ACRP

Interim Report – Activity Report

Program control:
Climate and Energy Fund

Program management:
Kommunalkredit Public Consulting GmbH (KPC)

1 Project Data

Short title	MoreSeedsAdapt	
Full title	Modelling the requirements of forest seeds and seedling provision for sustainable forest adaptation to climate change for meeting future raw material demand *Abschätzung von Bedarf und Angebot an forstlichem Vermehrungsgut zur Anpassung einer nachhaltigen Forstwirtschaft an den Klimawandel*	
Project number	KR16AC0K13339	
Program/Program line	ACRP 9th Call for Proposals	
Applicant	Bundesforschungs- und Ausbildungszentrum für Wald, Naturgefahren und Landschaft Institut für Waldwachstum und Waldbau, Seckendorff-Gudent-Weg 8, 1131 Wien, Österreich **Dr. Silvio Schüler**	
Project partners	1. Universität für Bodenkultur Wien, Institut für Marketing und Innovation, Wien 2. Kompetenzzentrum Holz GmbH, Linz, Oberösterreich	
Project start and duration	Project start: 01.05.2017	Duration: 30 months
Consecutive number of interim report	Interim report 1	
Reporting period	from 01.05. 2018 to 30.04.2019	

Synopsis: The project MoreSeedsAdapt aims to understand the demand for and the potential supply of forest seeds and seedlings in CC by the Austrian forest-based sector and to develop scenarios of future forest seedling production based on the potential seed supply. Within the first part of the project historic data on the seedling production and the seedling quality was collated and digitalized. The main climatic conditions and regimes controlling these reproductive features were analysed for 8 most important tree species. Sales quantities between 2012/13 and 2016/17 show a clear trend towards non-coniferous, especially oak species, and mixed forests seedlings. Preliminary results show a higher correlation coefficient for coniferous species than for non-coniferous species across all lags.

Technical /Scientific Description of the Project

1.1 Project abstract (max. 2 pages)

1. Initial situation / motivation of the project

Climate change (CC) will considerably affect environmental conditions for Central European trees. To overcome CC related risks for forests, the planting of alternative trees or the planting of different provenances better adapted or having a higher potential for adaptation to the expected climate has been suggested. Therefore, adaptation actions in forestry generate changes of the forest seed & seedling demand which has to be covered by forest seed producers and forest nurseries. Furthermore, the seedling demand for the various tree species depends on economic factors which are partly interdependent with ecological conditions, but are also influenced by political framework conditions, actions set by decision and policy makers and interdependencies with supranational (e.g. European Union) and global economy.

However, the amount of seeds produced by temperate trees varies between years and depends on various factors including site & weather conditions during and preceding the year of seed maturation. Thus, the availability of forest seeds also sets an upper limit for seedling production and thus for adaptation action in forestry.

2. Objectives of the project

The central objective of the current project is to understand the demand for and the potential supply of forest seeds and seedlings in CC by the Austrian forest-based sector. This requires:

- To identify the key climatic variables that affect the highly variable tree flowering and seed production in order to model potential seed supply in CC
- To analyse economic and socioeconomic predictors of seedling production
- To estimate the forest seedling demand under different adaptation management strategies for the most important tree species in Austria based on applications of species distribution models in CC.
- To develop scenarios of future forest seedling production based on the potential seed supply and predicted seed demand.

3. Project structure and methodology

The project is structured into four scientific work packages (WP 2 to 5) and one work package (WP1) for administrative and management tasks:

WP no. 1: Coordination and management

WP no. 2: Potential seed and seedling supply in CC

WP no. 3: Impacts on forest plant production and demand

WP no. 4: Modelling plant demand due to CC

WP no. 5: scenarios for future plant production

4. Results and conclusions of the project stage concerned

Within the second reporting period of the project, all milestones were reached as expected, except M2.3. Predictive models applied for Austrian regions which will be accomplished in July/august 2018. Also M5.2 Iterative simulations with WP4 are due to linkages to WP4, wich need further prove. The data exchange between working groups and institution for building the models in WP5 was successful. A testing round was conducted using dummy data. The seed harvest data was controlled and shared with all project partners for further analysis.

5. Outlook to the next project stage

Main activities of WP 3 and 4 are finalized, but some parts are still in progress and will be finalized in 2019. The remaining task of WP5 (construction of econometric models) will be finalized in 2019. Remaining activities mainly belong to WP 5.

1.2 Contents and results of the project (max. 10 pages)

1. Description of the targets originally defined for the reporting period

Activities of WP 1 Coordination and management

The aim of WP 1 is the coordination of the project partners, project management as well as dissemination activities and reporting. The coordination of the project faced no difficulties. Within the second project year, WP 1 included the following activities:

- *M1.3 Interim meetings*

Activities of WP 2: Potential seed and seedling supply in CC

The major objectives of WP 2 are to identify the decisive climatic conditions and regimes controlling these reproductive features in forest trees and to develop prediction functions that can be used to forecast potential seed production under the effect of climate change.

- *M2.2 Most important climate parameters for seed quality and quantity of 7 tree species identified*
- *M2.3 Predictive models applied for Austrian regions*

Activities of WP 3: Impacts on forest plant production and demand

The major aim of WP 3 is to deepen the understanding of the major factors determining the supply and demand of seedlings, to investigate time series for seed and seedling production (historical data), as well as to develop econometric models describing interactions between seedling supply/demand and exogenous variables.

- *M3.3 Construction of econometric models*

Activities of WP 4: Modelling plant demand due to CC

The major aim of WP 4 is to estimate the forest seedling demand under different adaptation management strategies for the most important tree species in Austria and Central Europe based on applications of species distribution models in climate change.

- *M4.1 Loss and gain of forest area for each species calculated (Strat. 1)*
- *M4.2 Climate-analogy models applied and used to estimate regeneration requirement estimated*

Activities of WP 5: Scenarios for future plant production

The major aim of WP 5 is to develop scenarios of future forest seedling production based on the potential seed supply and predicted seed demand.

- *M5.1 Adaptation of forest sector model to project requirements*

2. Description of the preliminary results and milestones of the reporting period (including project progress as percentage of total project on work package basis – e.g chart,..)

