Technical University of Zvolen Faculty of Forestry

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Annual report on the activities of the Faculty of Forestry for the year 2021

Material for discussionProposal for resolutions
Academic SenateLF

The AnnualReport is accepted:
- no comments
- with comments

It shall be submitted on the basis of
§ 27 (1) (g) of the Higher Education
Act

Prepared and submitted by: prof. Ing. Marek Fabrika, PhD., Dean of the Faculty

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1. Foreword

The management of the faculty submits an evaluation of the faculty's activities for the year 2021 in accordance with Act No.131/2002 Coll. on Higher Education of 21 February 2002 and on amendment and supplementation of certain acts. The annual report shall contain an evaluation of each of the main areas of the Faculty's activities, in particular teaching and pedagogical activities, scientific research activities, external relations and the management of the Faculty in the form in which they were approved by the relevant boards, i.e. the College of the Dean or the Scientific Council of the Faculty of Forestry. Behind this format is an effort to share analytically processed information as fully as possible with the members of the AS and the academic community of the Faculty of Forestry.

2. Bodies of faculty

2.1 Academic Senate

Composition of the Academic Senate for the term of office from 01 October 2019 to 30 September 2023

Bureau

Kmet'a Jaroslav, prof. Ing. PhD. - Chairman
Hlaváč Pavol, Ing. PhD. - Secretary, representative of the Faculty of Forestry in the Council of Universities of the Slovak Republic Střelcová Katarína, doc. Ing. PhD. - member
Bošeľa Michal, Ing. PhD. - member
Danilák Martin, Bc. - member (student representative)

Employee part

Kucbel Stanislav, doc. Ing. PhD.
Gejdoš Michal, doc. Ing. PhD.
Gömöry Dušan, prof. Ing. DrSc.
Gömöryová Erika, doc. Ing. CSc.
Holécy Ján, prof. Ing. CSc.
Kurjak Daniel, doc. Ing. PhD.
Lieskovský Martin, doc. Ing. PhD.
Lešo Peter, doc. Ing. PhD.
Máliš František, doc. Ing. PhD.
Merganič Ján, doc. Ing. PhD.
Scheer Ľubomír, prof. Ing. CSc.
Šulek Rastislav, doc. Mgr. Ing. PhD.
Tuček Ján, prof. Ing. CSc.
Ujházy Karol, prof. Ing. PhD.

Student part Csölleová
Linda, Ing. Ďurica Pavel, Ing.
Gracík Ivan, Bc.

Králik Daniel, Bc.
First Matthew, Bc.
Rajčeková Veronika, Bc. Toma
Tomáš, Bc.
Urbančík Ján Matúš, Bc.

2.2 Faculty Management

Dean: prof. Ing. Prof. Marek Fabrika, PhD.
Vice-dean for pedagogical activities: doc. Prof. Ing. Bc. Miroslav Kardoš, PhD. vice-dean for scientific research: prof. Dr. Mgr. Mgr. Jaroslav Ďurkovič
Associate Dean for External Relations: doc. Prof. Ing. Prof. Daniel Halaj, PhD.
Secretary of the Faculty: Ing. Miroslava Babiaková

2.3 College of the Dean of the Faculty of Forestry

Babiaková Miroslava, Ing.
Ďurkovič Jaroslav, prof. Dr. Mgr.
Fabrika Marek, prof. Ing. PhD.
Halaj Daniel, doc. Ing. PhD.
Chudý František, doc. Ing. CSc.
Jaloviar Peter, prof. Ing. PhD.
Kardoš Miroslav, doc. Ing. Bc. PhD.
Kmet'a Jaroslav, prof. Ing. PhD.
Kropil Rudolf, Dr.h.c. prof. Ing. PhD.
Merganič Ján, doc. Ing. PhD.
Scheer Ľubomír, prof. Ing. CSc.
Škvarenina, prof. Ing. CSc.
Šálka Jaroslav, prof. Dr. Ing.
Ujházy Karol, prof. Ing. PhD.
Danilák Martin, Bc.

2.4 Scientific Council of the Faculty of Forestry

The Chair:
Fabrika Marek, prof. Ing. PhD.

Members from LF:
Ďurkovič Jaroslav, prof. Dr. Mgr.
Fleischer Peter, doc. Ing. PhD.
Gömöry Dušan, prof. Ing. DrSc.
Gömöryová Erika, doc. Ing. CSc.
Halaj Daniel, doc. Ing. PhD.
Kardoš Miroslav, doc. Ing. Bc. PhD.
Kmet'a Jaroslav, prof. Ing. PhD.

Kropil Rudolf, Dr. h. c. prof. Ing. PhD.
Kucbel Stanislav, doc. Ing. PhD.
Messingerová Valéria, prof. Ing. CSc.
Pichler Viliam, prof. h. c. prof. Dr. Ing.
Rajský Dušan, doc. MVDr. PhD.
Saniga Milan, prof. Ing. DrSc.
Scheer Ľubomír, prof. Ing. CSc.
Střelcová Katarína, doc. Ing. PhD.
Šálka Jaroslav, prof. Dr. Ing. Ujházy Karol, prof. Ing. PhD.

Members from other departments:

Apfel Eduard, Ing., ŠOP SR Banská Bystrica, member of the Pro Silva Slovakia Committee Ditmarová Ľubica, RNDr. PhD., Director - Institute of Forest Ecology SAV Zvolen Fabriciusová Vladimíra, Ing., PhD., Director of the Poľana Protected Landscape Area Administration Jankovský Libor, prof. Dr. Ing., Faculty of Forestry and Wood Technology MU Brno Jendruch Jozef, Ing. PhD. managing director - Pro Populo s. r. o. neštátne lesy Poprad Kulla Ladislav, Ing. National Forestry Centre Zvolen
Marušák Róbert, prof. Ing. PhD. dean - Faculty of Forestry and Wood Technology ČZU Prague

3. Educational activity

SUMMARY

The aim of the presented evaluation report is to summarize and evaluate the pedagogical process through the indicators recorded in the University Information System (UIS) and the Dean's Office of the Faculty of Forestry for the academic year 2020/21. In the academic year (AR) 2020/21, teaching at the Faculty of Forestry took place in the Bachelor's degree programmes Forestry and Applied Zoology and Hunting. In the second cycle of studies, education was provided in the study programmes Adaptive Forestry, Applied Zoology and Hunting and Forest Ecology.

Pursuant to the Decree of the Ministry of Education, Science, Research and Sport of the Slovak Republic on the system of study disciplines of the Slovak Republic No. 244/2019 Coll. the original fields of study have been replaced by a single new field of study Forestry. As part of the offer of study programmes in this field of study, the study programme Arboriculture and Communal Forestry was also available for applicants at the bachelor's degree level. In the engineering study programmes, there was additionally the possibility of enrolling students in Geoinformation and Mapping Techniques in Forestry, Forestry Technology and the study programme in English Forestry and Wildlife Management. Despite their promotion among potential candidates, these were not opened due to a lack of applicants.

