

## Deliverable D1.4 – Documentation of Demonstration sites

Project Title	Alternative models and robust decision-making for future forest management
Project Acronym	ALTERFOR
Project Coordinator	Ljusk Ola Eriksson, Swedish University of Agricultural Sciences (SLU)
Scientific Coordinator	Vilis Brukas, Swedish University of Agricultural Sciences (SLU)
Project Administrator	Giulia Attocchi, Swedish University of Agricultural Sciences (SLU)
Project Duration	1 April 2016 – 30 September 2020
Project Duration in months	54
Authors, organizations (short name)	<p><b>Germany:</b> Peter Biber (TUM)</p> <p><b>Ireland:</b> Anders Lundholm (UCD), Kevin Black (UCD), Edwin Corrigan (UCD), Maarten Nieuwenhuis (UCD), Charles Harper (UCD)</p> <p><b>Italy:</b> Giulia Corradini (UNIDP), Mauro Masiero (UNIDP), Davide Pettenella (UNIDP)</p> <p><b>Lithuania:</b> Ekaterina Makrickienė (ASU), Nerijus Pivoriūnas (ASU), Gintautas Mozgeris (ASU)</p> <p><b>The Netherlands:</b> Marjanke Hoogstra (WU), Bas Lerink (WU), Geerten Hengeveld (WU)</p> <p><b>Portugal:</b> Ana Raquel Rodrigues (ISA), Brigitte Botequim (ISA), Marlene Marques (ISA), Carlos Caldas (ISA), Sandra Pinto (ISA), José Guilherme Borges (ISA), Américo Mendes (AFVS)</p> <p><b>Slovakia:</b> Robert Sedmak (TUZVO), Jan Tuzek (TUZVO), Jan Bahyl (TUZVO)</p> <p><b>Sweden:</b> Kristina Wallertz (SLU), Eric Agestam (SLU)</p> <p><b>Turkey:</b> Selahattin Köse (KTU), Uzay Karahalil (KTU)</p>
WP No., WPL(s)	WP1, Eric Agestam (SLU), Kristian Wallertz (SLU)
Date of delivery by Coordinator	28 August 2020
Date of delivery according to DoA	31 August 2020
Reviewed by (see list of abbreviations used)	
PC, SC and WP5 leader	
Type of Deliverable	
Report	X
Demonstration	
Websites, patents, fillings, etc.	
Dissemination level	
Public	X
Confidential, only members of the consortium (including the Commission Services)	
Other	

## Content

List of Figures.....	2
Abbreviations .....	3
Summary .....	4
1 General information about demonstration sites presented in ALTERFOR .....	5
Germany .....	7
Ireland .....	9
Italy.....	9
Lithuania.....	10
The Netherlands.....	10
Portugal .....	11
Slovakia.....	11
Sweden.....	12
Turkey.....	12
2 Brief description of demonstration sites.....	13
Germany .....	13
Ireland .....	14
Italy.....	16
Lithuania.....	17
The Netherlands.....	18
Portugal .....	19
Slovakia.....	19
Sweden.....	21
Turkey.....	22

## List of Figures

FIGURE 1. DIRECTORS OF THE BAVARIAN LONG TERM NETWORK OF GROWTH AND YIELD TRIALS. ....	7
FIGURE 2. CURRENT MAP OF THE BAVARIAN LONG-TERM NETWORK OF GROWTH AND YIELD TRIALS. ....	8

## Abbreviations

aFMM – alternative Forest Management Model  
AFVS – Sousa Valley Forest Owners' Association, Portugal  
ALTERFOR – Alternative Models and robust decision-making for future forest management  
ASU – Vytautas Magnus University, Lithuania (formerly Aleksandras Stulginskis University)  
CSA – Case Study Area  
FMM – Forest Management Model  
ISA – Instituto Superior de Agronomia, Universidade de Lisboa, Portugal  
KTU – Karadeniz Technical University, Turkey  
MSG – Management Support Group  
PA – Project Administrator  
PC – Project Coordinator  
SC – Scientific Coordinator  
SLU – Swedish University of Agricultural Sciences, Sweden  
TUM – Technische Universität München, Germany, Germany  
TUZVO – Technical University in Zvolen, Slovakia  
UCD – National University of Ireland Dublin – University College Dublin, Ireland  
UNIDP – University of Padova, Italy  
WP – Work Package  
WPLs – Work Package Leader(s)  
WU – Wageningen University, The Netherlands

## Summary

The ALTERFOR project examines existing and alternative forest management models (FMMs and aFMMs) in ten case study areas (CSAs) in nine European countries, trying to understand how management models would affect provision of different ecosystem services (ES) in a perspective of decades. Alternatives to existing management are identified and will hopefully be used to enhance the provision of desired ecosystem services.

The implementation of aFMMs in each CSA is an important task for ALTERFOR. For this reason, forest owners' guidelines are produced and demonstration sites (demo-sites) are established. The information about demo-sites and the guidelines are country-specific and written in the national language. Demo-sites and guidelines give basic experience, knowledge and instructions about aFMMs.

Demonstration sites are an important complement to guidelines. The demo-sites show silviculture techniques and the results of different aFMMs in the field to give possibilities to see not only read about them.

Demonstrations in field has a long tradition in forest education and knowledge transfer. Demonstration sites can be utilized for educational purposes at many different levels, from information to public and to forest owners, to experienced forest managers, but also at academic level.

All partners have established demo-sites for aFMMs. Many demo-sites are research-plots used in ongoing forest field research, others are established within the ALTERFOR project. For some alternatives, there are no possibilities to establish demo-sites and other technics are used as photos and visualizations.

## 1 General information about demonstration sites presented in ALTERFOR

Project ALTERFOR examines existing and alternative forest management models (FMMs and aFMMs) in ten case study areas (CSAs) in nine European countries, trying to understand how management models would affect provision of different ecosystem services (ES) in a perspective of decades. FMMs are documented in Deliverable 1.1 (D1.1) and aFMMs in D1.2 (available on the ALTERFOR homepage: <https://alterfor-project.eu/>).

