <ul style="list-style-type: none"> • General background on key issues related to forest reproductive material in Europe (synthesis of EUFORGEN' Working Group report, Michele Bozzano) 15 min • Presentation by the Organization for Economic Co-operation and Development (OECD) - Forest Seed and Plant (Csaba Gaspar) 15 min • Presentation by the European Forestry Nursery Association (EFNA) (Finnvid Prescher) 15 min • Presentation by the International Seed Testing Association (ISTA) (Fabio Gorian) 15 min • Presentation by the company LIECO (Austria) (Kurt Ramskogler) 15 min • Presentation of preliminary results from the international Stakeholders' survey on genetic considerations in relation to forest reproductive material, implemented in the framework of Gentree (Hans Verkerk, EFI) 15 min
16:15 -16:45	Coffee/tea break
16.45-18:15	Round of short interventions by: <ul style="list-style-type: none"> • Salvatore Martire (European State Forest Association (EUSTAFOR)) • Eurne Lacalle (Union of Foresters of Southern Europe (USSE)) • Lennart Ackzell (Swedish Federation of Forest Owners, Sweden) • Camille Loudun Hamon (Regional Forest Estates Centres, France (CRPF)) • Martin Höbarth (Austrian Forest Association, Austria)
18:15- 18:30	Wrap up
18.30	Transportation to the city centre (Hotel Leonardo Madrid City Center, Calle de Alberto Aguilera, 18)
20.00	Social dinner at Arrocería Casa de Valencia, Paseo del Pintor Rosales, 58

Tuesday 15 November	
8.30	Transport from Hotel Leonardo Madrid City Center to INIA "Puerta de Hierro" (bus departure in front of the Hotel Leonardo Madrid City Center)
9.00 – 9:15	Synthesis of main points from previous day
9:15-11:00	Discussion about research needs, regulatory gaps, demands for practical guidelines on genetic consideration in the production and use of forest reproductive material in Europe
11:00 - 11:30	Coffee/tea break
11:30-12:50	Definition of main recommendations from the meeting. Results will feed into the work of the EUFORGEN Working Group on Forest Reproductive Material, which will elaborate further the recommendations from this Stakeholders' event
12:50-13:00	Closing of the meeting
13.00-14.00	Lunch at INIA canteen

Annex 2 – List of participants

Lennart Ackzell
Federation of Swedish Family Forest Owners
105 33 Stockholm
Sweden
+46 771573573

Ricardo Alía
Centro Investigacion Forestal, INIA
Dpto. Sistemas y Recursos Forestales
Carretera Coruna km. 7,5
28040 Madrid
Spain
+34-91 3473959

Sándor Bordács
Department of Forest and Biomass
Reproductive Material
Keleti Karoly utca 24
1024 Budapest
Hungary
+36 13369300

Gregor Božič
Slovenian Forestry Institute
1000 Ljubljana
Slovenia
+386-1 200 78 21

Thröstur Eysteinnsson
Iceland Forest Service
700 Egilsstaðir
Iceland
+354 4702000 (switchboard)

Bruno Fady
INRA, FR ECCOREV, UR629 Ecologie des Forêts
Méditerranéennes (URFM)
Avignon cedex 9
France
+33 432722908

Aline Frank
Swiss Federal Institute for Forest, Snow and
Landscape Research WSL
Zürcherstrasse 111
8903 Birmensdorf
Switzerland
+41 447392468

Josef Frýdl
Forestry and Game Management Research
Institute (FGMRI)
Strnady 136
252 02
Jíloviště
Czech Republic
+420 257892271

Csaba Gaspar
OECD Forest Seed and Plant Scheme
2, rue André Pascal - 75775 Paris Cedex 16
France
+33 145249553

Dušan Gömöry
Technical University
T.G. Masaryka 24
960 534 Zvolen
Slovakia
+421 455206226

Fabio Gorian
International Seed Testing Association (ISTA)
Zuerichstrasse 50, 8303 Bassersdorf
Switzerland

Monique Guibert
IRSTEA U.R. Ecosystème Forestiers
Domaine des Barres
45290 Nogent-sur-Vernisson3
France