Activities of WP 1 Coordination and management

M1.3 Interim meetings

Two interim meetings took palce in the second reporting period at the BOKU and at the BFW. The agenda of the meeting included the discussion of administrative structures, the coordination of overlapping tasks. Further, future dissemination activites were reported. The meeting supported the coordination and knowledge exchange among project partners.

Several meetings took place among the project partners in June and July 2018/2019. All project partners were present at the Interim meeting 12th of March 2019. The progress of each work package was presented, following by a discussion on coordination of future steps.

Table 1 Dissemination Activites.

When	Where	Description	Comments (who was reached?)
06.07.2017	BfW	internal kick off meeting	project partners
21.02.2018	BOKU	internal project meeting (project coordination meeting, presentation of preliminary WP3 results and WP5 test run)	project partners
18.04.2018	meeting "Klimafittes Pflanz- und Saatgut" at BMNT	presentation of MSA project and preliminary results from WP3	scientific community, policy makers, business representatives
24.04.2018	19. Österreichischer Klimatag, Universität Salzburg	poster presentation of MSA project and preliminary results from WP3	policy makers, scientific community, (business representatives)
Apr.18	Wood News Article	report about the MSA and CareForParis poster presentations at Klimatag	stakeholders, interested public

03.08.2018	BOKU	internal presentation of WP3 results	project partners
17.09.2018	Cool Forests Conference at IIASA, Laxenburg	presentation "Utilising forestry data to explain and forecast forest seedling demand" (results from WP3), incl. book of abstracts	scientific community, policy makers, NGOs
Okt.18	Wood News Article	report about the MSA presentation at Cool Forests Conference	stakeholders, interested public
12.03.2018	BOKU	internal project meeting (data from WP2 to WP3 and WP5)	project partners
24-25.04.2019	20. Österreichischer Klimatag, BOKU Wien	Klimatag	policy makers, scientific community, (business representatives)

Activities of WP 2: Potential seed and seedling supply in CC

In the first period the transformation of fructification and seed harvest data into electronic form was completed (M2.1) and the most important climate parameters for seed quality and quantity of 7 tree species identified (M2.2). The following activities of the WP 2 were conducted in the reporting period:

M2.2: Most important climate parameters for seed quality and quantity of 7 tree species identified

The temporal trends of climate variables influencing the seed quality were further analysed. The results show that the climatic variables affecting masting vary between species and geographical areas. A further factor influencing seed production was elevation. Visualisation on the correlation (https://www.youtube.com/watch?v=2_aFwuh4s2E&t=10s) helped to piture the local variation in mast events and supported the evaluation of further statistical methods. Analysis on chosen combinations of geographic units were made (Figure 2).To complete this task we are currently using additional statistical methods, which have been applied for the genus *Larix* needs to be applied for the other key tree species in the following reporting period.

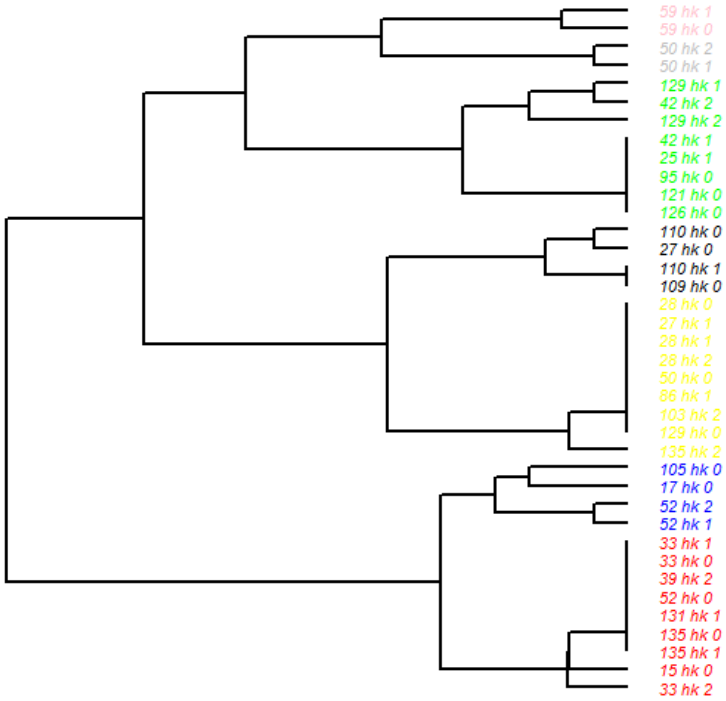


Figure 1 Distance matrix for Larix based on distance measures, histogram intersection and Manhattan distance.

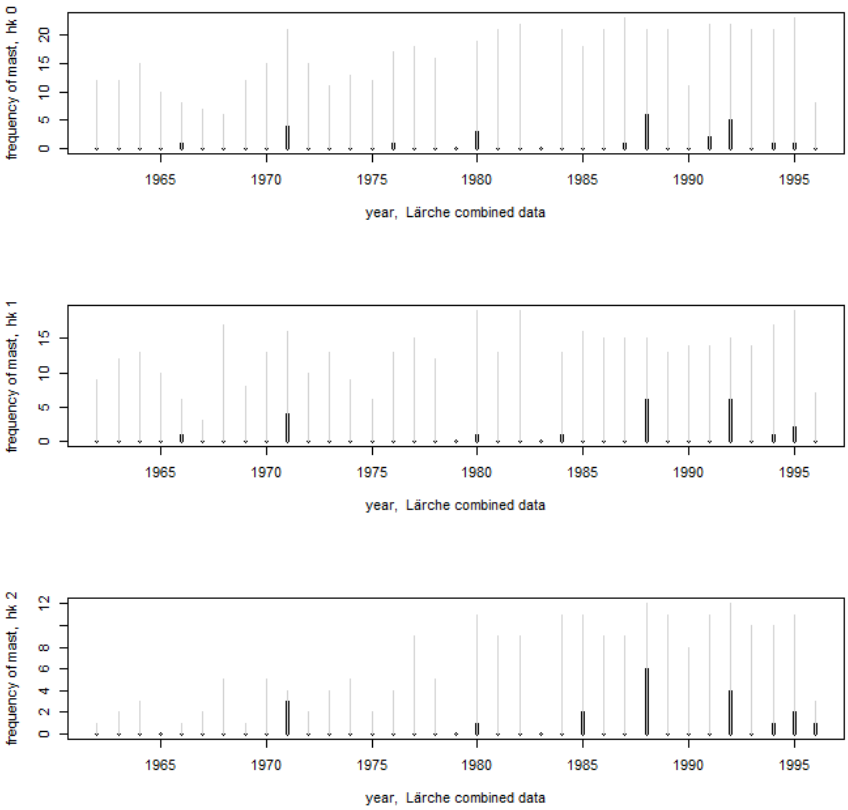


Figure 2 Frequency of mast events by elevation classes (hk0=< 900m, hk1=900 to 1500m, hk2= >1500m) of the species Larix decidua.