The academic year under review is particularly specific in terms of the ongoing pandemic and the resulting impact on full-time teaching, which has persisted for almost after throughout winter and summer semesters .

Similarly as in the previous academic year, part of the teaching was carried out by distance learning via MSTeams. The state examinations for the graduating students in both the 1st and 2nd cycle of studies were conducted in a face-to-face format. At the same time, processes, structures, guidelines were shaped at the university and faculty level during the AR in connection with the work on curriculum alignment according to the standards of the accreditation agency.

At the Faculty of Forestry in the evaluated AR 2020/21, a total of 608 students studied in the 1st and 2nd cycle of studies, years, as well as both forms of study, which is a decrease of 38 students compared to the previous AR 2019/20 (646 students).

The number of students enrolled in the assessed AR 2020/21 increased in the 1st cycle of full-time and part-time studies by 35 students in total. In the current AR 2021/22, a total of 162 students have enrolled.

The deadline for applications for the next AR was March 31, 2021. Following this, student enrollments were held in two rounds (7/2021 and 9/2021). In order to promote studies at the Faculty of Forestry, opportunities to reach potential applicants were used, mainly through targeted campaigns via social networks, advertisements, direct outreach via Edupage in cooperation with secondary schools.

In the academic year 2020/21, a total of 63 internal lecturers were involved in teaching. The total teaching load is 53,159 points, while the average teaching load of 61.07 full-time in-house teaching staff is 870 points, a decrease of 60 points from the previous AR.

EVALUATION OF EDUCATIONAL ACTIVITIES AT THE FACULTY OF FORESTRY HERE IN ZVOLENO FOR THE ACADEMIC YEAR 2020/21

1. Studyprogrammes and disciplines, in which teaching was provided at the Faculty of Forestry in the academic year 2020/21

In the academic year 2020/21, the following accredited study programmes were taught at the Faculty of Forestry:

1. degree (Bachelor's degree):
   - Study programme ***Forestry***, full-time and part-time
   - Study programme ***Applied Zoology and Hunting***, full-time and part-time

2. degree (engineering):
   - Study programme ***Adaptive Forestry***, full-time and part-time
   - Study programme ***Applied Zoology and Hunting***, full-time and part-time • Study programme ***Forest Ecology***, full-time form

2. Number of students at LF in the academic year 2020/21 (as of 31.10. 2020)

The numbers of students in each form, degree and study programme are shown in Figure 1a, b,c. *(note: the data, also for the previous AR, are adjusted for duplicate students registered in the UIS, e.g. due to transfer to external studies)*

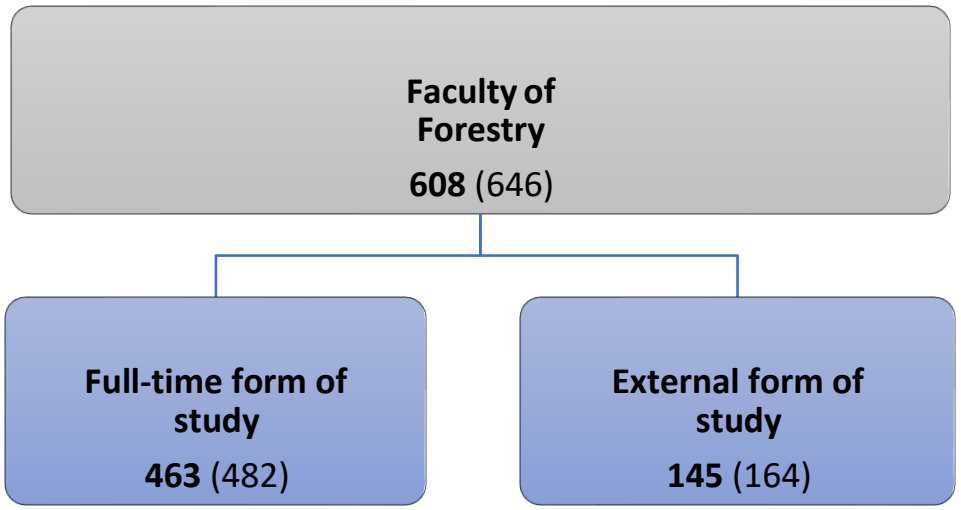


Fig. 1a Number of students at the Faculty of Forestry by form of study in AR 2020/21
Note: Figures in brackets are for the 2019/20 academic year

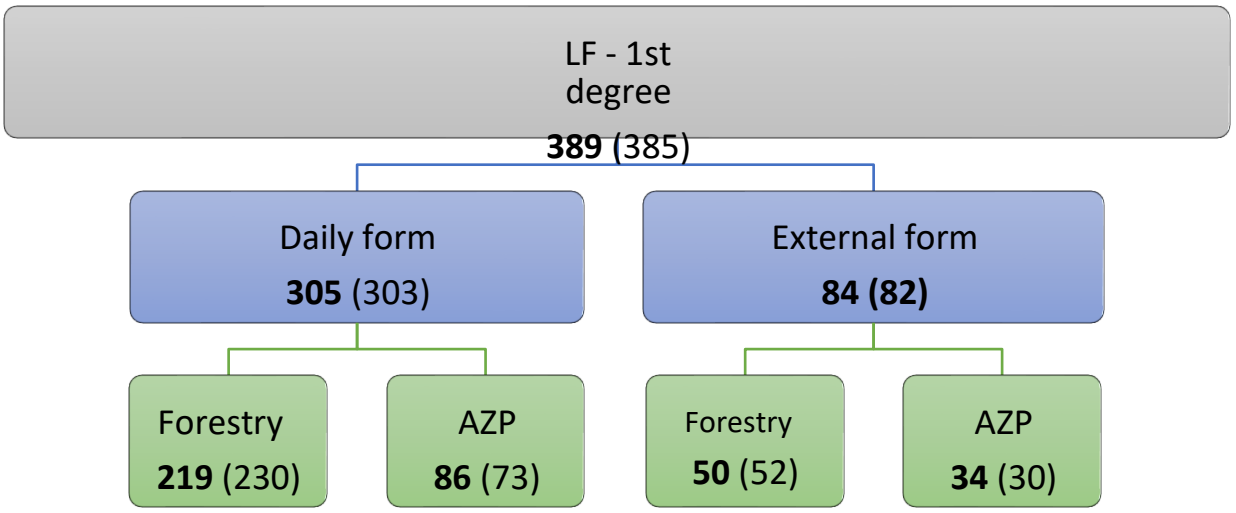


Fig. 1b Number of students at the Faculty of Forestry in the academic year 2020/21 in the first cycle of studies