Forest Management Models vary a lot between CSAs. The different models must be adapted to natural conditions such as climate and site properties and to ownership structure. Also, different management models are used for different tree species and combinations of species. The social, technical and administrative situation and the demand for products and services vary between CSAs.

Existing FMMs might have served well until now and will mainly do so, also in the future. But an important task for ALTERFOR is the implementation of alternative Forest Management Models (aFMMs). The aFMMs are alternatives to replace or complement existing FMMs. Changing climate will affect forestry in many ways. But forests and the way we manage them play an important role in our work to reduce climate change, too, perhaps primarily as a carbon sink. This has strongly influenced the work in ALTERFOR, which is reflected in the work with guidelines and now demo-sites. Care for biodiversity and chances for social services such as recreation are important and will be more important in the near future. Cultural monuments of different types and ages that are found in forests are important to manage, because they remind us of our and nature's history. The risk of damage, such as insect- and storm damages, affect forestry and is something that is highlighted in several demo sites, too.

In order to have any chance to impact future use and management of forests, the aFMMs must be known and accepted by managers, forest owners and others. Therefore, ALTERFOR WP1 put a lot of effort in producing pedagogical tools for knowledge transfer about forest management and silviculture in general and specially about the aFMMs. The work is divided in two main parts. Part one: **guidelines**. The guidelines are mainly written information on forest management and aFMMs. They are presented in Deliverable 1.3 (D1.3, May 2020).

Demonstration sites (demo-sites) are a very important complement to guidelines. They are closely connected to them. Demonstration sites show silviculture techniques and the result of different aFMMs in the field giving the chance to see the results, not only to read about them. All aspects can hardly be described in words and perceived without visiting the forest. Forests are not only trees, but much more. Forest owners and managers often focus on wood production, but considering risks for damages and failures are also important. Society and the public appreciate other ecosystem services from forests as biodiversity, recreation and cultural values. Seeing and feeling the forest, not just reading about it, is extremely important in the process of knowledge transfer and necessary if the aFMMs are to be used and ALTERFOR project is to have an impact on forestry in the partner countries. Demonstrations in field has a long tradition in forest education and knowledge transfer. Demo-sites can be utilized for educational purposes where forest owners can see the aFMMs in practice with different silviculture techniques and assist in gaining a better understanding of their ES provision and management.

For some alternatives, there are no possibilities to establish demo-sites and other technics are used, such as photos and visualizations.

Below, there is a description of the demonstration sites. The sites are also described for each CSA in the national language. All descriptions can be found on the ALTERFOR homepage: <https://alterfor-project.eu/wp1.html>. The demo-sites will be used many years and the descriptions will be edited when new information is available, e.g. measurement of growth and yield.

## Germany

### Long-term forest growth and yield trials in Bavaria

The ALTERFOR demonstration sites presented now have the advantage of being part of the long-term growth and yield trial network in the federal state of Bavaria, which was first established in the 1870ies by August v. Ganghofer and has been gaplessly maintained and surveyed since then (Figure 1). The ALTERFOR-partner TUM (Chair for Forest Growth and Yield; head: Prof. Hans Pretzsch) is responsible for this network.

Figure 1. Directors of the Bavarian long term network of growth and yield trials.



Since its establishment, the network has supported forest scientists and practitioners on their way from “rules of thumb” to sound knowledge. The network is not to be misunderstood as a set of plots that were established in 1870 and surveyed since then (although such plots exist in the network). It is rather a dynamic system, where new plots are established in order to answer new questions and others are abandoned in case there is nothing more to learn out of them. But, there is always the view, that the longevity of forests requires a long-term perspective in experimenting and monitoring in order to avoid misleading results.

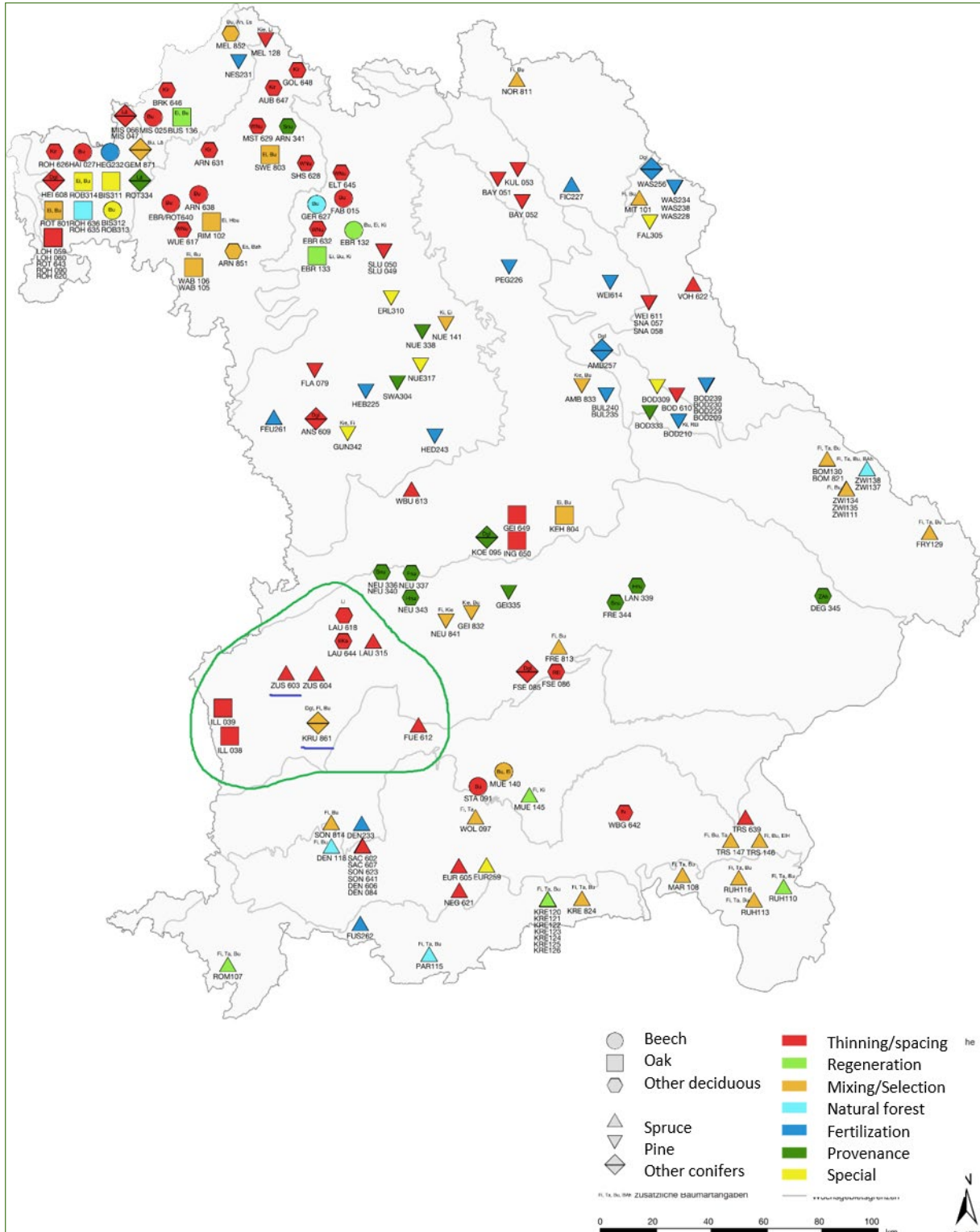
In the context of ALTERFOR, this means that it was not necessary to establish demonstration sites ad hoc and to secure their future. The trials and plots used as demonstration sites have been surveyed several times already, and this will continue for several decades at least, following clear experimental plans and standardized survey and evaluation procedures.