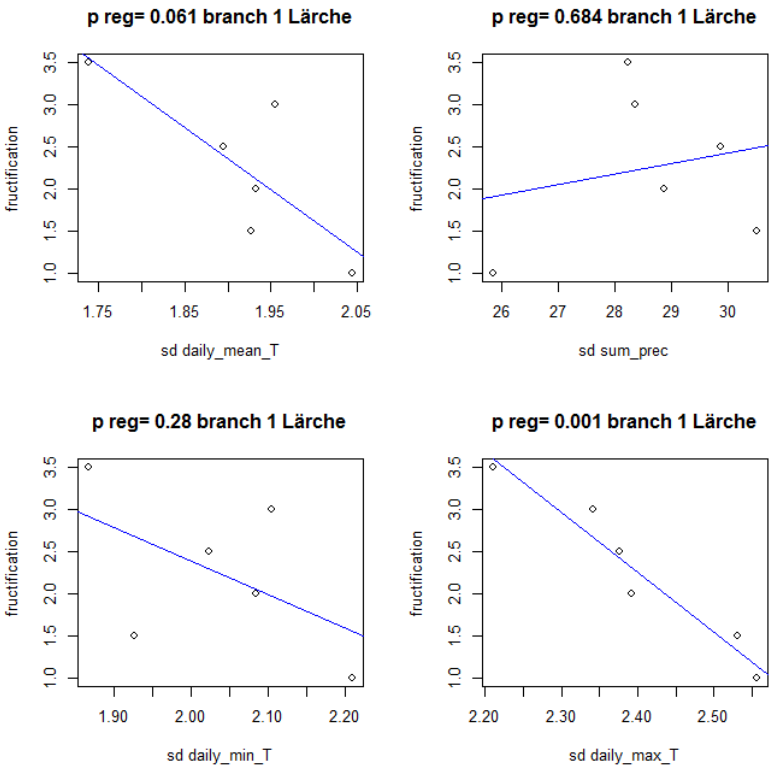


Figure 3 Regression of frutification levels and cliamte parameters: Daily mean temperature, Daily minimum temperature, Daily precipitation, Daily maximum temperature.

M2.3 Predictive models applied for Austrian regions

First predictive models were build and discussed. Several theretical approaches have been selected and tested. Furthermore, the work on M2.3 (*Predictive models applied for Austrian regions*) and M3.3 (*Construction of econometric models)* is still due to the delayed delayed data digitization and data control of mast reporting. The chosen method follows a new theoretical approach which was not followed before in the scientific literature. Therefore a litarure review was started to collate statistical approaches from other disciplines. This review is aimed to be providing the theoretical basis for the planned publications.

Aditionally the examination of growing regions and seed harvest (coordinates) was made to correlate the Potential seed and seedling supply for each key species.

Table 2 Impacts of forest plant production and demand: Correlation absolute values.

correlation results - absolute values								
seedling production	seed harvest	total logwood	coniferous logwood	deciduous logwood	clear cuttings	damaged wood	price fir/spruce roundwood	price beech roundwood
coniferous		0,29	0,29	0,16	0,23	0,23	0,09	-0,24
deciduous		0,09	0,06	0,33	0,04	-0,07	0,18	0,11
norway spruce	-0,23	0,57	0,59	0,09	0,50	0,34	0,33	
silver fir	0,33	-0,54	-0,55	-0,10	-0,43	-0,23	-0,28	
scots pine	-0,18	0,05	0,06	-0,06	0,11	0,12		
european larch	-0,11	0,43	0,43	0,24	0,49	0,25		
oak species	-0,31	0,22	0,18	0,66	0,34	0,13		
common beech	-0,81	-0,51	-0,53	0,02	-0,71	-0,69		0,79
sycamore maple	-0,19	-0,15	-0,16	-0,04	-0,14	-0,21		

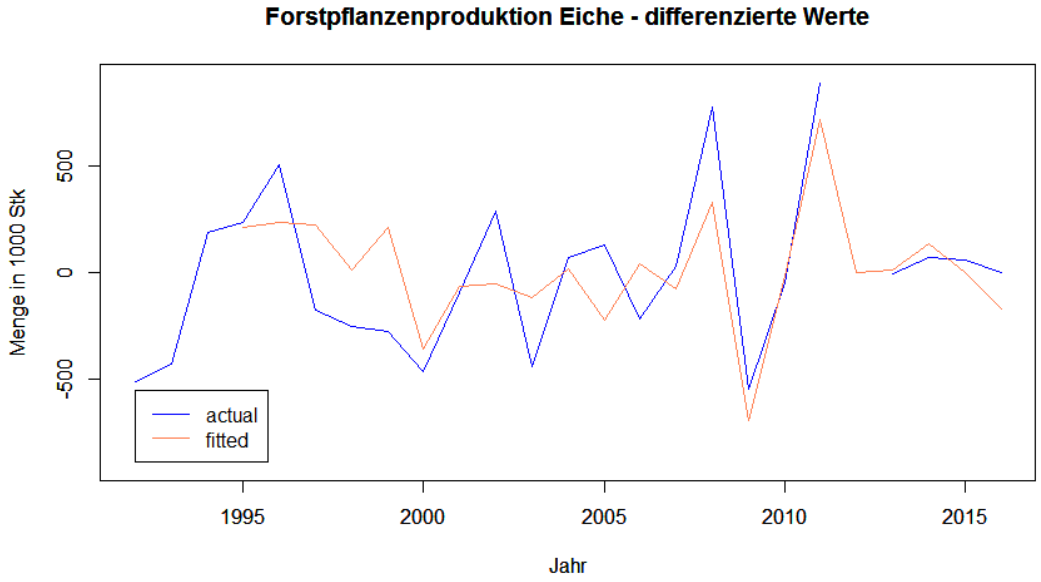


Figure 4 Regression for differenced values: oak (*Quercus spp.*)