Note: Figures in brackets are for the previous academic year 2019/20

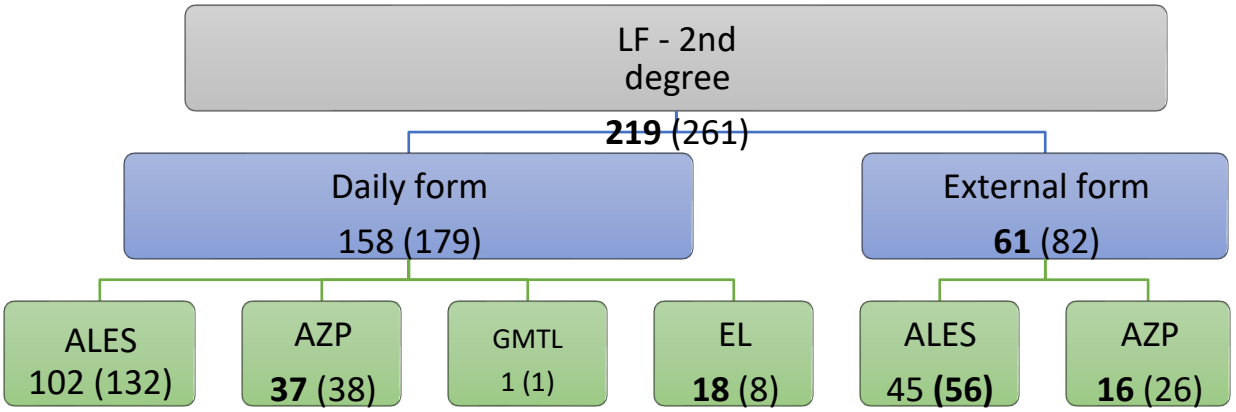


Fig. 1c Number of students at the Faculty of Forestry in the academic year 2020/21 in the second cycle of studies

Note: Figures in brackets are for the previous academic year 2019/20

3. Study programmes

3.1. Bachelor's degree programmes

Table 1 presents numerical data on students of Bachelor's degree programmes in the academic year 2020/21.

Table 1 Number of students enrolled in the academic year 2020/21- I. degree

Study program	enrolled students	Completion of the academic year 2020/2021							
		successful completion of AR		have interrupted their studies		dropped out, were expelled		code 79 - transfer	
		number	%	number	%	number	%	number	
I. degree - full-time study									
Forestry	220	171	78	5	2	44	20	2	
applied zoology and hunting	87	56	64	3	3	28	32		
full-time study Together	***307***	***227***	***73***	***8***	***3***	***72***	***23***	***2***	
I. degree - external study									
Forestry	52	33	63	4	8	15	29	1	
applied zoology and hunting	34	24	70	-		10	29		
external study Together	***86***	***57***	***66***	***4***	***5***	***25***	***29***	***1***	
ES + ES TOTAL	***393***	***284***	***72***	***12***	***3***	***97***	***25***	**3**	

In full-time studies, 73% of the 307 students of the first cycle of studies successfully completed the academic year (76%, 80% in the previous two ARs), in external studies 66% of the 86 enrolled students successfully completed the academic year (50%, 60% in the previous two ARs). Of the total number of first cycle students (307) enrolled in the academic year 2020/21, 72 % successfully completed the year of study (71 %, 76 % in the previous two ARs).

A total of 72 full-time students (66 - AR 2019/20, 59 - AR 2018/19) and 25 part-time students (28 - AR 2019/20, 31 - AR 2018/19) dropped out or were expelled
i.e. a total of 97 students (104 - 2019/20, 90 - AR 2018/19) out of a total of 393 enrolled in both forms of study, up 25% from 27% in the last AR and 21% in AR 2018/19.

The number of expelled students is partly related to the difficulty of studying at the Faculty of Forestry, but it has also been influenced to some extent by the coronavirus pandemic in the current AR.

An important task in this regard for teachers remains increased activity in communication and work with students, motivation of students by partial assessment during the semester, the use of alternative forms of teaching (block exercises, joint problem solving in a team, problem-oriented assignments, highlighting the practical content of the taught issues).

3.2. Engineering study programmes

Table 2 presents the figures on students of engineering study programmes in the academic year 2020/21. In full-time study, 91% of 159 students of the 2nd cycle of study successfully completed the academic year (94% - AR 2019/20, 95% - AR 2018/19), in parttime study, 98% of 63 enrolled students successfully completed the academic year (94% - AR 2019/20, 95% - AR 2018/19).
% (82% WITH 2019/20, 86% WITH 2018/19).

Of the 222 enrolled 2nd cycle students in the academic year 2020/21, 93% of students successfully completed the academic year (90% of students in the last AR, 93% in AR 2018/19).

Table 2 Number of students enrolled in the academic year 2020/21 - Level II

study programme	**enrolled students**	**Completion of the academic year 2020/2021**							
		successful completion of AR		have interrupted their studies		dropped out, were expelled		code 79 - transfer	
		number	%	number	%	number	%	number	
II. degree - full-time study									
adaptive forestry	102	93	91	-	-	9	9	5	
Geoinformation and mapping techniques in forestry	1	-	-	-	-	1	100		
applied zoology and hunting	38	34	89	2	5	2	5	1	
forest ecology	18	[18]	100	-	-	-	-		
full-time study Together	***159***	***145***	***91***	***2***	***1***	***12***	***8***	***6***	
II. degree - external study									
Forestry	46	46	100	-	-	-	-	1	
applied zoology and hunting	17	16	94	-	-	1	6		
external study Together	***63***	***62***	***98***	***-***	***-***	***1***	***2***		
ES + ES TOTAL	***222***	***207***	***93***	***2***	***1***	***13***	***6***		

The average grades by year and programme for the academic year 2020/21 are shown in Table 3a.

The overall mean grade of LF students in the Bachelor's degree is 2.6, which is a slight improvement from the previous AR (2.67) (Table 3b). The best average grade was achieved by

students in the AZP external form (2.43), the lowest repetition index of 1.57 was achieved by forestry students in the full-time form.

The overall average grade of LF students in the engineering degree is 2.2, almost identical to the previous AR 2019/20, with the same repetition index of 1.33. The best results were achieved by students in the Forest Ecology engineering degree programme, with an average grade of 1.62 and a repetition index of 1.14.

Table 3a Average grades by year, study programme, field of study in the academic year 2020/21 for full-time and part-time studies together

study programme (union)	P r o o c e s s								
	Level I					**Level II**			
	I.	**II.**	**III.**	**IV.**	**Toget her**	**I.**	**II.**	**III.**	**Toget her**
forestry - B-FORESTRY	2,67	2,64	2,52		**2,61**				
	1,74	1,58	1,38		**1,57**				
forestry - B-FORESTRY	3,27	2,76	2,61	2,65	**2,82**				
	2,27	1,81	1,64	1,33	**1,76**				
app. zoology and hunting B-AZP	2,97	2,5	2,41		**2,63**				
	2,05	1,67	1,47		**1,73**				
app. zoology and hunting B- AZPE	2,82	2,55	1,91		**2,43**				
	1,96	1,52	1,27		**1,58**				
S P O L U - I. Grade (ES + ES)	***2,93***	***2,6***	***2,4***	***2,65***	***2,6***				
	2,0	***1,6***	***1,44***	***1,33***	***1,7***				
adaptive forestry I-ALES						2,15	2,0		**2,06**
						1,27	1,25		**1,26**
forest ecology I-EL						1,97	1,27		**1,62**
						1,26	1,01		**1,14**
adaptive forestry I-ALES (ES)						2,72	3,04	2,32	**2,69**
						1,56	2,05	1,35	**1,65**
geoinformation and mapping techniques in forestry									
app. Zoology and hunting. I-AZP						2,05	2,05		**2,05**
						1,32	1,22		**1,27**
app. Zoology and hunting. I-AZPE						2,13	2,81	2,08	**2,34**
						1,6	1,82	1,12	**1,51**