At the time being, the network comprises 141 trials, which break down into 885 single plots. Figure 2 shows the distribution of the trials across the Federal State of Bavaria, with a green outline around the trials mentioned as demonstration sites in table below. The two most important demonstration sites are the Norway spruce thinning and spacing trials Zusmarshausen 603 (ZUS 603) and the Douglas-fir/European beech growth series trial Krumbach 861 (KRU 861), both underlined in blue.

On the following pages, we present excursion guides for the trials Zusmarshausen 603 and Krumbach 861. These excursion guides are mainly made for practitioners and stakeholders who command basic knowledge of forests, forestry and forest ecology. The excursion guide for ZUS 603 is appended in an English version, while the one for KRU 861 is available in German. Interested persons are encouraged to contact us with requests for more information.



Figure 2. Current map of the Bavarian long-term network of growth and yield trials.



Each symbol represents at least one trial, which typically comprises several plots. The green outline contains trials that serve as ALTERFOR demonstration sites. The most important sites, ZUS 603 and KRU 861, are underlined in blue.

## Ireland

The Irish aFMMs offer a combination of low-impact blanket bog forest management systems. These aFMMs complement each other regarding which site productivities they were designed for, so that there is a varied and fragmented forest landscape when they are established. The aFMMs are complementary to forest management and do not exclude the use of other forest species or management systems.

For production, one suggestion is to plant lodgepole pine, at a lower than normal stocking (ca 1,600-2,000 stems ha<sup>-1</sup>). The demonstration site for this purpose is located on the eastern edge of the Finnaun forest estate in Cloosh Valley Forest, Co. Galway. The site is 81.81 ha in size and composed of two adjacent stands. The lower stockings rise many questions in this area.

The mixture of Sitka spruce and downing birch is another aFMM, where the main focus is production of sawlog on better blanket peat sites. The demonstration site was established in 2000 on previous industrial cutaway peat (milled peat, mainly Phragmites) and is thus an afforested site. The birch acts as a nurse for the Sitka spruce and the plan is to successively thin the birch until sawlog procuring Sitka spruce remains.

The demonstration site Nephin thin: Wild Nephin is located south of Bellacorrick and north of Newport, Co Mayo and is roughly 97 ha. After removal of 75 % of the stems, an increase in light was expected to improve floral biodiversity on the site. However, problems has occurred a) with rhododendron creeping and b) high mortality of naturally regenerated pine saplings.

The Emlaghdauroe demonstration site represents bog restoration and is located on the southwestern slopes of Ben Gleninsky, on the southern edge of the Twelve Bens mountain range in the Connemara region of Co. Galway. The site (90.3 ha) serves as good demonstration of how many similar conifer plantations in Connemara can be managed for environmental benefits.

## Italy

The Italian aFMMs aim to increase recreation values and special habitats. Two demo-site activities were planned, but partly delayed due to Covid-19.

In “Bosco Sacile forest” different management options, thinning and selection cuttings, are planned. They will support the nature values of the site but also create favorable conditions for recreation as hiking and to be used for education at different levels (not only academic).

Multiple stakeholders interested in management of the local forest area for the provision of cultural ecosystem services have been invited to discuss future management solutions and actions about the San Stino forest. In this way forest management is not only demonstrated but also discussed with stakeholders. Some of these activities are documented in D1.3.

Information on the area are (or will be) provided directly at the site and online, via the WOW nature platform ([www.wownature.eu/areewow/bosco-sacile/](http://www.wownature.eu/areewow/bosco-sacile/)) managed by Etifor as well as via online resources developed and managed by the forest owner with the support of Etifor.

## Lithuania

In Lithuania, three aFMMs are of interest. One is "adaptive rotation periods". It is a controversial issue and conflicts with the current legislation and tradition of many forest managers. Information will be disseminated in several ways to have a chance to make a difference. Instead, visualizations will be used, illustrating the development of forests and delivered ecosystem services over time assuming management under adaptive rotation ages and contrasting with current forest management approaches. Visualizations include information on the trends of forest characteristics.

