Mixed species forest management. Lowering risk, increasing resilience

REFORM- REsilience of FORest Mixtures

FP7 ERA-NET Sumforest

Minutes of the annual meeting
2-3 April 2019, Krakow (Poland)

Minutes summary

0. Attendance list

- Andreas Brunner- NMBU- Norwegian University of Life Sciences (Norway)
- Andrés Bravo-Oviedo-MNCN-CSIC/INIA (Spain)
- Anna Barbati- UNITUS- University of Tuscia (Italy)
- Antonio Tomau- UNITUS- University of Tuscia (Italy)
- Astor Torano- TUM- Technical University of Munich (Germany)
- Charlotte Poeydebat - INRA- Institut National de la Recherche Agronomique (France)
- Cristobal Ordoñez- UVA-University of Valladolid (Spain)
- Enno Uhl- TUM- Technical University of Munich (Germany)
- Felipe Bravo-UVA- University of Valladolid (Spain)

- Gediminas Brazaitis- ASU- Aleksandras Stulginskis University (Lithuania)
- Guillermo Vega- UVA- University of Valladolid (Spain)
- Ignacio Barbeito- SLU- Swedish University of Agricultural Sciences (Sweden)
- Jerzy Skrzyszewski-AUK -University of Agriculture (Poland)
- Jorge Aldea- SLU- Swedish University of Agricultural Sciences (Sweden)
- Kamil Bielak- SGGW- Warsaw University of Life Sciences (Poland)
- Liga Jansone- SILAVA- Latvian State Forest Research Institute (Latvia)
- Maciej Pach-AUK -University of Agriculture (Poland)
- Magnus Lof- SLU- Swedish University of Agricultural Sciences (Sweden)
- Markus Engel - BOKU- University of Natural Resources and Life Sciences (Austria)
- Mathias Steckel- TUM- Technical University of Munich (Germany)
- Maude Toïgo- CNRS- Centre National de la Recheche Scientifique (France)
- Miren del Río- INIA- National Institute for Agricultural and Food Research and Technology (Spain)
- Quentin Ponette- UCL- Université catholique de Louvain (Belgium)
- Rafael Calama- INIA- National Institute for Agricultural and Food Research and Technology (Spain)
- Ricardo Ruiz-Peinado- INIA- National Institute for Agricultural and Food Research and Technology (Spain)
- Silke Houtmeyers - NMBU- Norwegian University of Life Sciences (Norway)
- Sonja Vospernik - BOKU- University of Natural Resources and Life Sciences (Austria)

1. Presentation and adoption of agenda. Status of the project.

M. Pach welcomed all to the meeting.

Prof. Jarosław Socha, Deputy Dean for Science and Development of the Faculty of Forestry welcomed and presented the Forestry Faculty

M. del Río explained the changes in the agenda (Annex 1); informed about the Midterm report, possible extension of the project, abstract submission to the IUFRO Congress 2019, and the need to review the publication plan.

2. WP2_T2.1 Status of crown data from transects

C. Poeydebat first presented an overview of the data available for the Task 2.1 on beech damages (15 triplets). Then she exposed the possible data analysis to be done with this dataset and showed some preliminary results of the effect of species composition (mix vs pure) on herbivory. To complete the analysis some additional data from the triplets are needed such as climate, tree heights, etc. We agreed that C Poeydebat will ask for the additional information to the data providers. The plan is to analysis and write the manuscript before October 2019.

3. WP2_T2.2 Status of data from CSs

M del Río presented the status of this task. There are data available form eight case studies and data from two other CSs will be sent. It was discussed that in two CSs the data are the same than those provided for the spruce-pine transect. We agreed that they can be maintained in this study too. In the CS4 (TUM) data from pure plots are missing, but they will try to provide data from pure plots. Q Ponette expressed his interest to provide data from beech-oak mixture. Any additional data are welcome. Regarding climate data when Maximum and minimum temperatures are not available AGRI4cast data are used.

At the moment of the meeting the BAI series and SPEI values were already available for the CSs with data. Due to the high variability in species composition M. Pardos proposed to consider the different European forest type classes and species traits (e.g. SLA, deciduousness, etc.). Regarding the drought events it was exposed the criteria to select them, based on the Standardised Precipitation-Evapotranspiration Index (SPEI) and the BAI growth series. It was discussed whether to use the SPEI of six month or the hydrological year, deciding that it is better to test both. All data will be harmonized before the summer 2019 and the plan is to finish the analysis before the final conference.