S P O L U - II.						***2,20***	***2,23***	***2,2***	***2,2***
Grade						***1,40***	***1,47***	***1,24***	***1,33***
(ES + ES)									

Note: the first row is the average mark, the second row is the repetition index **Table 3b average grades and repetition index for the past 4 academic years**

Level 1

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
average	2,7	2,63	2,6	2,62	2,67	2,60
Index op.	1,7	1,59	1,55	1,55	1,68	1,7

Level 2

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Average	2,1	2,13	2,14	2,27	2,27	2,20
Index op.	1,26	1,27	1,25	1,39	1,33	1,33

4. Evaluation of the main exercises

In the academic year 2020/21, the main exercises took place in the winter semester in full-time form for two days only, then switched to the distance form and alternative HC solutions according to the instructions of the tutors.

Transportation was paid for by a grant from the University Forestry Enterprise. Transportation requests need to be defined on the application forms for entry to the HCFP due to production scheduling and student safety during HC. Settlement of earmarked activity funds (including for transport to HC) takes place annually during October for the past period with the participation of the management of the VŠLP. The funds saved for transport were used to provide practical aids for teaching.

The main exercises in the summer semester of AR 2020/21 were carried out in the same distance form. Course tutors were contacted with a request to send their opinion on how they plan to implement HC in the distance learning mode, while alternative HC solutions were offered, e.g. assignment to work in stands in the vicinity of the student's residence, solving the task on the basis of existing measured data from the VŠLP, sending instructional videos, the possibility of recording 360° panoramic shots from selected locations. Several teachers approached the alternative HC solution very responsibly as evidenced by the positive feedback from students.

4.1 Graduates and practice

According to the Dean's guidelines on the involvement of students in the OLH certificate programme during their studies, students of engineering study programmes have the opportunity, after meeting the basic requirements (e.g. an average for undergraduate studies up to 1.5), to apply for and subsequently undergo work experience in various positions within the VŠLP. These internships will allow students to gain practical knowledge of OLH activities during their studies. As OLH practice necessarily requires a full-time form of teaching, the OLH

programme was not opened in the assessed AR. The standard 25-day internship covers all areas defined by the OLH Decree, i.e. forest cultivation, forest management, forest harvesting and transport, forest protection, legislation. Following the completion of the internship, a special state examination committee is formed, where students answer questions from thematic units that are in line with the requirements for the OLH examination according to the OLH Decree and the requirements of the Ministry of Forests and Forestry of the Slovak Republic.

Of course there is a compulsory operational practice I. in the 1st year of study, which is carried out at the University Forestry Enterprise TU in Zvolen in order to gain practical experience in basic forestry activities. From the 2nd year of bachelor studies, students are obliged to undergo the Operational Training after a period of study leave.

Practice 2. They can complete the internship at individual organizational units of the State Forests of the Slovak Republic, or at private communities, urban gardens, conservation organizations, national parks, etc. This practice is carried out on the basis of an agreement on the placement of the student on operational practice with the respective organisation. The agreement also includes guidance on the specific content of the internship, so that it corresponds to the profile of the graduate of the relevant field of study. Students are then required to submit a written report and a certificate of completion of the internship, on the basis of which the internship can be recognised. In this academic year, as in AR 2019/20, due to the pandemic, the operational practice could not be carried out in the above form, so students were given an alternative assignment, which was prepared in cooperation with the Vice-Dean for Teaching activities by the tutors of the individual courses that the students had taken in the given year. The task of the first year students was to prepare a project, which consisted of the selection of a site in the place of residence and its characterization in relation to the acquired knowledge from the subject Geology, Bioclimatology, characterization of soil conditions on the basis of soil probes, photo-documentation and characterization of trees and herbs. The 2nd year students worked out a concrete solution for the calculation of stand characteristics on the example of a selected stand through forestry GIS in the locality of residence, as well as the identification and photo-documentation of abiotic and biotic harmful agents in the given stand. The completed field reports were emailed by the students to the Associate Dean for Educational Work for which they were awarded 2 credits.

Students of the 1st year of the 2nd stage of studies completed a pre-diploma practice in the scope of 3 weeks in the months of July - August 2020. The pre-diploma practice serves to obtain the basis for the preparation of the diploma thesis. The pre-diploma practice is supervised and credit is awarded by the supervisor of the diploma thesis.

Within the framework of linking education with practice and increasing the share of practical teaching, the subject of adaptive forest management in forestry practice has been introduced, where lecturers from the external environment (forestry operation, nature and landscape protection) are invited, who point out positive examples of nature-friendly forest management in practice through their lectures and discussions with students. The course was not open in the evaluated AR, but the lecturers from forestry practice under the leadership of prof. Saniga - the course supervisor - developed university scripts, which met with high interest among students and the public.

5. Evaluation of the quality of teaching

In terms of evaluating the quality of teaching, feedback from students and translating measures to improve the quality of learning into study programmes plays an important role. In this context, at the Faculty of Forestry we have started in the previous AR to implement the process of the so-called optimization of the pedagogical process, in which about 40 teachers, practitioners and students participated. On the basis of an extensive discussion, theses were formulated, which are gradually being implemented and translated into teaching or curriculum optimisation. The basic themes include increasing the knowledge level of students, facilitating the personal development of students, intensifying the transfer of research and development knowledge into teaching and practice through graduates, and improving the conditions for a successful course of study. This also includes the permanent collection of feedback from students through the UIS or through alumni questionnaires.
1st and 2nd degree studies. The material has been discussed and approved by the Dean's

College as well as the Scientific Council and represents a tool through which we continuously meet the objectives in relation t o raising the standards for the quality of studies at the Faculty of Forestry.

As part of the ongoing evaluation and quality assurance of the pedagogical process, we have carried out the following steps within the AR:

1. **Control of the number of theses supervised**

An important criterion is the adequacy of the number of university teachers, researchers or artists supervising theses in relation to the number of students. In this context, however, we have continued to implement measures (by means of a regulation of the Dean of the Faculty of Forestry) to redistribute indirect teaching more evenly, i.e. to limit the maximum number of theses supervised. By the instruction of the Dean of the Faculty of Forestry, from the AR 2018/19 onwards, a maximum of 5 students with their theses can be enrolled with one thesis supervisor (B.Sc. and Eng. theses together).