The second aFMM is "care for deciduous trees" which is important in a forestry dominated by coniferous species. To increase interest, brochures describing various steps in the management of deciduous trees are available (see D1.3). Forest stands all over Lithuania will be presented for interested managers, forest owners and the public.

The third aFMM is "no management" to increase the areas of important habitats in Lithuania. Many local branches of State Company State Forest Enterprise (non-academic ALTERFOR partner) established demonstration site in their forests all over Lithuania with no active forest management to be used as demo-sites.

Besides the more traditional way of knowledge transfer, Facebook is also used for communication with stakeholders.

## The Netherlands

The aFMMs in the Netherlands span over a wide range of forest types and management regimes. Several models are designed to strengthen natural values and recreational values. The primary goal of other models is to produce valuable timber, and one model aims to increase the forest's diversity to make forest stands better adapted to problems in a changing climate e.g. forest health.

The CSA in the Netherlands cover the whole country. Therefore, it was natural to collaborate with the Ministry of Agriculture, Nature Management and Food Quality and the website produced about climate and management of nature resources. The Dutch ALTERFOR team provides input to this website about forestry and forest management. This is a win-win situation because the national website benefits from the ALTERFOR employees' expert knowledge and work and ALTERFOR-results are widely disseminated. Information will be provided on one main website commissioned by the Ministry of Agriculture, Nature Management and Food Quality and developed by the working group climate smart forest and nature management: <https://www.vbne.nl/klimaatslimbosennatuurbeheer>. (Reference to the website: Lerink, B., Schelhaas, M.J., Boosten, M., Kremers, J., Den Ouden, J., Clerkx, S., Nabuurs, G.J. (2020). Gereedschapskist Klimaatslim Bosen Natuurbeheer. Wageningen University & Research en Stichting Probos.)

The website aims to provide more knowledge and experience about climate smart forest and nature management and provides an overview of different possible forest management strategies, including the aFMMs developed for the Dutch case. The webpage provides information on forestry, on how to establish forest but also about agroforestry, landscape etc. The webpage includes both guidelines and maps etc. to demo-sites. The target groups/audience are Dutch forest and nature managers. The website is hosted by the VBNE (the Dutch Association for Forest and Nature Owners).

## Portugal

In the Vale do Sousa case study area, Portugal, eight different FMMs were identified: four FMMs in practice and four alternative ones (aFMMs). The current landscape includes mostly pure eucalypt, mixed eucalypt with maritime pine (in varying proportions), and chestnut stands. The aFMMs have been developed to meet the demand for a variety of ecosystem services, including wood and non-wood products supply, fire risk control, biodiversity conservation, soil protection, carbon storage and cultural services. Pedunculate oak, pure maritime pine and cork oak stand level management models were proposed. Moreover, conservation concerns suggested the preservation of riparian areas.

Demonstration sites are being installed in the CSA for the maritime pine (FMM5), pedunculate oak (FMM6) and cork oak (FMM7) models. These sites will be available for landowners and other stakeholders to visit, as a support for knowledge transfer on these aFMMs management practices and ecosystem-services provision. Their location, description, status and/or expected future developments are described in the table below (see part 2).

The location of the demonstration sites and the corresponding aFMM characteristics will become available at the local forest owner's association webpage (AFVS, Associação Florestal do Vale do Sousa) also shared by CEF/ISA webpage and social media. All ALTERFOR workshop participants will get this information by e-mail. The flyer format (D1.3) will be used to facilitate the dissemination.

## Slovakia

Slovakia is working with two alternative Forest Management Models (aFMMs). One model aims to increase sustainability in forest ecosystems for forest areas, which have lost some of the ecological values. The model includes more intensive overstorey thinnings, selective cuttings and target diameter cuttings. The second model aims for valuable timber production combined with low risks and ecological stability.

Several long-term research plots are used as demo-sites. The demonstration object consists of three research plots in different phases of transformation. At the case study area Podpoľanie there are several good examples of transformation to selective forest or permanent multi-layered forest stands. In most cases, these are Pro Silva objects with a well-defined target structure.

Research on forest management with a short rotation period is only at beginning to be implemented, so results are not yet visible directly in the field.

Not only traditional ways of information and knowledge transfer will be used. With the help of modern simulation and visualization tools (tree growth simulator combined with virtual cave), it will be possible to demonstrate alternatives and possible outcome of them.

Information about the demonstration object include a description of the object, photos, maps, as well as a virtual visualization using the Sibyla growth simulator and subsequent 3D structures demonstration under Virtual Cave framework. Everything is available on the webpage mainly in Slovakian as it is going to be used in Slovakia. (Some information is available in English.)

The guidelines and demo-sites are going to be used by foresters, forest owners, forest administration and planning specialists. Information material, visualizations and guidelines will be administrated and available on the website of the Technical University in Zvolen: <http://gis.tuzvo.sk/alterfor-sk/>.

## Sweden

In the Swedish CSA most of the forest is owned and often also managed by a large number of private forest owners, while other areas are managed by more professional foresters. The demonstration sites are valuable for tools for interested forest managers, students and for experienced forest managers.

Two aFMMs are well-known in Sweden, mixed stands and non-native species and the demonstration sites for these aFMMs at Asa Experimental Forest and research Station are well described with results from measurements during a 20 to 35 years periods. Mixed stands are represented by a trial with different plots with mixture of birch and spruce in various proportions. An experiment with non-native tree species was established in 1992 and includes several conifer tree species. In the case study area the focus lay on Douglas fir, Sitka spruce and hybrid larch. These experiments are now included in SLU long term experiments which means that they are secured for future management. The information of the demonstration site includes maps, instructions on how to get there, historical facts, description of the site and results such as volume production and survival.