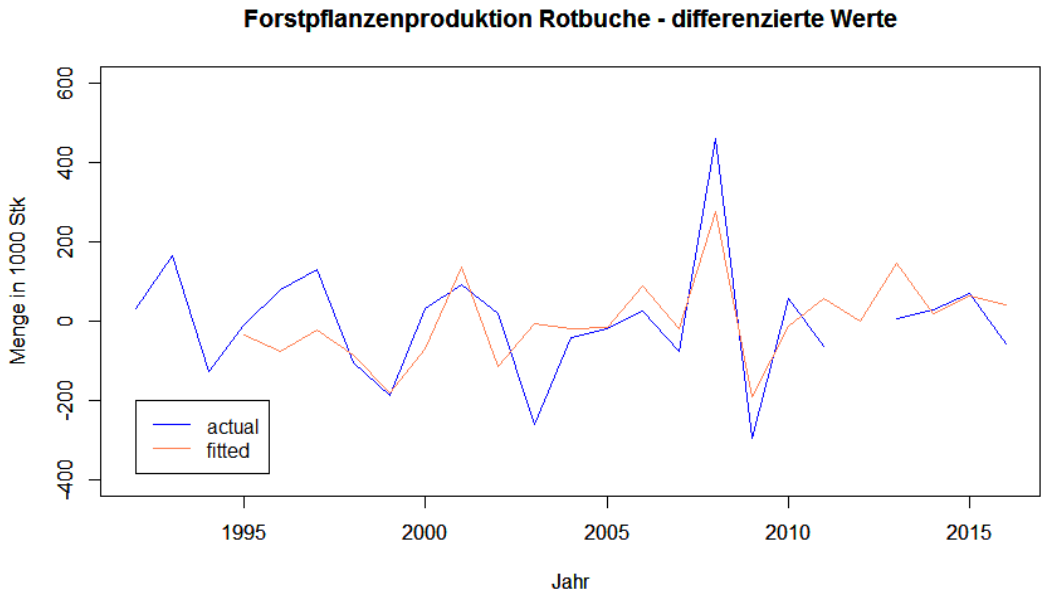


Figure 5 Regression for differenced values: European beech (*Fagus sylvatica*)

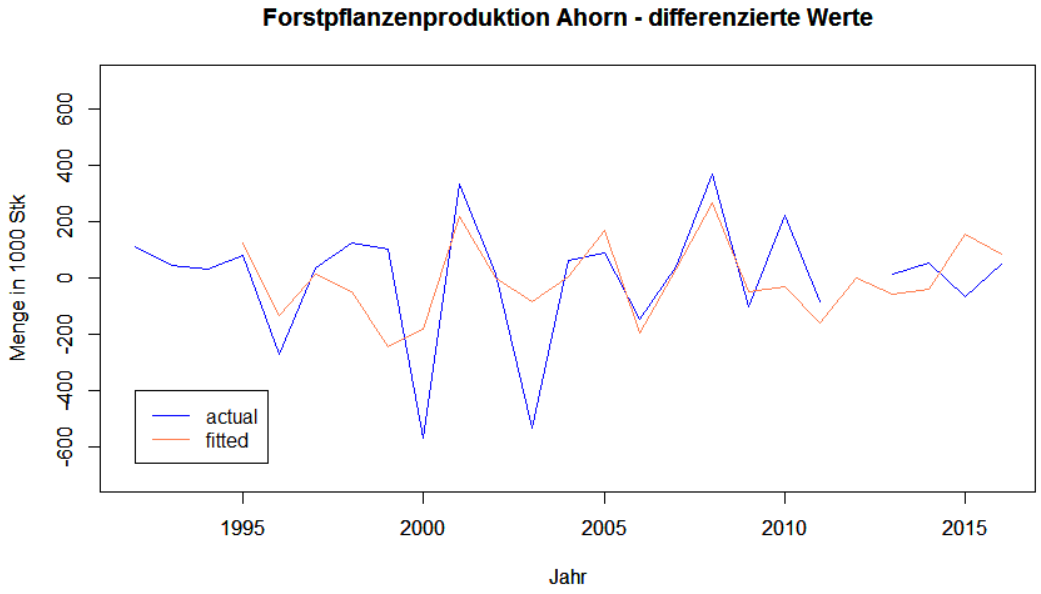


Figure 6Regression for differenced values: Maple (Acer spp.)

Activities of WP 3: Impacts on forest plant production and demand

M3.1 Development of the consistent time-series data base and *M3.2 Correlation analysis and econometric estimations – identifying the drivers* were completed. The next step includes determining the effects of these strategies of the seven studied tree species as well as the loss or gain of forest area for each single species. In addition, an econometric model including relevant forestry data (logging activity,deadwood, lumber prices of wood assortments) as well as data on economic development and forest nurseries was formulated

to explain historical seedling demand and estimate the future demand for forest seedlings in Austria. In combination with the econometric model, predictions for future seed yield can be made and new suitable plantation areas for each species determined. Since producers of tree seedlings currently face a high degree of uncertainty owing to the 1-year to 4-year lag between the beginning of the production process and marketing of the seedlings, our results will help to minimize production risks and provide a sufficient supply to cover future market demand for seedlings. The results will also help to develop transnational climate change adaptation strategies to ensure future forest ecosystem services in Austria and Central Europe.

