

D5.1: Stakeholder demands and perceptions on improved FRM use and adaptive breeding and forest management strategies

Executive summary

1. Background information

This report focuses on adaptive breeding for productive, sustainable and resilient forests under climate change and was commissioned by the EU-funded Horizon 2020 project B4EST. The activities of the European forest genetics and breeding community need to be acceptable among stakeholders of the forest-based bio-economy, which is why breeders need detailed and updated knowledge on perceptions and demands towards improved forest reproductive material and its use in forest management.

2. Methodology

To understand demands of various societal groups and members of forest based value chains towards improved forest reproductive material, we conducted an online survey to collect quantitative data. The investigated species are six native (Norway spruce, Scots pine, maritime pine, poplar, common ash, stone pine) and two non-native (Douglas-fir, Eucalyptus) in nine (Finland, France, Germany, Italy, Norway, Portugal, Spain, Sweden and the United Kingdom) European countries. Our objectives are:

- To outline a comprehensive picture of desired benefits of improved forest reproductive material
- To understand to what extent opinions diverge between different countries, species and main response groups
- To identify priorities in terms of adaptation of future forests to climate change and forest sector needs

3. Main results

3.1 Characteristics of the sample

Our study yielded 565 responses in total and the species with the highest number of responses are Douglas-fir, Norway spruce and Scots pine.

Socio-demographic: The online survey was open to all stakeholders of the forest-based bio-economy and the highest number of responses came from public administrators as well as public and private forest managers. The majority of respondents work at the provincial and forest management level which constitutes the operational level. Concerning size, respondents overwhelmingly represented forest areas of more than 11,000ha. Our respondents are experienced and knowledgeable in their field because the majority has 20 or more years of professional work experience and holds a university degree in forestry or a closely related subject.

3.2 Perceptions of climate change

Our research shows that negative effects of climate change in the forests are already observed today and even more negative effects are expected by 2050. There are regional differences concerning the perceived effects of climate change, for example, in Scandinavian countries and the United Kingdom there is a balance of observed positive and negative effects of climate change whereas in Southern European countries and Germany, the observed and expected effects are more negative.

3.3 Climate change adaptation measures

There is some confidence by the European forest sector that future climatic changes will be manageable. Our analysis shows confidence variations between Finland, Italy and Norway leaning towards the expectation that adaptation to climate change through forest management will be possible on the one hand. On the other hand, in Portugal and Germany respondents are leaning more towards the perception that adaptation will (only) be

moderately possible by 2050. Based on our research, the three most important forest management strategies to adapt to climate change cited by respondents are:

- Diversification of tree species
- Artificial regeneration with improved forest reproductive material
- Enrichment of natural regeneration with forest reproductive material better adapted to future climate changes

3.4 Level of knowledge of improved forest reproductive material and adaptive breeding

We show that the level of knowledge of improved forest reproductive material and adaptive breeding differ across the investigated countries and stakeholder groups. Generally, the respondents are moderately informed about improved forest reproductive material.

3.5 General perceptions of improved forest reproductive material

Our research shows that improved forest reproductive material is considered important in forest regeneration and afforestation to adapt to climate change. Consequently, the effects of improved forest reproductive material are positively perceived in forest regeneration and afforestation. This is true across the countries that we studied and in particular in countries such as Finland and Portugal with a high share of intensively managed forests. The following strategies related to forest reproductive materials have the same importance when it comes to climate change adaptation in the European forestry sector:

- Diversification of the gene pool through mixing today locally adapted provenance and other improved forest reproductive material (from local or non-local origins)
- Use of non-local provenances tested and recommended for their adaptation to future climate (e.g. population transfer from different locations)
- Use of today locally adapted provenances

3.6 Species-specific perceptions and demands of improved forest reproductive material

Following general perceptions of forest reproductive material, respondents had the opportunity to answer questions for each species covered by the online survey. The following overview shows the most frequent answers across all investigated species:

Table A: Overview of species-specific results

	Douglas fir	Norway spruce	Scots pine	Maritime pine	Poplar	Common ash	Eucalyptus	Stone pine
Biophysical criteria for selection	Biotic disturbances ¹	Biotic disturbances	Biotic disturbances	Biotic disturbances	Biotic disturbances	Survival rate	Abiotic disturbances ²	Non-timber products ³
Socio-economic criteria for selection	Forest managers ⁴	Forest managers	Forest managers	Forest managers	Industry ⁵	Forest managers	Forest managers	Forest managers

¹ Expected higher resilience to biotic disturbances (e.g. pests and diseases)

² Expected higher resilience to abiotic disturbances (e.g. floods, frost, temperature, windstorm)

³ Expected higher productivity of non-timber forest products (e.g. cones, resin, oil)

⁴ Positive perceptions of forest owners and managers

⁵ Positive perceptions of the industry



Issues preventing the use of FRM	Forest management	Availability	Forest management	Limited choice	Concerns of managers	Availability	Concerns of managers	Availability
Improved vs. non-improved FRM ⁶	6.0	6.0	6.0	7.0	7.0	6.0	7.0	6.0
Climate conditions ⁷	Drought	Drought	Drought	Drought	Windstorm	Drought	Drought and frost	Drought
Needed improvements in plant traits	Seed quality	Seed quality	Seed quality	Seed quality	- ⁸	-	-	-
Cost-benefits ratio ⁹	4.0	5.0	4.0	5.0	-	5.0	-	-
Outlook ¹⁰	6.0	5.0	5.0	6.0	6.0	5.0	6.0	6.0

4. Final remarks

Across all countries and all species investigated, improved forest reproductive materials are perceived positively now and in the future. To successfully adapt to climate change, the use and importance of improved forest reproductive material is expected to increase and at the same time, more research is needed to find solutions to the biggest threats like droughts, windstorms and pests. This may indicate that breeding programs for a larger number of species are required to reach an expected level of diversification. Our research could be enhanced by covering Eastern European countries, which also have a strong breeding community.

⁶ Comparison of benefits between using improved FRM* and non-improved FRM (1.0=not at all beneficial, 4.0=moderately beneficial, 7.0=extremely beneficial)

⁷ Most important climate condition for which improved FRM needs to be more resilient

⁸ No data available

⁹ Cost-Benefit relation of investment in improved FRM (1.0=net loss, 4.0=investment fully compensated, 7.0=net gain)

¹⁰ Expected improved FRM developments in the next 20 years (1.0=will strongly decrease, 4.0=remain the same, 7=will strongly increase)