Forest research have just recently started to establish research and demonstration plots to study other forest methods than clear felling systems, such as continuous cover forestry. Therefore, the demonstration sites are young and mainly show the ideas behind the experiment and in one site the first effect of first cutting. In the case study area, at least three such demonstration sites are identified and will be documented. Two of the sites are located in Asa Experimental Forest.

In Asa there are good examples of border zones that can be used as demonstration sites. They are transitions between forest and field or forest and water and two sites are marked on maps and could easily be found. Unfortunately, there are yet no experimental trials, but the sites could be used for demonstration, education and discussions of how to manage these zones for different purposes.

## Turkey

For Turkey, the main alternative FMM will be continuous cover forestry. Beech dominated stands with various aged/sized allocated for ecological and social values will be managed as "Continuous Cover Forestry" (CCF) via creating uneven structure.

Since the CCF is a very new concept for the Gölcük forests, there was no sample or previously conducted research within the CSA. However, just recently some stands have been allocated and different sample plots with a size ranging from 600 m<sup>2</sup> to 1000 m<sup>2</sup> have been chosen. The first cuttings will be done in the following years to be compatible with existing forest management plan practices within the demo sites. The interventions within the demo sites will be recorded, documented and monitored.

## 2 Brief description of demonstration sites

### Germany

aFMM	Description
<b>Production forest</b>	<p>In our institute, we manage a large network of long-term growth and yield trials (~141 trials comprising ~885 plots). Among them, there are several long-term research sites/plots (most under survey for several decades at least), which are very useful for demonstrating key options and implications for production forest concepts. Among them (directly located in or in close vicinity to the Southern German case study) are the Norway spruce thinning and spacing trials Zusmarshausen 603, 604 and Fürstenfeldbruck 612. All these trials comprise several very different treatment variants from no thinning to consequent low density and almost solitary tree concepts. These experiments inform about the elasticity of the wood production in connection to stand density (i.e. a risk-determining trait).</p> <p>A good demonstration site is also the monospecific Douglas fir plot in the Douglas-fir/European beech growth series trial Krumbach 861. This plot is very interesting, for it allows to compare the productivity of Douglas fir with Norway spruce under comparable site conditions as well as the productivity of Douglas fir in monoculture with Douglas fir/European beech mixed stands. All plots are surveyed in five-to-eight-years intervals. Fact sheets (including maps, diagrams, and tables documenting the development) are updated after each survey.</p>
<b>Multifunctional forest</b>	<p>Concerning the multifunctional forest concept, we can contribute different long term trials/plots as demonstration sites – among them the mixed stand plot series Krumbach 816 which comprises mixed stands of European beech, Douglas fir and Norway spruce at different stages of development. This plot series provides the quantitative basis for an intensive debate on mixed stands of native species with the non-native Douglas fir. The mixed stand plot Laugna 315/2 comprising European beech, pedunculate oak, Norway spruce, Douglas fir, and European larch allows a direct comparison of the dynamics of a multi-mixture to the classic Norway spruce monoculture. The thinning and spacing pedunculate oak trial Illertissen 039 completes the picture. Oak is among the native deciduous species whose importance in Germany will probably strongly increase. This experiment informs us about the response of the species on initial spacing and thinning strength. All plots are surveyed in intervals of five-to-eight-years. Fact sheets (including maps, diagrams and tables documenting the development) are updated after each survey.</p>
<b>Set aside</b>	<p>The above-mentioned thinning and spacing trials Zusmarshausen 603, 604, Fürstenfeldbruck 612, and Illertissen 039 contain unmanaged reference plots, which are ideal for demonstrating the dynamics of forests when silvicultural management is stopped. Fact sheets (including maps, diagrams, and tables documenting the development) are updated after each survey.</p>

## Ireland

aFMM	Demonstrations sites
<b>Low-stocked lodgepole pine – fiber</b>	<p>Located on the eastern edge of the Finnaun forest estate in Cloosh Valley Forest, Co. Galway, the demonstration site is 81.81 ha in size and composed of two adjacent stands. The stands are divided by a road, along which there are several wind turbines.</p> <p>The previous crop species was lodgepole pine and Sitka spruce, with a productivity of Sitka Spruce Yield Class (SS YC) 10 - 12 (YC 8 -10 for lodgepole pine). The main harvest assortment from the Sitka spruce was pallet wood, the crop did not yield any sawlog. New policies and best management practices has made fertilisation ineligible on this site, so planting lodgepole pine at a lower stocking was the best option. Alternatives considered were to retain the existing stand indefinitely, but the site was deemed productive enough to support a crop of low-stocked lodgepole pine.</p> <p>The previous crop was harvested full pole and extracted, with no following windrowing after. All the dead branches remained on ground, and planting took place in a brash free space. The site was planted in 2019, with a stocking of 2,000 stems per hectare, using lodgepole pine bare-root seedlings. The site is located on deep peat and has no special protection or designation. Coillte expects 10% seedling mortality within four years. This will leave 1,800 stems per hectare, which will ensure sufficient forest cover. Clearfell is expected at around 50 - 60 years. Some issues with using lower stockings is that the Forest Service has not issued clear guidelines on whether planting lower densities, such as 1,800 and 1,600 stems per hectare, fulfil the requirements for bioenergy production or not, because the lower stockings are usually reserved to biodiversity and water protection management designations. Planting at lower stockings could result in higher maintenance costs to ensure forest cover.</p>
<b>Low-stocked lodgepole pine – biodiversity</b>	<p>No demonstration site for this aFMM exists in Ireland.</p>
<b>Low-stocked lodgepole pine – Nephin thin</b>	<p>Located south of Bellacorrick and north of Newport, Co Mayo, the demonstration site is roughly 97 ha. The site comprises two stands that were afforested by double mould board ploughing of virgin blanket peat in 1977 and planted with south coastal lodgepole pine.</p> <p>Productivity of both sites are YC 10. The first thinnings were hard and took place in 2015 and 2017 at the age of 38 and 40, respectively. Both stands had around 1,800 trees per hectare at the time of thinning, and the thinning operation uniformly removed 75% of the stems, leaving around 450 stems per hectare.</p> <p>This site was established as a transition area to wilderness, where an increase in light would improve floral biodiversity on the site. However, this is very much a pilot project and opening the canopy and increased light has caused</p>