Katri Himanen
Natural Resources Institute Finland
Juntintie 154, 77600 SUONENJOKI
Finland
+358295325276

Martin Höbarth
Austrian Chamber of Agriculture
Schauflegasse 6 1015 Wien
Austria
+43 1534418592

Ana Jurše
Ministry of agriculture, forestry and food
Dunajska c. 22 1000 Ljubljana
Slovenia
+386 (0)1 4789369

Stuart Kennedy
Forest Research; Northern Research Station
Kilmacurragh Co. Wicklow
Ireland
+353 40448400

Jan Kowalczyk
Silviculture and Genetics Department
Braci Lesnej Street, No. 3, Sekocin Stary
05-090 Raszyn
Poland
+48 227150473

Mladen Ivankovic
Dept of Tree Breeding and Forest Seed
Husnabdry, Cvjetno naselje 41
10450 Jastrebarsko
Croatia
+385 1 62 73 005

Edurne Lacalle
Union de Selvicultores del Sur de Europa
(USSE)
Parque Tecnológico de Bizkaia
C/ Kanala, Edificio 103, 2ª planta
E- 48170 - ZAMUDIO,
Spain
+34 944747826

Marco Lassnig
Land & Forst Betriebe Österreich (LFBÖ)
Schauflegasse 6/5
1010 Wien
Austria
+4315330227

Heike Liesebach
Thünen Institute of Forest Genetics
Sieker Landstraße 2
22927
Großhansdorf
Germany
+49 4102696158

Camille Loudun Hamon
Centre National de la Propriété Forestière
Délégation de Provence-Alpes-Côte d'Azur
7, impasse Ricard Digne
13004 Marseille
France
+33674891876

Tiit Maaten
Estonian University of Life Sciences
Kreutzwaldi 5
51014 Tartu
Estonia
+372 5296523

Barbara Mariotti
University of Florence,
Department of Agricultural, Food and Forestry
Systems, Florence
Italy
+393491834158

Salvatore Martire
European State Forest Association
(EUSTAFOR)
European Forestry House
Rue du Luxembourg, 66
1000 Brussels
Belgium
+32 22392306

Felipe Perez Martin
Ministry Of Agriculture And Fishing, Food And
Environment
Av. Gran Vía de San Francisco 4 - 6, 5ª planta -
28005 MADRID
Spain
+34 913475887

Arantza Perez Oleaga
Programme for the Endorsement of Forest
Certification (PEFC)
Madrid
Spain
+34 91 591 00 88 87

Andrej Pilipovič
Institute of Lowland Forestry and Environment
Antona Cehova 13
21000 Novi Sad
Serbia
+381 21540383

Finnvid Prescher
Svenska Skogsplantor Fröverksamheten
Åbyforsvägen, 341 51 Lagan
Sweden
+46 37230381

Roberta Proietti
Consiglio per la ricerca in agricoltura e l'analisi
dell'economia agraria (CREA)
Forestry Research Centre (CREA-SEL)
Viale S. Margherita, 80
52100 Arezzo, Italy
+39 0575 353021

Gunnar Friis Proschowsky
Ministry of the Environment
Gillelejevej 2B
DK-3230 Græsted
Denmark
+45 49190214

Kurt Ramskogler
LIECO GmbH & Co KG
A-8775 Kalwang, Forstgarten 1
Austria
+436763205235

Volker Schneck
Institute of Forest Genetics
Eberswalder Chausee 3a
15377 Waldsiedersdorf
Germany
+49 33433157179

Ralf Stölting
Forest Seed Dealing
Hexentellerweg 32, Kiel
Germany
+491707744473

Mari Mette Tollefsrud
Norwegian Institute of Bioeconomy Research
PO Box 115 NO-1431 Ås
Norway
+47 64949194

Josep Maria Tusell
Consorci Forestal de Catalunya
Representative of the Confederation of
European Forest Owners (CEPF)
Jacint verdaguer, 3
17430 Santa Coloma de Farners
Spain
+34 666031181

Dr. Pieter Johannes (Hans) Verkerk
European Forest Institute
St. Antoni M. Claret, 167
08025 Barcelona
Spain
+34663625875