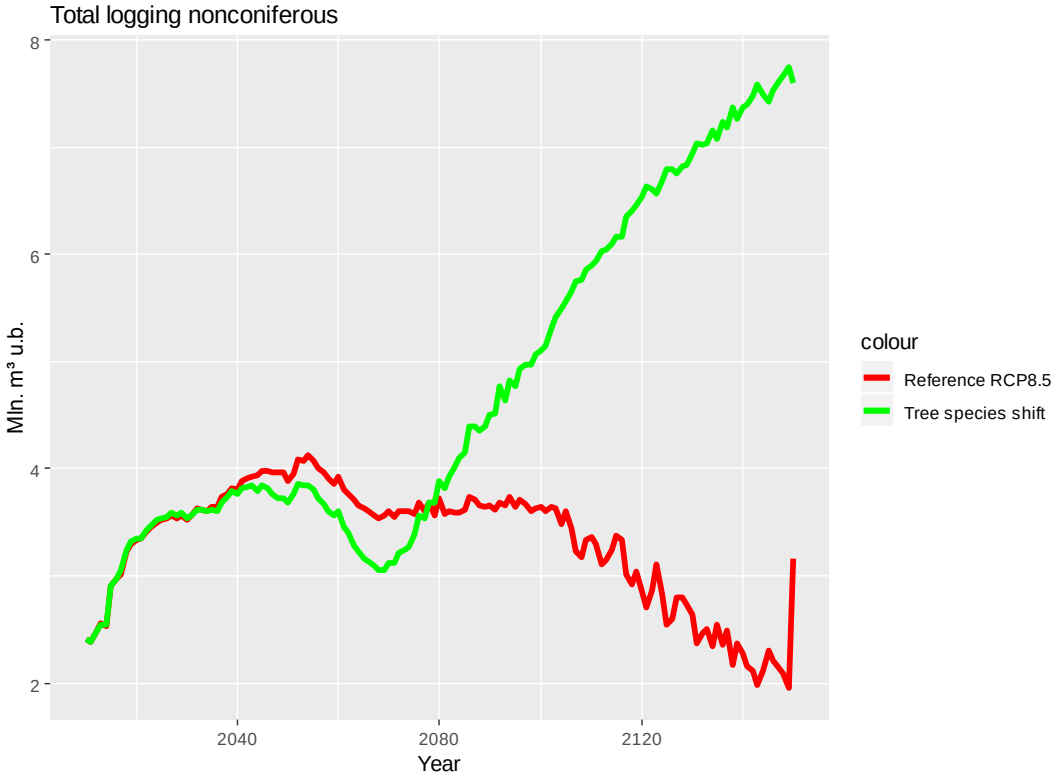
Activities of WP 4: Modelling plant demand due to CC

The loss and gain of forest area for each species was calculated. Climate-analogy models were applied and used to estimate regeneration requirement. Annual regeneration requirement and seedling demand were calculated.

Austrian forest-products model FOHOW included:

1. **General economy**: includes exogenous market drivers (gross domestic product, population). Product markets interact between general economy and the forest-based sector
2. **Forest product markets**: includes supply, demand, prices and trade for each semi-finished product
3. **Forestry**: Includes timber supply from three ownership categories: small private forest owners (<200ha), large private forest owners (≥200ha) and Austrian Federal Forests
4. **Forest resources**: includes forest area, growing stock and increments subdivided into coniferous and non-coniferous forests as well as into two age classes and the three ownership categories mentioned above
5. **Carbon stocks and dynamics** for intermediate products and semi-finished products (sawnwood, panels, paper and paperboard), distribution of final products (according to ÖPRODCOM production statistics)

The development of wood used by the Austrian forest-based sector were calculated for two scenario: Forest management “business as usual” and Forest management with tree species shift (orientation to natural forest vegetation with adaptation to climate change). The general assumption is that no adaptation of the Austrian wood-processing industry to hardwood takes place.



- **Figure 7 total logging non-coniferous for the Climate projection for RCP8.5 (MPI-ESM-LR/RCA).**

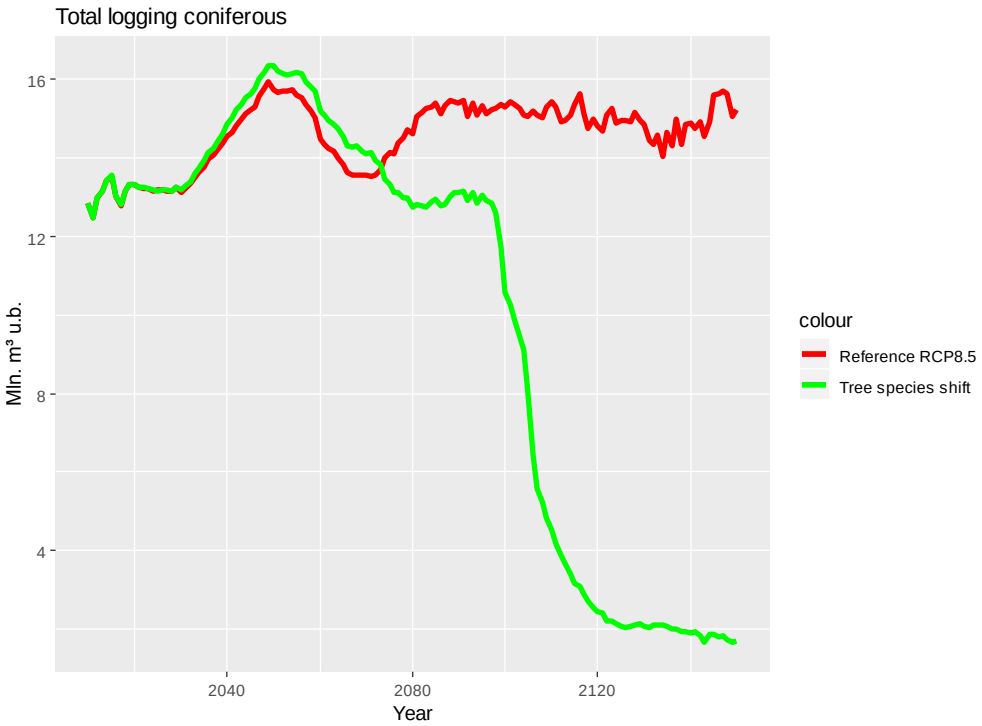


Figure 8 total logging coniferous for the Climate projection for RCP8.5 (MPI-ESM-LR/RCA).