2. Control of the deadline for the submission of bachelor's and master's theses

Based on the results of the final thesis submission check, we would like to draw the attention of teachers to instruct their graduates and undergraduates to submit their bachelor and master theses on time, as well as upload them into the university information system. Similarly, students are reminded to get their theses and dissertations done by the end of June in the 2nd year of B.Sc. Thesis topic and supervisor should be selected by November at the latest in the 1st year of B.Sc. and by November at the latest in the 1st year of Eng. Thesis supervisor and thesis topic. During the year, the scientific and pedagogical staff are notified of the announcement of new thesis topics and their updating in the UIS. Additionally, in this AR we have been offered to cooperate on the topics with NLC within the Memorandum of Cooperation with NLC and LF TUZVO. The topics were provided to our scientific and pedagogical staff by the research staff at NLC Zvolen, who will be their consultants in case of student's application for the topic.

3. Control of the handing in of examination sheets at the Dean's Office of the Faculty of Forestry

Teachers are also reminded repeatedly to fulfil their obligations to students (entering the assessment in the UIS) as soon as possible after the examination, which becomes even more important with the abolition of paper indexes. It is also important to hand in the examination papers by the deadlines set because of the obligation to archive them.

4. Finding out the number of announced examination dates (number of places for registered students)

From the level of the dean's office, a survey was conducted through the UIS to determine the number of dates during study leave.

- Both 1st and 2nd make-up dates should be posted during study leave so that students can plan their exam schedule.
- Examinations, including make-up dates, can be taken up to 31 July of the academic year in question, please advise teachers by email communication to announce the dates continuously during this period, or in case of student interest.

5.1. Evaluation of the quality of teaching by students

The evaluation of the quality of teaching by students, or the evaluation of individual

teachers, is carried out on the basis of a survey in the UIS, which includes the evaluation of the quality of studies for the academic year 2020/21. Students have the opportunity to comment on a specific subject, but also on additional questions

regarding satisfaction with the faculty, etc. At the same time, the questionnaires for teacher and subject evaluation were updated in the AR under review.

Questionnaire for the evaluation of teachers and subjects of ZS and LS 2020/2021:

1. Did the lecturer manage to arouse your interest in the subject?
2. Did the practitioner succeed in arousing your interest in the subject?
3. Is the speaker's form of expression (verbal, written, ...) appropriate to your requirements?
4. Is the form of the practitioner's expression (verbal, written, ...) appropriate to your requirements?
5. Lecturer's approach to students is correct, tactful, within the limits of "fair-play" ...
6. The practitioner's approach to the students is correct, tactful, within the limits of "fair-play" ...
7. To what extent did you attend lectures?
8. Is the knowledge and information acquired in the course new and not repetitive (not duplicated with another course)?
9. Do you get the impression that the lecturer is interested in the students mastering the material?
10. Did the lectures provide you with more than just studying the recommended readings?
11. Did the exercises provide you with more than just studying the recommended literature?
12. Practical examples are used in teaching the subject?
13. In your opinion, how does the lecturer handle the subject?
14. How, in your opinion, does the practitioner handle the subject matter?
15. You rate the interpretation of the course content as ...
16. This subject ma ...
17. The difficulty of the subject, in your opinion, is ...
18. What did you like and dislike about the course (lecture)? (Your observations, comments, suggestions, criticism, ...) What new things would you suggest to revive the teaching of the subject in the future?
19. What did you like and dislike about the course (exercise)? (Your observations, comments, suggestions,
    criticism, ...) Or what new things would you suggest to revive the teaching of the subject in the future?

Part of the evaluation is the opportunity to comment on the quality of the teaching process at Faculty.

1. How satisfied are you with your choice of faculty (university)?
2. How satisfied are you with your choice of the programme you are studying?
3. How satisfied are you with the information at the faculty, university?
4. Do you feel that if you want to, you have the possibility and opportunity to express your opinion on the quality of the educational content at the faculty, university?
5. What do you think is the provision of didactic and computer technology?
6. How satisfied are you with the services of the study department at your faculty, university?

Table 4. Overall statistics of course evaluation in UIS (comparison AR 2020/21, 2019/20)

Period: LF - LS 2020/2021			**AR2019/20**	
Course evaluation				
Potential number of respondents:	647		695	

Actual number of respondents:	33	**5%**	42	**6%**
Number of courses duly enrolled in the period:	75	**40%**	73	**38%**
Number of subjects with answers:	30		28	
Number of completed survey ballots:	91		102	
Average number of tickets per subject:	1,21		1,4	
Additional questions				
Potential number of respondents:	605	**3%**	640	**3%**
Actual number of respondents:	19		24	
Period: LF - ZS 2019/2020				
Course evaluation				
Potential number of respondents:	632	**13%**	703	**14%**
Actual number of respondents:	84		105	
Number of courses duly enrolled in the period:	68	**70%**	68	**75%**
Number of subjects with answers:	48		51	
Number of completed survey ballots:	272		332	
Average number of tickets per subject:	4,00		4,88	
Evaluation of individual subjects				
Additional questions				
Potential number of respondents:	611	**8%**	650	**8%**
Actual number of respondents:	52		56	

Students are invited to complete the above questionnaires via UIS automatically after the end of the semester. We have also taken the opportunity to mobilize students for course evaluations through the SMS gateway. The percentage of completion of questionnaires on the quality of learning provided has been maintained at the level of the previous AR.

We recommend that lecturers themselves encourage their students to complete the survey after the lectures and tutorials (e.g. during the last week of the semester tutorials). Student evaluations are an important tool not only for the educator himself, but also for the continuous improvement of quality and standards in the curricula.

In addition to the course evaluations in UIS, we also used our own tools to gather feedback, especially from students of the 1st and 2nd cycle of study. The results of these questionnaires are discussed by the management of the Faculty of Forestry and are part of the proposals for changes that we continuously submit to the academic community (e.g. corrections of study plans, proposals for changes in the process of conducting state examinations at the Faculty of Forestry, which are approved by the Academic Senate of the Faculty of Forestry).

Graduates of both 1st and 2nd degree studies were contacted after successful defence of their bachelor thesis and passing the state examination to express their opinion especially on the state examinations, but also on the overall pedagogical process for the whole study through an anonymous questionnaire via Google form application.

In the questionnaire, the following questions were asked to both undergraduate and graduate students (the answers are also given). In addition to the above questions, the students could also comment on the teachers themselves, the way the state examination is conducted, the application of

in practice after graduation and, of course, to express any comments on the course of study on LF.

Engineering graduates:

A total of 25 engineering graduates participated in the survey.

In the questionnaire, students were asked the following questions:

1. How do you evaluate the prepared training camp before the state exams through MS Teams?
2. How do you evaluate the seminar on writing and presenting a thesis that you had the opportunity to attend during your studies??
3. To what extent were you satisfied with the state examinations (defence and oral examination)?
4. Are you in favour of holding the annual re-examination of the state examinations during the month of August?
5. Write the name of 1-3 teachers who have most positively influenced you during your studies at LF (you can also give a reason).
6. Write the name of 1-3 teachers who have left negative memories in you during your studies at LF (if you also give a reason it will be better).
7. Do you have a job offer after graduating from LF?
8. If you are not considering a career in forestry, please state the reason.
9. Please express your any comments or suggestions that can help us to improve the course of study at LF in the future.