Miljenko Županić
Croatian Union of Private Forest Owners
Associations (CROUPFOA)
Representative of the Confederation of
European Forest Owners (CEPF)
Frana Supila 7
HR-10000 Zagreb
Croatia
+38598604739

EUFORGEN Secretariat

Michele Bozzano

Nina Olsen Lauridsen

Ewa Hermanowicz

Biodiversity International

Barbara Vinceti

Facilitator
Jeremy Cherfas



Group photo of all participants to the Gentree Stakeholders' event

Annex 3 - Organizers

The EU project Gentree (<http://www.gentree-h2020.eu/>) has the goal to provide the European forestry sector with better knowledge, methods and tools for optimising the management and sustainable use of forest genetic resources (FGR) in Europe in the context of climate change and continuously evolving demands for forest products and services.

To reach its goal, GenTree will make scientific, technological and implementation breakthroughs in:

- designing innovative strategies for dynamic conservation of FGR in European forests
- broadening the range of FGR used by European breeding programmes
- preparing new forest management scenarios and policy frameworks fully integrating genetic conservation and breeding aspects, to adapt forests and forestry to changing environmental conditions and societal demands.

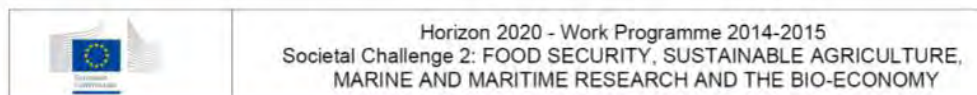
GenTree focuses on economically and ecologically important tree species in Europe, growing in a wide range of habitats and covering different societal uses and values.

Bioversity International delivers scientific evidence, management practices and policy options to use and safeguard agricultural biodiversity to attain sustainable global food and nutrition security. Bioversity International is a member of the CGIAR Consortium, a global research partnership for a food secure future. www.bioversityinternational.org

Co-organizer

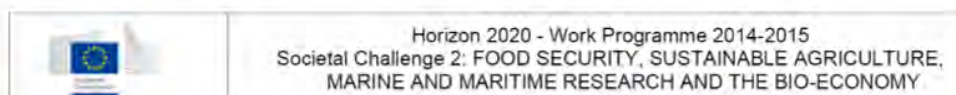
The European Forest Genetic Resources Programme (EUFORGEN) is an instrument of international cooperation promoting the conservation and appropriate use of forest genetic resources in Europe. It was established in 1994 to implement Strasbourg Resolution 2 adopted by the first Ministerial Conference of the FOREST EUROPE process on Conservation of forest genetic resources. EUFORGEN promotes conservation and sustainable use of genetic resources of forest trees in Europe. During the past 20 years, more than 30 European countries have contributed to its work. The EUFORGEN Secretariat is hosted by Bioversity International. www.euforgen.org

Annex 4 – Information on the Gentree project



GenTree **Optimising the management and sustainable use of forest genetic resources in Europe**

Website: <http://www.gentree-h2020.eu/>



GenTree **Optimising the management and sustainable use of forest genetic resources in Europe**

Topic: SFS-7-2014/2015 (Genetic resources and agricultural diversity for food security, productivity and resilience)

Sub-topic: SFS-07b-2015 (Management and sustainable use of genetic resources)

Start date: 1st March 2016

Duration: 48 months

Budget: 7.9 Million Euro (with a 6.7 Million Euro grant by the European Union)

Coordinator: Dr. Bruno Fady, INRA, France (bruno.fady@avignon.inra.fr)



GenTree **Optimising the management and sustainable use of forest genetic resources in Europe**

Overall concept of GenTree – Expected impacts

To provide the European forestry sector with **better knowledge** and **new tools** for efficient **management and sustainable use of FGR** in the context of environmental change and evolving societal demands, GenTree will:

- (i) expand the current scientific knowledge on how genetic diversity, phenotypic trait diversity and environmental diversity co-vary over multiple spatial scales,
- (ii) inform on the genetic basis of phenotypic trait variability and plasticity,
- (iii) characterise in-situ and ex-situ conservation units and underused natural resources, and
- (iv) produce models of future species distribution usable for FGR management under diverse policy and environmental scenarios.