Activities of WP 5: Scenarios for future plant production

Based on silvicultural strategies developed in WP4 as well as with long-term social and economic considerations, various scenarios will be developed to simulate their potential impacts on the forest sector in the future. At this point we highlight that the scenarios in WP4 and 5 are used to estimate CO2 emissions / sinks along partial sizes of the Austrian value chain wood. These are scenarios, not predictions - "what if" responses are provided for these CO2 emissions under the different scenarios according to scenarios. The scenarios do not reflect any kind of political statement. The scenarios cover a time horizon up to 2100. The reference scenario represents a comparison quantity. Other scenarios deviate significantly from those of the reference scenario in terms of their specifics and corresponding manipulated variables. Currently, the task is not completed due to the delay in WP4.

- **Table 3 Description of the reference scenario: Forest management "business as usual".**

	Referenzszenario 8.5 – business as usual RCP 8.5, Variante 28 (MPI-ESM-LR / RCA)
Beschreibung	Die weitere Nachfrage nach Holz (mengenmäßig und in Zusammensetzung) und die dementsprechende Waldbewirtschaftung entspricht dem Trend der letzten Jahre und ist beeinflusst durch die gleichen Rahmenbedingungen wie derzeit. Der National Renewable Energy Action Plan 2010 wird umgesetzt. In diesem Referenzszenario werden nach 2020 keine politischen Eingriffe hinsichtlich weiterer Forcierung von Holzbiomasse für energetische Nutzung mehr wirksam. Die Produktion der Säge-, Platten- und Papierindustrie sowie die energetische Nutzung von Holz folgen den Marktgegebenheiten. Der Rückgang der grafischen Papiere aufgrund der Zunahme elektronischer Medien wird durch die Zunahme bei Verpackungspapier kompensiert. Das Verhalten der übrigen Marktakteure bleibt sonst über den Zeitraum konstant.
Charakteristika	• Ziele des National Renewable Energy Action Plan 2010 werden 2020 erreicht; • Förderung der Nutzung von Waldbiomasse für energetische Zwecke läuft nach 2020 aus, • moderate Wirtschaftsentwicklung, • keine weiteren politischen Eingriffe, • Zuwachsentwicklung ergibt sich aus Waldwachstumsmodellierung unter Annahme einer bestimmten Klimaprojektion • Berücksichtigung des nicht-disponiblen Energieholzes für den Eigenbedarf
Stellgrößen und deren Quantifizierung zu Ist-Situation	• Wirtschaftswachstum: für Österreich bis 2018 entsprechend Statistik Austria/WIFO, bis 2050 entsprechend OECD GDP long-term forecast; 2051+: 1,6% jährlicher BIP Zuwachs (durchschnitt OECD GDP long-term forecast 2041-2050), für Competitor (i.e. OECD) 2017-2050 OECD GDP long-term forecast; 2051+: 1,7% (durchschnitt 2041-2050), • Ölpreis; bis 2050 entsprechend der EIA (EIA Annual Energy Outlook 2017): danach jährlich +0,7% (durchschnitt EIA Annual Energy Outlook 2017, Reference Case 2041-2050), • Waldfläche bleibt konstant
Importe	**limitiert auf …** • Sägerundholz: folgt den Marktgegebenheiten. Die maximale Importverfügbarkeit (Obergrenze) entspricht Maximum der Importe 2000-2016 (FPP/FHP) -

	Obergrenze • Industrieholz (Sägenebenprodukte): folgt den Marktgegebenheiten. Die maximale Importverfügbarkeit (Obergrenze) folgt dem Maximum der Importe 2000-2016 (FPP/FHP) - Obergrenze • Altpapiernettoimporte werden wie in den letzten Jahren konstant auf einem Niveau von 1 Million Tonnen gehalten. • Brennholz: Exporte bleiben konstant; Importe folgen den Marktgegebenheiten. Die maximale Importverfügbarkeit (Obergrenze) entspricht Maximum der Importe 2010-2016 (FHP). Importe werden endogen formuliert.

Table 4 Description of the scenario"Tree species shift": Forest management with tree species shift (orientation to natural forest vegetation with adaptation to climate change)

	Baumartenanpassung-Szenario RCP 8.5, Variante 28 (MPI-ESM-LR / RCA)
Beschreibung	Tree species shift with particular promotion of hardwood in low land areas and consideration of softwoods shift to higher areas Changing tree species composition and reducing the rotation time are two possible ways of adaptation. It needs to be defined which species combination on which sites will help reducing risk and/or increase increment and income. Tree species selection will be done by defining site characteristics like soil, altitude, temperature or precipitation on which a specific species is preferred for regeneration. Orientiert sich an der natürlichen Waldgesellschaft, Ersatz von Fichte durch Laubholz (z.B. Buche, Eiche, Ahorn), fremdländische Baumarten werden nicht berücksichtigt, Tanne und Kiefer bleiben bestehen. Anpassung erfolgt auf Basis klimatischer Änderungen. Temperaturbereiche Jahresmitteltemperatur: Nadelholz: <= 8°C Ahorn: 6°C bis 12°C Buche: 7°C bis 11°C Eiche: >= 10°C (wenn Standort weder für Ahorn noch für Buche geeignet ist dann >= 8°C) Es wird die Jahresmitteltemperatur und der lineare Temperaturtrend der letzten 30 Jahre laufend bestimmt. Sobald die in 50 Jahren erwartete Temperatur einer Baumart entspricht, wird diese schon heute zur Aufforstung herangezogen. z.B.: Wenn auf einem Standort heute Fichte stockt und das Klimaszenario in 50 Jahren eine Jahresmitteltemperatur von 10°C erwarten lässt, dann wird im Falle einer Wiederaufforstung heute schon mit Buche aufgeforstet. Berücksichtigung des Bodentyps: Grundsätzlich jene Baumart, die schon auf der Probefläche war. Im Falle eines temperaturbedingten Baumartenwechsels wird Eiche auf allen Böden gepflanzt, im Ahorn-Bereich wird Ahorn auf sauren Standorten (Bodenvegetationstypen) ausgeschlossen, im Buchenbereich wird die Buche auf vergleyten bzw. pseudovergleyten Standorten ausgeschlossen. Wenn mehrere Baumarten möglich sind, wird ein Mischbestand aus diesen zu gleichen Anteilen begründet.
Charakteristika	• Ziele des National Renewable Energy Action Plan 2010 werden 2020 erreicht; • Förderung der Nutzung von Waldbiomasse für energetische Zwecke läuft nach 2020 aus, • moderate Wirtschaftsentwicklung, • keine weiteren politischen Eingriffe, • Zuwachsentwicklung ergibt sich aus Waldwachstumsmodellierung unter Annahme einer bestimmten Klimaprojektion • Berücksichtigung des nicht-disponiblen Energieholzes für den Eigenbedarf