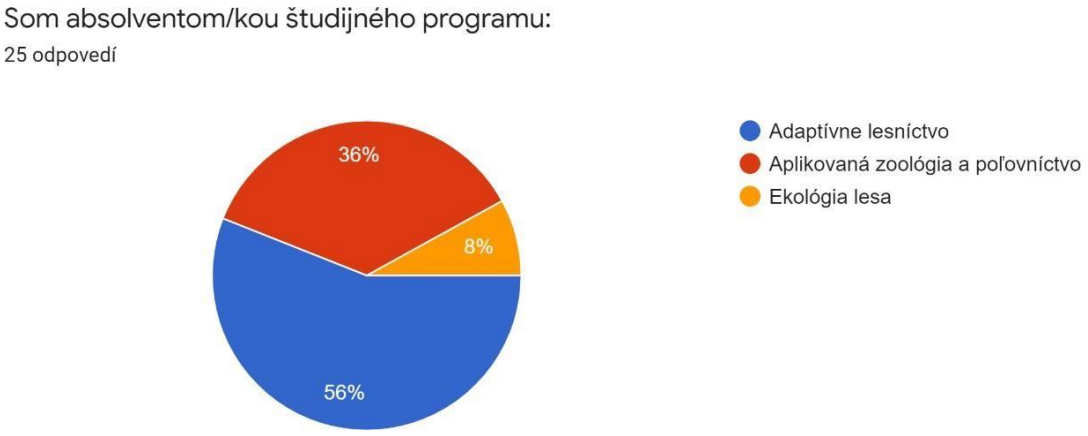


Fig. 2a Structure of study programmes according to respondents' answers

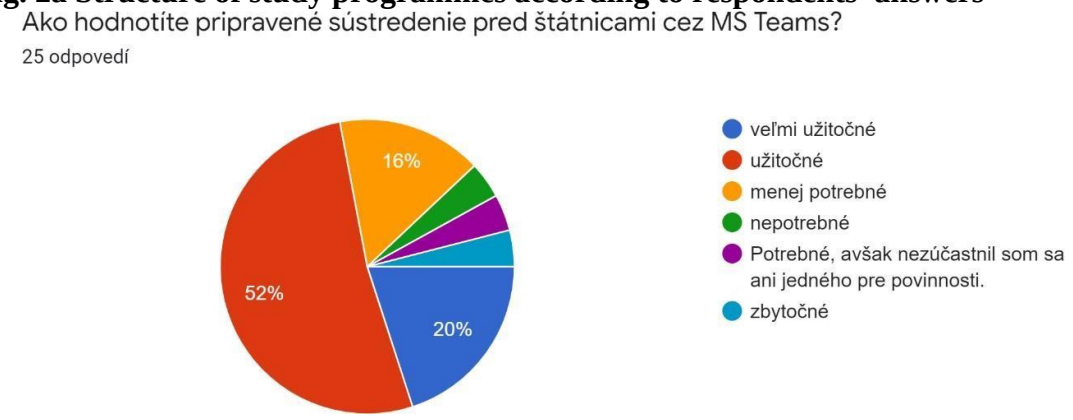


Fig. 2b Evaluation of the implemented concentration before the state exams

Fig. 2c Evaluation of the seminar for improving the quality of theses

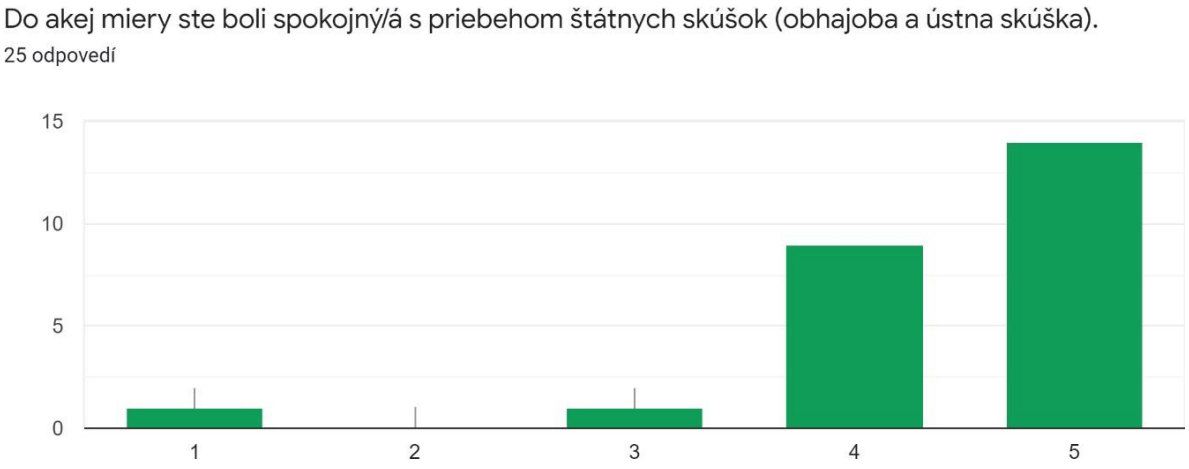


Fig. 2d Students' satisfaction rating with the level of state thesis **examinations** (note: 1 least satisfied, 5 most satisfied)

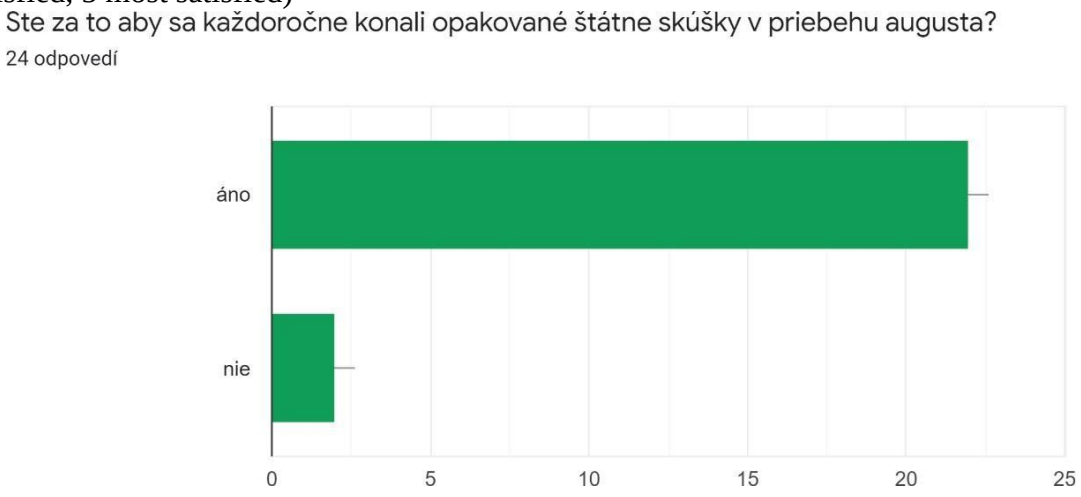


Fig. 2e Students' responses regarding the national re-tests

Fig. 2f Students' responses regarding employment after graduation from LF

5.2. Evaluation of state examinations by members of state examination boards

Each year after the state examinations are completed, the chairs of the state examination boards are asked to evaluate them from the perspective of the individual state examination boards.