	<p>rhododendron to creep in. There were signs of lodgepole pine naturally regenerating, but those saplings performed poorly due to:</p> <ul style="list-style-type: none"> <li>a) heavy frost, resulting in frost heave, where the roots are pushed up and exposed to the air and die</li> <li>b) weevil attacks killing saplings.</li> </ul> <p>Thus, overall regeneration is not happening on the demonstration site. Some of the mature trees on site have snapped halfway up the stem, indicating the site is actually windblow stable.</p>
<p><b>Modified Kronoberg system – Sitka spruce and downy birch mixture</b></p>	<p>The test site was established in 2000 on previous industrial cutaway peat (milled peat, mainly <i>Phragmites</i>) and is thus an afforested site. The afforestation was a part of the BOGFOR project that investigated the potential to afforest decommissioned industrial cutaway peats. Although this site is not located on blanket peat, this demonstration site is the closest thing existing in Ireland.</p> <p>To date, no thinning has been done in the Sitka spruce and birch mixture, but the next thinning will remove one line of birch from centre of each bay with some selective thinning of larger birch (i.e. negative selection). The post-thin birch stocking should be maintained to about 600 trees per hectare. Thinning of Sitka spruce should be delayed.</p>
<p><b>Bog restoration</b></p>	<p>The Emlaghdauroe demonstration site is located on the southwestern slopes of Ben Gleninsky, on the southern edge of the Twelve Bens mountain range in the Connemara region of Co. Galway. The site is surrounded by the Twelve Bens/Garraun Special Area of Conservation (SAC) and the area with restored bog will be subsumed into the SAC once restoration has been shown to be successful. In total, the site is 90.3 ha in size and was restored as a part of the EU LIFE project LIFE02 NAT/Ire/8490, which restored around 2,000 ha of blanket bog in Ireland.</p> <p>Emlaghdauroe was partly chosen as demonstration site since areas of montane heath habitat are relatively rare in Ireland. The site will serve as a good demonstration of how many similar conifer plantations in Connemara can be managed for environmental benefits. Recolonisation by regenerating blanket bog vegetation has been a relatively slow process, but recolonisation has taken place. <i>Juncus effusus</i> has developed extensively in sloping areas and/or areas subject to flushing by flowing surface waters. The other parts of the site are currently dominated by <i>Molinia caerulea</i> and the moss <i>Hypnum cupressiforme</i>.</p>



Italy

aFMM	Demonstrations sites
<p>Recreational and habitat selective management model</p>	<p>Two demo-site activities:</p> <ol style="list-style-type: none"> <li data-bbox="480 483 1418 943">1. Participatory planning activities for the aFMM have been developed in one forest site within the CSA (S. Stino di Livenza) on November 16 in 2019. Multiple stakeholders interested in the management of the local forest area for the provision of cultural ecosystem services were invited to discuss future management solutions and actions about the S. Stino forest. Stakeholder involvement has been organized via Open Space Technology techniques and brought to the agreement and planning of short objectives (1 year) and actions under the responsibility of different actors. The Lowland Forest Association (AFP) will monitor the implementation of these actions and provide inputs for further developments in the future. A report summarizing the key-activities, findings and pictures of the activity has already been delivered in the past weeks. Information has been spread via Etifor and AFP websites and social media channels.</li> <li data-bbox="480 981 1418 1335">2. Thinning and selective harvesting operations in the “Bosco Sacile” area, a private-owned seminatural lowland oak-hornbeam forest entirely falling within the EU Natura 2000 network. Management solutions are intended to support the conservation of the site and its environmental values while creating favorable conditions for low impact activities at the same time, like environmental education, hiking and, in the medium-long term, green care initiatives. Information on the area are (or will be) provided directly at the site as well as online, via the WOW nature platform managed by Etifor as well as via online resources developed and managed by the forest owner with the support of Etifor (<a href="http://www.wownature.eu/areewow/bosco-sacile/">www.wownature.eu/areewow/bosco-sacile/</a>).</li> </ol> <p>Note: Field operations have been planned and organized, however, due to restrictive measures against Covid-19 in Italy they were not implemented so far.</p>

## Lithuania

aFMM	Demonstrations sites
<p><b>Adaptive rotation ages</b></p>	<p>As adaptive rotation ages contradict current legal Lithuanian forestry requirements, it is today impossible to establish physical demonstration sites. Demonstration of forest compartments, harvested at different age, would be rather meaningless. Therefore, we use “virtual demonstration sites”. As such we assume compilation of all materials introduced in the guidelines section and scientific publications elaborated during implementation of current project. Among the scientific publications – one master thesis defended in June 2020 and one PhD thesis to be finalized by the end of 2020. The impacts of adaptive rotation ages on sustainability of forestry are demonstrated in master thesis by Š.Alesius „The influence of alternative harvesting ages on the sustainability of forestry“ (<a href="https://www.vdu.lt/cris/handle/20.500.12259/105759">https://www.vdu.lt/cris/handle/20.500.12259/105759</a>).</p> <p>Additionally, we created visualizations illustrating the development of forests and delivered ecosystem services over time assuming management under adaptive rotation ages and contrasting with current forest management approaches. Visualizations include information on the trends of forest characteristics and ecosystem services delivered under current and alternative forest management models, together with animated maps, displaying the information under focus at specific time points or intervals, used for simulations in WP3. Materials on “demonstration sites” are exposed together with the guidelines.</p>
<p><b>Care for deciduous</b></p>	<p>The short stories about the best forestry practices are associated to certain forests owner/manager, estate, forest stand in the country. I.e. they are geolocated on the map and can be found in the field. Locations of each example are stored at ArcGIS Online. Contacts of professional foresters, who provided their stories, were given to anyone interested in further details as well. The Facebook group “Kas vyksta miške” [What happens in the forest] was created by the ALTERFOR team. It contains the guidelines and other recommendations on alternative forest management. It is to be noted, that alternative forest management options going much beyond the scope of ALTERFOR are discussed in this FB group.</p>
<p><b>No management at potential habitats of European importance</b></p>	<p>The lists of potential habitats of European importance are provided on the following webpage: <a href="http://www.geoportal.lt">www.geoportal.lt</a>. For interested people we provided information ArcGIS Online. Management guidelines are currently elaborated within the frames of LIFE NATURALIT project. Most likely, the management model will be there – no <i>active</i> forest management. To illustrate the natural forest development without human intervention, local regional branch of State Company State Forest Enterprise (non-academic ALTERFOR partner) established demonstration site in their forests with no active forest management, which is described later in this report and also referred to in ArcGIS Online. The short stories about the role and success of “no management” forestry are also communicated as for “care for deciduous” case (FB group). More emphasize will be given to availability of such “demonstration sites” virtually, as current no management areas are usually associated with limited access.</p>