4. WP2_Other activities

M del Río presented the Task about analysis of mortality using National Forest Inventory data proposed by S Condés. After exploring the data available the objective is to analyse the mixing effects on tree mortality of Pinus sylvestris growing in different mixtures and how this mortality is modified by site climatic conditions. It is expected to cover four mixtures with data from five countries.

M Steckel showed the first results of the analysis of resistance, recovery and resilience to drought events using the oak-pine transect. He presented the methodology used to select the drought events and to study the growth response (Lloret's indices). The first results indicate that the two species differ in their growth reaction in pure stands, being also the mixing effects different between species. The next steps are to consider other aspects in the analysis such as the drought intensity, tree social status and site conditions. The plan is to finish the analysis and write the paper before October 2019.

M del Río commented that the analysis of temporal stability will be started as soon the data with annual growth information at stand level are available. Preliminary results will be presented in the IUFRO Congress 2019

5. WP3_T3.1 Review of effect of structure on resilience

A Torano summarized the approach of this task to detect the different interrelations among forest structure, dynamic and disturbances (Systems Dynamics, Vensim tool). He explained how they introduced the different disturbances (water stress, snow, wind, fire, bark beetle, and heterobasidion) and how to analyse resilience showing some simulations. The plan is to finish the analysis and write the manuscript before September 2019.

6. WP3_T3.2 Productivity in pine-oak transect

M del Río presented the first results on productivity in pine-oak transect on behalf of H Pretzsch. There are a total of 36 pine-oak triplets in 25 sites in 13 countries. The preliminary results indicate that the mean steam dimensions of Scots pine are ahead in mixture, while those of oak are decelerated. SDI, BA and V are slightly higher in mixtures. Productivity is also greater in mixture, with overyielding for the two species and the total stand. Overyielding occurs mainly under benign site conditions. The next step is to write the common paper about stand productivity depending on site conditions**.**

7. WP3_T3.2. Status of transect pine-spruce. Preliminary analysis

R. Ruiz-Peinado informed about the status of the pine-spruce triplet transect study. There are 22 triplets in 10 countries, but at this moment only 15 triplets are analysed. The preliminary results show similar trends than for pine-oak but with smaller effects. However, as some data from some triplets are still missing the analysis needs to be done again. The next step is to finish the data analysis with the other 7 triplets and write the manuscript on overyielding before April 2019.

J Aldea proposed two analysis based on spruce-pine data. 1) Individual tree growth as function of competition of neighbouring tree species, and 2) Drought resilience of pine and spruce in pure and mixed stands. He exposed the approach for the first study: to split the competition in intra- and inter-specficic and size-symmetric and size-asymmetric components and to consider the weather conditions and their interaction with competition indices. The analysis will be done as soon the data from the triplets are available.

8.WP3_Task 3.3 interaction species mixing and thinning

A. Brunner exposed some concepts about the thinning effects in spruce-pine mixed stands, such as the change in species proportion and stand structure caused by thinning from below, the species-specific thinning response, etc. He introduced also other topics closely related (crown volume efficiency, effect of size variation on growth, etc.).

9.WP3_T3.4 Risk resilience silvicultural guidelines

E. Uhl presented the status of the task on behalf of H. Pretzsch. The main objective is to develop quantitative guidelines for complex forests, which are now mainly missing for most type of forests. He reviewed the main concepts used for stand regulation and how they could be used in complex forests.

10. WP3_T3.5 Computer algorithms

R. Calama exposed the concepts for developing a set of general common thinning algorithms. The thinning concepts and quantitative methods for regulating complex forest developed in task 3.4 have to be translated into a rule. To understand how currently this process is working on models a questionnaire will be sent to REFORM modelers. Then a set of thinning algorithms will be published in an open library.

11. WP3_T3.6 Training plots

G. Brazaitis presented the main idea of the training plots and the difference with the marteloscopes and revised the available training plots and marteloscopes in the framework of REFORM. There are four countries contributing with training plots (thinning, selection forests, etc.) and four with marteloscopes. The possibility of using the triplets transects as an international network of training plots was proposed. The training plots have to be developed based on partner initiatives. A common template for describing the plots will be developed (see task T5.3).

12. WP5_T5.3 Training tools

E. Uhl exposed the activities under this task, including training software, training guides, and database. He presented the concept of the training software for marteloscopes which is currently under construction. The content of the training tools is already available. E Uhl will provide the template to training plots/marteloscopes owners for completing the training guide. It was commented that it is not needed to prepare a common protocol for establishing the marteloscopes. Before the end of the year the training guide should be completed.