Based on the comments of the members of the State Examination Boards, the students were distributed more evenly among the Boards over more days, and the examination days were shortened to ensure greater hygiene of the working process. In the future, we consider it important to objectify the supervisor's and opponent's evaluations of the final thesis so that they

contain an appropriate number of questions. Also, the state thesis topics are updated by the course tutors well in advance and should be more comprehensively formulated in order to assess the student's understanding of the context in relation to the knowledge acquired.

Due to the partial relaxation of the pandemic-related teaching restrictions, the state examinations were held in full-time attendance, with safety and hygiene measures being observed. Based on the comments of the members of the State Examination Boards, the students were distributed more evenly among the Boards over more days and the examination days were shortened to ensure a more hygienic working process. Examinations were conducted with spacing between examiners as well as the student himself, with disinfection of the premises and hands and covering of the respiratory tract being a matter of course. The state examination, consisting of the defence of the diploma or bachelor's thesis and the oral part, lasted in both cases 50 minutes, which in most cases was considered by the examiners as sufficient time to evaluate the student's answers. Based on the comments of the members of the State Examination Boards, the students in this AR also submitted one version of the printed final thesis in accordance with the approved rules for the organisation of the State Examinations.

5.3. Evaluation of teaching during the transition to distance learning

In the academic year 2020/21, a significant proportion of teaching was distance learning due to the pandemic and associated measures. In the winter semester of AR 2020/21, teaching was full-time for 2 weeks, with 2 days of core classes. Subsequently, due to the worsening pandemic situation, a switch to distance learning was made, which practically lasted the entire summer semester. For the first time in the summer semester, students came in attendance for the final state examinations and thesis defenses. Teachers used a variety of software tools to communicate with students, conduct lectures and exercises, but especially Microsoft Teams (MST), which is available to all staff and students free of charge as part of the Office suite 365. Students are assigned to the appropriate group directly from UIS, and the list of students is updated regularly.

Equally important was communication via UIS, document server or email. To this end, students' emails were redirected to Office 365, where there is significantly more storage space compared to UIS. In addition to online lectures via MST, some lecturers also used sending annotated lectures and were available for online consultations via MST. In this context, we have prepared a presentation with instructions for educators to create an annotated lecture via Microsoft Powerpoint.

An important element of quality assurance of distance learning was the collection of feedback from students, which was carried out through a survey. The results pointed to several shortcomings, e.g. lack of internet connectivity for students, lack of experience of lecturers with online teaching, poor communication with students. In order to continuously improve the quality of distance education, we initiated a survey among all LF students, the results of which we report:

Survey: Distance Learning and Examination of the ZS 2020/21 (70 responses)