General	<p>Maps, descriptions, results etc. will be available at Faculty of forests and Ecology of Vytautas Magnus University and State forest enterprise, some materials also on <a href="http://www.forest.lt">www.forest.lt</a>. However, we believe the best option to reach the audience is social media. We highlight the Facebook group “Kas vyksta miške” [What happens in the forest], which has been created and maintained by the ALTERFOR team and which is actively supported with forestry professionals willing to share their experiences on alternative forest management models (also, suggesting their own models).</p> <p>Demo sites on ArcGIS Online: <a href="https://tvdu.maps.arcgis.com/apps/View/index.html?appid=9adb3e84928741bd8dcd042eeff1497e">https://tvdu.maps.arcgis.com/apps/View/index.html?appid=9adb3e84928741bd8dcd042eeff1497e</a></p>
---------	--

## The Netherlands

aFMM	Demonstrations sites
General	<p>Information about demo-sites (and much more as guidelines): <a href="https://www.vbne.nl/klimaatslimbosennatuurbeheer/">https://www.vbne.nl/klimaatslimbosennatuurbeheer/</a></p>
Recreation forest management	<p>An extreme example of these recreation forests in the Netherlands are the food forests which become more and more popular. Demonstration sites are currently under development.</p> <p>No other demonstration sites necessary as the Dutch sector is familiar with some of the famous examples of recreation forest management, such as the Amsterdam forest and the Vondelpark (urban forest areas).</p>
High quality timber management	<p>One of the management strategies discussed on the website is the pruning of trees to improve the quality of the stems. A demonstration site is under development.</p>
Biomass production	<p>One example of a demonstration site on the website is the Brabantse Delta (South of the Netherlands, province of Noord-Brabant), describing the potential to use areas for short rotation woody biomass production.</p>
Climate+	<p>The website refers to several demonstration sites, such as the transformation of ash forests in Siddeburen (North of the Netherlands, province of Groningen) and Elspetherbosch in Elspeet (Center of the Netherlands, province of Gelderland)</p>
Nature and nature-oriented management	<p>On the website, references are made to several of the Dutch forest reserves, where natural processes can take place without human intervention and where harvesting is limited or postponed. These include the forest reserves Lheebroek (North of the Netherlands, province of Drenthe) and Pijpestrootje (Center of the Netherlands, province of Gelderland)</p>

## Portugal

aFMM	Location	Description	Status
aFMM5 Maritime pine	Lat: 41,117449, Lon: -8.374286  Managed by “Floresta Atlântica”, a private industrial forest owner.	Pure maritime pine stand, about 25 years old.	With the agreement of the private owner, access to this demonstration site will be mediated by the local forest owner’s association (AFVS) to all stakeholders who may be interested.
aFMM6 Pedunculate oak	Lat: 41.141565, Lon: -8.351415  From a local private owner, Mrs. Cristina Silva.	As it was not feasible to get funding for a plantation of a pedunculate oak stand, both ISA and the forest owners association (AFVS), decided to take advantage of the offer by a forest owner to have as a demonstration site a mixed stand including red oak ( <i>Quercus rubra</i> L.), installed in 2011.	With the agreement of the private owner, access to the site by stakeholders who may request it, will be mediated by the local forest owner’s association (AFVS).
aFMM7 Cork oak	Lat: 41.118871, Lon: -8.391891  Owned by Junta de Freguesia da Sobreira, a public administration stakeholder.	A recently burned (2017) public forest area, available for a new plantation.	Budget constraints to development of the site were addressed by the public administration with AFVS assistance. Cork oak trees plantation in this area will meet both the need for an in-practice example of this aFMM for the region and for the rehabilitation of a public forest area.

## Slovakia

aFMM	Demonstrations sites
Sustainable multifunctional management in partly uneven-aged mixed stands	<p>With the case study area Podpoľanie we have a several good examples of transformation to selective forest or permanent multi-layered forest stands. In most cases, these are Pro Silva objects with a well-defined target structure.</p> <p>For the application of this alternative model a demonstration object was selected in the district of Mikulášska, FMU Hriňová, in stands No. 224 and 225. The demonstration object consists of three research plots in different phases</p>