Stellgrößen und deren Quantifizierung zu Ist-Situation	• Wie bei Referenzszenario 8.5
Importe	**limitiert auf …** • Wie bei Referenzszenario 8.5

3. Description of difficulties encountered in the pursuit of the targets during the reporting period (if any)

The process of data controlling took longer due to unexpected gaps. However, data control was completed. The review on suitable statistical methods based on a comprehensive literature review impacted the time planning. Therefore M2.3 Predictive models applied for Austrian regions is not completed. The activites in WP2 and WP3 will be completed by July. A Project meeting to finalise and interpret the data analysis is scheduled for 23rd of July 2019. Once this is completed the open tasks in WP5 will be progressed.

4. Description of project progress “highlights”

- First results were successfully presented at a large number of scientific conferences in poster presentations and oral presentation.
- Consultation and literature research on the statistical approaches showed new ways to calculate the potential seed supply in relation to local climatic variables.
- Loss and gain of forest area for each species calculated
- Climate-analogy models applied and used to estimate regeneration requirement
- Annual regeneration requirement and seedling demand calculated
- The econometric models were build and discussed within the scientific community.
- Development of wood used by the Austrian forest-based sector. Assumption: no adaptation of the Austrian wood-processing industry to hardwood
- Feedbacks are implemented in the next steps of the analysis in the upcoming year.

2.3 Description of dissemination and publication measures

The project has been presented by a poster at a national meeting and a presentation within an ongoing policy working group on forest reproductive material in climate change:

- Martin Braun, Katharina Lapin, Peter Schwarzbauer, Theo Koller, Franziska Hesser, Christoph Dobeš, and Silvio Schüler Modelling Austrian forest seedling demand under different adaptation management strategies, Thu, 11 Apr, 09:02–09:04 https://meetingorganizer.copernicus.org/EGU2019/EGU2019-8764-1.pdf

- Katharina Lapin , Martin Braun , Peter Schwarzbauer , Theo Koller , Franziska Hesser , Christoph Dobeš , Silvio Schüler: Implications of forest mast seeding for the projected supply of forest seeds and seedlings of the Austrian forest-based sector. 20. Österreichischer Klimatag, 24.–26. April 2019, Wien. https://www.ccca.ac.at/fileadmin/00_DokumenteHauptmenue/03_Aktivitaeten/Klimatag/Klimatag2019/Tagungsband_klimatag2019_final.pdf

- MoreSeedsAdapt - Bedarf und Angebot an Forstsaat- und Pflanzgut im Klimawandel**.** Poster presented at the 19. Österreichischer Klimatag. Salzburg, Österreich, 24. April 2018

- Presentation of the Project at the working group „Klimafittes Pflanz- und Saatgut“ at the Austrian Ministry for Agriculture, Forestry, Environment and Water Management on 18.04.2018

2 Presentation of Costs

2.1 Table of costs for the reporting period

The following table provides an aggregated overview of the costs incurred by the applicant and the project partners in the current reporting period (01.05. 2018 to 30.04.2019), broken down by staff costs, capital expenditure, travel expenses, administrative and material expenses, and third-party costs. All figures in EURO.

Table 5 Overview of the current state of the project costs.

Cost category	**Eligible total costs according to contract**	**Cumulative costs of the reporting period** Total costs for the consortium*	**Applicant** **BFW** Costs in the reporting period from01.05. 2018 to 30.04.2019	**Partner 1** **BOKU** Costs in the reporting period 01.05. 2018 to 30.04.2019	**Partner 2** **Wood K-Plus** Costs in the reporting period from 01.05. 2018 to 30.04.2019
Staff costs	€ 208.727,00	€ 117.238,84	€ 81.136,30	€ 28.454,00	€ 7.648,54
Capital expenditure	€ -	€ -	€ -	€ -	€ -
Travel expenses	€ 7.282,00	€ 2.509,46	€ 1.777,78	€ 410,00	€ 321,68

Administrative and material expenses	€ -	€ -	€ -	€ -	€ -
Third-party costs	€ -	€ -	€ -	€ -	0,00
Total	€ 216.009,00	€ 119.748,30	€ 82.914,08	€ 28.864,00	€ 7.970,22

* Sum total of costs incurred / cost category of the applicant and all partners

2.2 Statement of costs in the reporting period

In total, staff and travel costs summed up to 117.238,84 €. The applicant **(BFW)** and project partner 1 **(BOKU)** had the highest costs, because they are responsible for most tasks of the workpackages 2, 3, 4 and 5 which have been the main work in the first project year. All Project partner claimed travel expenses. No costs for material or other administrative expenses were made.

2.3 Cost reclassification

A reclassification of project costs is not necessary at the moment.

3 Outlook

Ongoing project activities mainly include activities of work package 4 and 5.
The activities include the following milestones:

- *M4.2 Climate-analogy models applied and used to estimate regeneration requirement estimated (Strat 2)*
- *M4.3 Annual regeneration requirement and seedling demand calculated*
- *M5.2 Iterative simulations with WP4*
- *M5.3 Analyse critical drivers and feedbacks*

Furthermore, the work on M2.3 (*Predictive models applied for Austrian regions*) is still due to the delayed finalization of the data control and statistical method adaptation (see above). The chosen method follows a new theoretical approach which was not followed before in the scientific literature.

3.1 Time schedule

Figure 14 shows an overview on the time frame of the finished and actual activities. Colours mark the project progress. It is expected that the project objectives can be fulfilled within the given timeline.