13. WP6_T6.1 Web and dissemination material

G. Brazaitis presented the webpage of the project and remembered the availability of the intranet. For instance the presentations of the regional workshops are in the intranet. The presentations from Paris meeting are in their respective task. The presentations of this meeting will be uploaded too. The visibility of the web page is now greater, but we should use the potential of the intranet. When sending the information (papers, presentation etc.) to G. Brazaitis (Gediminas.brazaitis@vdu.lt) people have to indicate the title, description and the attached material.

14. WP6_T6.2 and T6.3- Regional workshops and Final conference

M Löf explained the agendas of the two regional workshops already done in Riga and Vienna, and the main messages to research derived from workshops. It was agreed that the next workshop will be in November in Spain. Then he presented the venue of the Final Conference and the first circular already sent. We discussed that the second circular should be sent before the summer, where we have to include the invited speakers and the special issue. It is important that all the REFORM participants distribute well the circulars in order to have success with participants from outside of the REFORM project.

15. WP4_T4.1 ES provision- Data from transects

Q. Ponette presented the main activities under the task 4.1, the analysis of provision of various ecosystem services in the triplets and of soil storage in selected beech-pine/oak-pine triplets (R. Osei, PhD student). The soil samples are finished with a total of 22 triplets. The Bulk density analysis is done, and the Carbon/Nitrogen analysis in 80% of the samples. Q. Ponette will ask for some additional information required from the triplets (plot and tree data). The plan is to write two paper before the end of the year.

C. Poeydebat showed the status of the analysis of ES provision at stand scale. She presented the available data (50 triplets of different compositions from 18 countries). In order to estimate productivity some additional data are needed (site, tree and stand data). C. Poeydebat will ask for this information to triplets owners. It was discussed how to use the information about wood quality. F Bravo will explore the possibilities of developing one indicator from the measured variables. Then C. Poeydebat explained the meta-analytical approach to be used in the analysis and showed some first results. The possibility to use other indicators of biodiversity (number of larger trees, size heterogeneity, etc.) using tree and stand data was discussed.

WP4_T4.2 Scenario analysis

S Vospernik presented the methods and status of the scenario analysis of risk resilient silvicultural options. She explained the four models used in this task (3D-CMCC, Forceeps, Silva, Prognaus). The simulations are being done using the data from oak-pine transects to start the simulations, with three thinning intensities and two thinning types. The growth observed in triplets will be used to calibrate the models, as done with Austrian triplets. It was discussed which climate data to use. A. Tomau will organize the climate data from AGRI4cast. Another

problem is how to define the maximum basal area, needed to define the thinning. It will be taken from literature. Once the simulations are available a skype conference will be organized to discuss the results.

16. WP4_T4.3 Modelling ES provision in the long-run

M Toïgo presented the plan for this task to model ES provision in the long-run. Six models will be used to do simulations in the Case Studies. During last year the model ForCEEPS has been calibrated for eight species in France using NFI data. It was also tested in the CS10. In the simulations to be done, some CSs can be simulated using different models. In March 2019 som data were requested to CS managers (template sent). It has to be clarified which simulations will be done in each CS.

17. WP4_T4.4 Large scale ES assessments by NFI data

A. Barbati presented the data and methods used in this task. There are eight CS with different species compositions, from 6 countries. The number of available NFI plots by CS changes from 52 to 3200 plots. She explained the methods and first results from four CSs already analysed. The preliminary results confirms the Jack-of-all-trades effect. It was discussed that it is necessary to modify the use of the Shannon index, since by definition the mixed stands have higher values than pure stands. The next steps are to analyse the other four CSs (before summer). It was decided that the CS1 will be extended to other area to increase the sample size and that the model simulations will not be included in this study.

18. WP5_T5.1 Open Access Simulation Hube Service

G Vega explained the main objective of the Open Access Simulation Hube Service. He exposed the importance of Linked Open Data and the need for a forest ontology, which has been already initiated in the framework of OASIHS. Some aspects are still missing in the ontology (tree species component, common measures in forestry, etc.). The next step is to develop an RDF converter of the Spanish forest inventory, which can be later extended to other inventories.

19. WP5_T5.2 Knowledge database

F. Bravo explained the importance of sharing data (Task 1.4) and the need to develop the Data Management Plan. Following the Horizon 2020, in future all data have to be shared. He explained the concepts of Open data and Linked Data. For data sharing, a common ontology is also very important. We agreed that we will open the data of the triplet transects after the end of the project plus some time embargo. F. Bravo will send an updated version of the Data Management Plan to develop it.