	<p>of transformation. The first two plots are in the transformation phase, the last plot is in the final phase. The tree species composition is dominated by spruce 70-100%. Occasionally beech and larch are represented. The age of forest stands is 65 and 90 years respectively. The plot areas are 50 x 50 meters.</p> <p>The locality is also known from Travellab, but unfortunately most of the forest stands in the area were significantly disrupted by the wind calamity in 2018.</p> <p>Information about the demonstration object includes a description of the object, fotodocumentation, maps, as well as virtual visualization using the Sibyla growth simulator and subsequent 3D structures demonstration under Virtual Cave framework.</p>
<p><b>Sustainable timber production in even-aged mixed species stands</b></p>	<p>The spruce-dominated non-original forest stands at the case study area Podpoľanie were ideal for application of more flexible age-class model. In forest stands number 18 and 129, in the locality Snohy at the forest management unit Poľana, 8 research plots were established for research of increased variability of rotation periods in combination with different lengths of regeneration periods. There are four variants of rotation periods – very short, short, normal and extended rotation periods and two variants of regeneration periods – short and long regeneration period. The demonstration object will verify the possibilities of natural forest regeneration for various combinations of rotation periods and regeneration periods. The age of stand N. 129 is 70 years and the stand N. 18 is 90 years. In both forest stands are dominated by spruce (up to 95%), beech is rarely represented now (up to 5%), although according phytocoenological survey the site should be dominated by beech. The next generation of forest resulting from natural regeneration is expected to be dominated by beech.</p> <p>Research on forest management with a short rotation period is only at beginning to be implemented, so results are not yet visible directly in the field.</p> <p>Information about the demonstration object consists of a description of the object, photodocumentaries, maps as well as a visualization using the growth simulator Sibyla and subsequent 3D structures demonstration under the Virtual Cave framework.</p>
<p><b>General</b></p>	<p>Maps, descriptions, results are also available on the homepage <a href="http://gis.tuzvo.sk/alterfor-sk/">http://gis.tuzvo.sk/alterfor-sk/</a></p>

## Sweden

aFMM	Demonstrations sites
<p><b>Introduced tree species, in particular Douglas fir, Hybrid larch and Sitka spruce</b></p>	<p>The tree species trial in Asa Experimental Forest and Research Park, part of the Faculty of Forest Sciences, SLU, is part of a larger series of trials that now belong to SLU's long-term trial which means that it will be measured and controlled for the future. In Asa, there are two trials planted on sites with various site conditions. The most accessible site and the one we will use at first as a demonstration site is called "block 1 Sâgvâgen". In that area, we have six introduced and two native tree species. The roads in the research park are open and there are no barriers.</p> <p>The experiment started in 1994, 2500 seedlings per ha were planted. The plots for each tree species are 40 m x 40 m, marked and easy to find. The information of the demonstration site includes maps, instructions on how to get there, historical facts, descriptions of the site and results such as volume production and survival.</p> <p>(SLU Experiment 2299 Asa Experimental Forest)</p>
<p><b>Boarder zones</b></p>	<p>In Asa Experimental Forest and the surroundings, we have some good examples for boarder zones that can be used as demonstration sites. Unfortunately, there are yet few, if any, experimental trials. The boarder zones in Asa are a transition between forest and field or forest and water. We will describe these areas and the measures that are suitable for these boarder zones. Maps and descriptions on how to get there will also be provided.</p>
<p><b>Mixed forest spruce - birch</b></p>	<p>The demonstration site is located at Asa Experimental Forest, approximately 45 km north of Vâxjö. The experiment is established as comparison between plots with 100% spruce, 80% spruce – 20% birch, 50% spruce - 50% birch. The plots are approximately 0,1 ha and easy to find and to identify different treatments in the field. By winter 2020, the stand was 35 years old and the dominant height was 21 m.</p> <p>Maps are available as well as descriptions of the stand and the treatments. Results are available from establishing the experiment 1998 until last measurement winter 2019/2020.</p> <p>(SLU Experiment 8556 (AO56) Asa/Brudahall)</p>
<p><b>Selection systems or alternative to clear-felling systems</b></p>	<p>Forest research have just recently started to establish research and demonstration plots to study other forest methods than clearfelling systems. Therefore, the demo-sites are very young and mainly show effect of first cuttings, and in two experiments the cutting is delayed. Two or three such new experiments/demo-sites in the case study area are identified and will be documented.</p> <p>SLU Experiment 12606, Asa Experimental Forest/Bruaängen)</p>

<p><b>General</b></p>	<p>Asa Experimental Forest and Research Station is within the CSA and offer good facilities for education and knowledge transfer. Asa is situated approx. 45 km north of the city Växjö.</p> <p>Maps, descriptions, results etc. will be at SLU homepage, either Southern Swedish Forest Research Centre or Asa Experimental Forest (<a href="https://www.slu.se/institutioner/skoglig-faltforskning/forsoksparker/asa-forsokspark/">https://www.slu.se/institutioner/skoglig-faltforskning/forsoksparker/asa-forsokspark/</a> or <a href="https://www.slu.se/en/departments/southern-swedish-forest-research-centre/">https://www.slu.se/en/departments/southern-swedish-forest-research-centre/</a>)</p> <p>Information about long term research plots in Sweden can also be found here: <a href="https://www.silvaboreal.com/">https://www.silvaboreal.com/</a></p>
-----------------------	--

## Turkey

<p>aFMM</p>	<p><b>Demonstrations sites</b></p>
<p><b>Continuous Cover Forestry -CCF</b></p>	<p>Since “Continuous Cover Forestry”, or CCF, is a very new concept for the Gölcük forests, there was no sample or previously conducted research within the CSA. Therefore, after communicating with Sakarya Regional Directorate of forestry, it has been decided to allocate some stands for “Continuous Cover Forestry”. It is also important to show its transition from even-aged to uneven-aged management system.</p> <p>Different sample plots, with a size ranging from 600 m<sup>2</sup> to 1000 m<sup>2</sup>, were taken in June and the first cuttings will be done in the coming years, in order to be compatible with existing forest management plan practices within the demo-sites. The interventions within the demo-sites will be recorded, documented and monitored.</p> <p>We will share the inventory, intervention results and other related information for the Continuous Cover Forestry. Maps and descriptions on how to get there will be provided, too.</p>
<p><b>General</b></p>	<p>Maps, descriptions, results etc. will be available at Gölcük State Forest Enterprise and Karadeniz Technical University Faculty of Forestry homepage.</p>