Table 6 Overview of the current state of the project. The central activities are in line with the planned schedule.

		Year1												Year2												Year3					
		Months																													
		M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O
WP1: Project coordination and management																															
	M1.1 Kick off meeting	MV																													
	M1.2 Project website						MV					MV												M							M
	M1.3 Interim meetings											MV					M							M						M	
	D1.1 Interim reports												DV											D							
	D1.2 Final project reports & dissemination activity																														D
WP2:	**Potential seed and seedling supply in CC**																														
	M2.1 Transformation of fructification and seed harvest data into electronic form completed				MV																										
	M2.2 Most important climate parameters for seed quality and quantity of 7 tree species identified																							MV							
	M2.3 Predictive models applied for Austrian regions																									Mx					
WP3:	**Impacts on forest plant production and demand**																														
	M3.1 Development of the consistent time-series data base													MV																	
	M3.2 Correlation analysis and econometric estimations – identifying the drivers							MV																							
	M3.3 Construction of econometric models											M						MV													
WP4:	**Modelling plant demand due to CC**																														
	M4.1 Loss and gain of forest area for each species calculated (Strat. 1)																		M												
	M4.2 Climate-analogy models applied and used to estimate regeneration requirement estimated																		M												
	M4.3 Annual regeneration requirement and seedling demand calculated																							M							D
WP5:	**Scenarios for future plant production**																														
	M5.1 Adaptation of forest sector model to project requirements																		M												
	M5.2 Iterative simulations with WP4																							M							
	M5.3 Analyse critical drivers and feedbacks																													M	
	D5.1 Simulation results																													D	
	D5.2 Uncertainty-mode and effects analysis																														D

	activity realised within the forseen timeline
	foressen timeframe
	prosponed activity
M	**planed end of the milestone**
Mx	**planed end of postpond the milestone**
MV	**milestone reached**
DV	**deliverable reached**

4.2 Planed Cost schedule

The cost for the next reporting period will be mainly personal costs and travel cost in agreement with the project proposal.

4 Signature

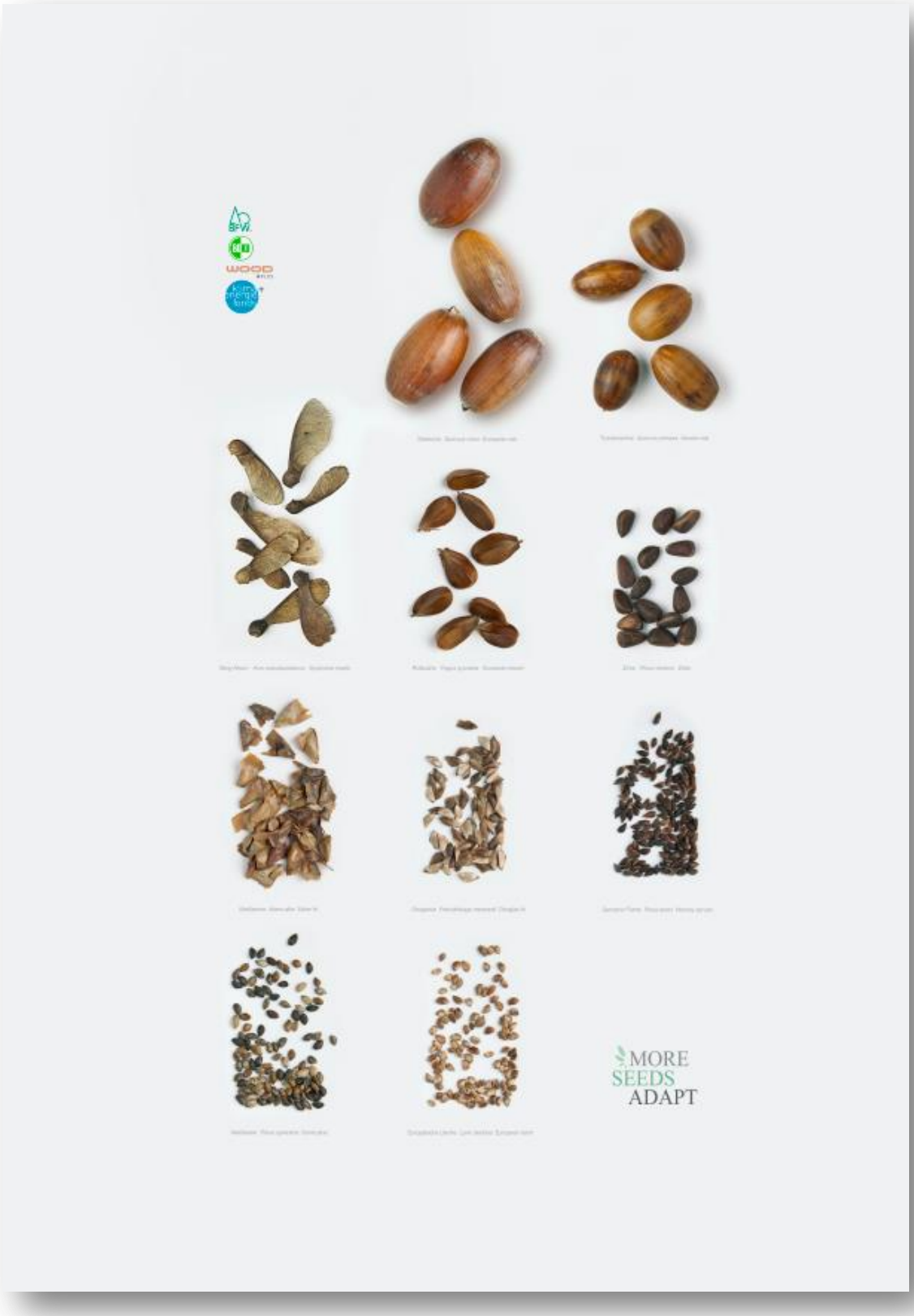
I herewith confirm that the report in its entirety has been accepted by the project partners.

Vienna, 31.05.2019

Place, date

Signature of the applicant (coordinator)

APPENDIX I – Dissemination Poster



APPENDIX II – Poster: Kimatage 2019