20. Other presentations

M Engel presented the results of the study on “Species mixture effects on the climate-sensitivity, resistance, and trends of lagged climate effects on tree growth” based on Austrian triplets.

A Bravo-Oviedo presented the first results on “Inter-annual variability in the mode of competition based on TTs data”. These results correspond to pine-beech TT data, but the sample is bias as the cored trees are mainly dominant trees. Using the estimated growth for the rest of the trees could mitigate this bias. The plan is to do the analysis using all the transects, also pine-oak and pine-spruce transects which do not show this problem. A Bravo will ask for these data to TTs responsible people.

S Houtmeyers presented the results on “Thinning responses in spruce-pine mixtures” based on data gathered in Norway

21. Publication plan and conclusions

M del Río reviewed some important points for the next year. WPs leaders have to monitor in detail their tasks development in order the deliverables are reached at the end of the project. If needed, additional meetings for specific tasks could be done.

Regarding the extension of the project, we agreed that the coordinator (M del Río, INIA) will apply for an extension of six months. Several partners agreed to apply for this extension to their respective funding organizations. This means that the final report will be done after this period, that is, in October 2020. It is not a problem if one partner cannot or don’t want to apply for an extension. During June 2019 M del Río will communicate all the partners indicating how to proceed.

The publication plan was reviewed by all the meeting participants updating the list and the dates.

Anex 1. Agenda

Agenda of the annual meeting, 2-3 April 2019, Krakow

Tuesday 2sd April		
Time	**Issue**	**Presentation/moderation**
9:00	Introduction	M Pach (UAK)
9:15	**WP1** Adoption of the agenda Status of the Project Publication plan	M del Río (INIA)
9:30 10:15	**WP2** T 2.1. Status of crown data from transects -Beech crown condition (leaves) T 2.2 Status of data from CSs -Mortality study using NFIs T 2.3/T2.4 ?? Discussion WP2	Charlotte Poeydebat (INRA) M del Río (INIA)
10:30	Coffee break	
11:00	**WP2** Resilience/drought pine-oak transect	M Steckel (TUM)
11:25 11:50 12:20 12:40	**WP3** T 3.1. Review of effect of structure on resilience T 3.2. Productivity in pine-oak transect (Status of pine-oak thinned triplets) -Status of transect pine-spruce analysis -Preliminary analysis at tree level in spruce-pine triplet	A Torano H Pretzsch R. Ruiz-Peinado (INIA)/M Löf (SLU) J Aldea (SLU)
13:00	Lunch	
14:00 14:30 14:45 15:00	**WP3** T3.3. Species mixing and thinning T3.4 Risk resilience silvicultural guidelines T3.5 Computer algorithms T3.6 Training plots Discussion WP3	A Brunner (NMBU) H Pretzsch (TUM) R Calama (INIA) G Brazaitis (ASU)
15:30	Coffee break	
16:00	**WP5** T5.3 Training tools	E Uhl (TUM)
16:20 16:35	**WP6** T6.1 Web and dissemination material T6.2 Regional workshops	G Brazaitis (ASU) M Löf (SLU)

16:50	T6.3 Final conference WP6 Discussion	M Löf (SLU)
Wednesday 3th April		
Time	**Issue**	**Presentation/moderation**
	WP4	
9:00	T4.1 ES provision- Data from transects	Q Ponette (UCL)/Charlotte Poeydebat (INRA)
9:45	T4.2 Scenario analysis	S Vospernik (BOKU)
10:15	T4.3 Modelling ES provision in the long-run	M Toïgo (CNRS)
10:45	Coffee break	
	WP4	
11:15	T4.4 Large scale ES assessments by NFI data WP4 Discussion	A Barbati (UNITUS)
	WP5	
12:00	T5.1 Open Access Simulation Hub Service platform	G Vega (UVA)
12:30	T5.2 Knowledge database WP5 Discussion	F Bravo (UVA)
13:00	Lunch	
	Other presentations:	
14:15	Climate-sensitivity, resistance, and resilience under pure and mixed stand situations in Lower Austria evaluated with distributed lag models and penalized regression splines for year-ring time series	M Engel (BOKU)
14:35	Inter-annual variability in the mode of competition based on TTs data	A Bravo-Oviedo (INIA/CSIC)
14:55	Thinning responses in spruce-pine mixtures	S Houtmeyers (NMBU)
15:15	Discussion	
	WP1	
15:30	Project coordination Publication plan Conclusion	M del Río