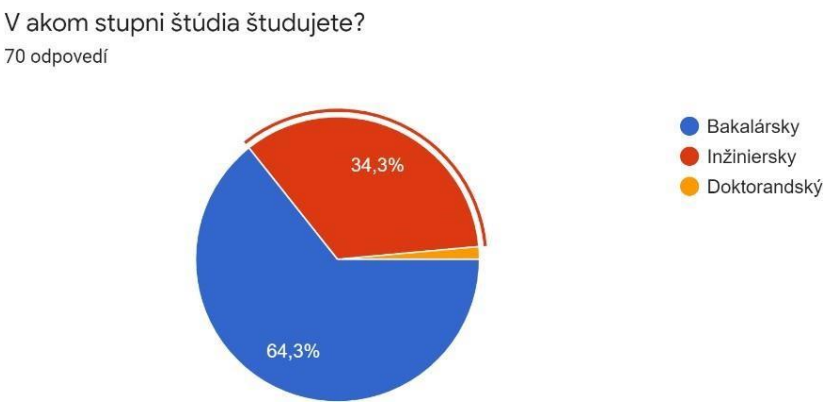


Fig. 3a Degree of study according to respondents' answers

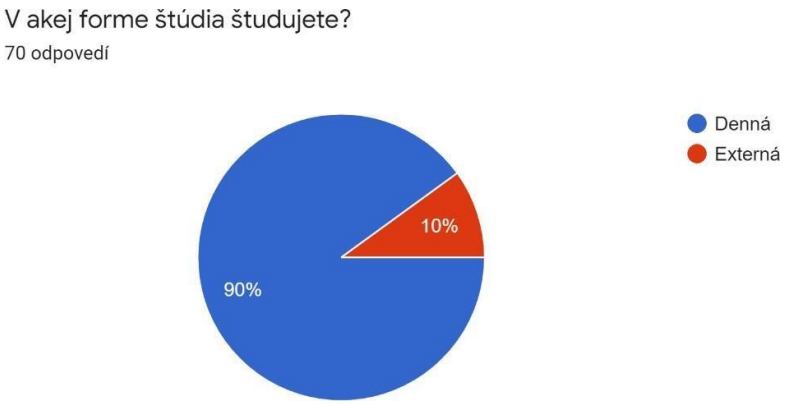


Fig. 3b Form of study according to respondents' answers

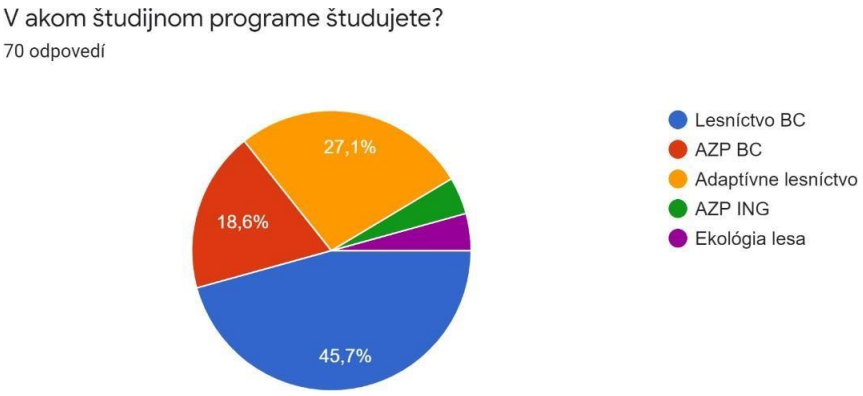


Fig. 3c Structure of study programmes according to respondents' answers

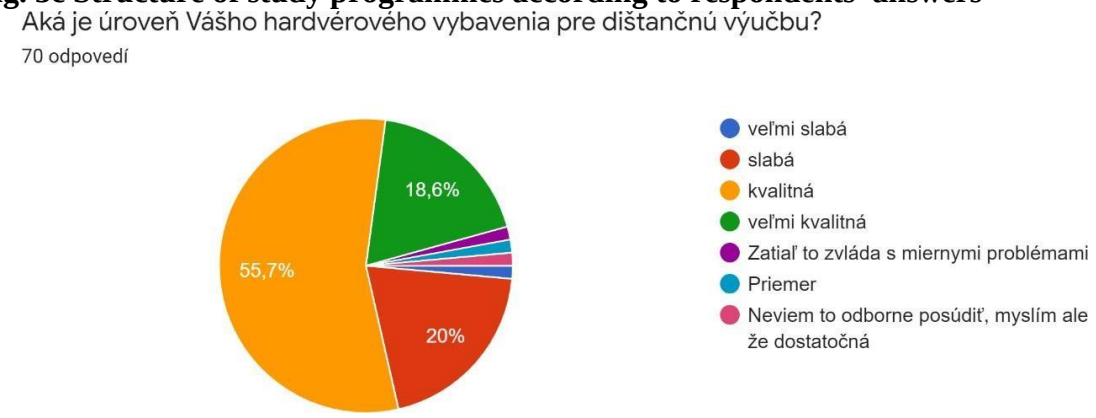


Fig. 3d Level of hardware equipment of students for distance learning

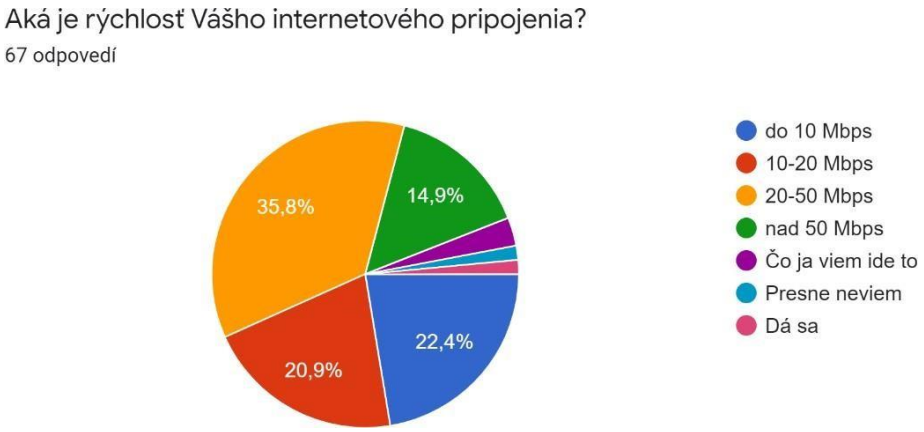


Fig. 3e Internet connectivity of students in the home environment for distance learning

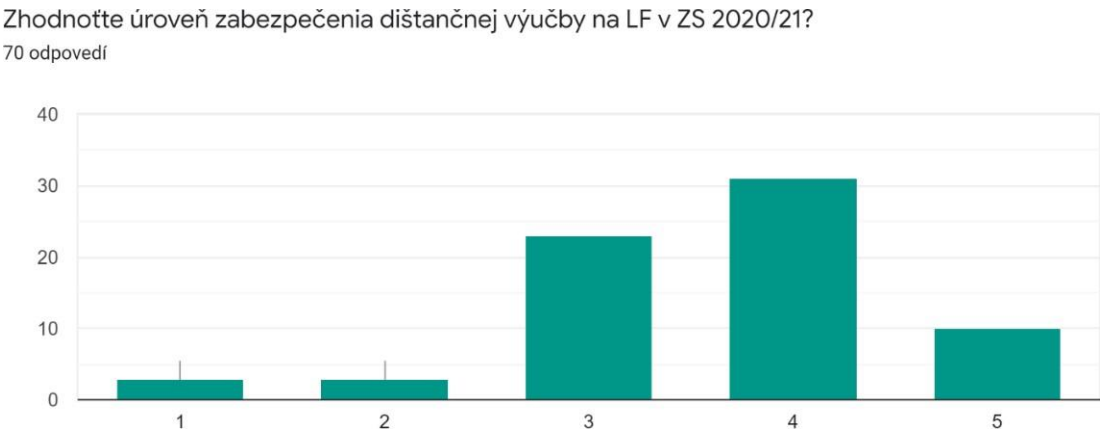


Fig. 3f Evaluation of distance learning provision according to respondents' answers (note: 1 - poor level, 5 - high level)

Next, students were given the opportunity to comment on the following questions (answers not given due to the range and diversity of responses, but were evaluated by members of the LF management).

Which 3 subjects do you consider to be the best managed with regard to distance learning (subject, teacher, form of distance learning)?
Name specific problems in teaching specific subjects (if any). Name specific problems in the provision of the examination process (if any).
Make any comments not covered in the previous questions, e.g. the issue of conducting endof-year theses, etc.

Survey: Distance Learning and Examination LS 2020/21 (46 replies)

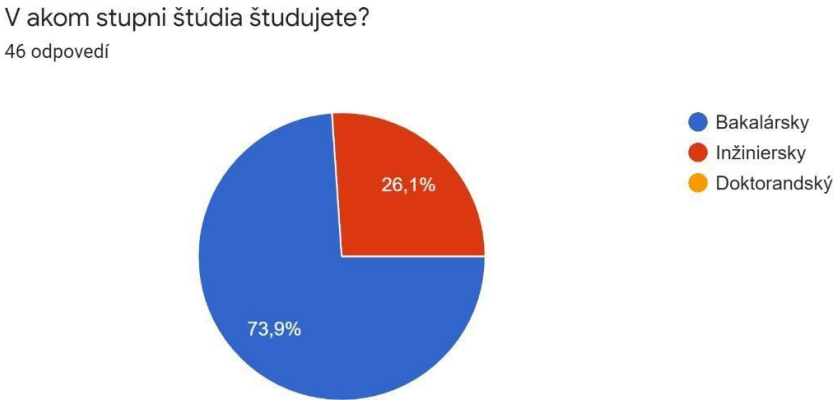


Fig. 4a Degree of study according to respondents' answers

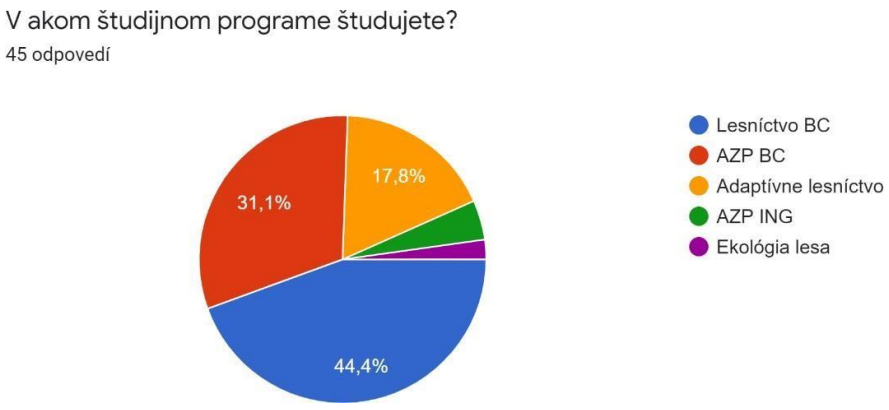


Fig. 4b Form of study according to respondents' answers

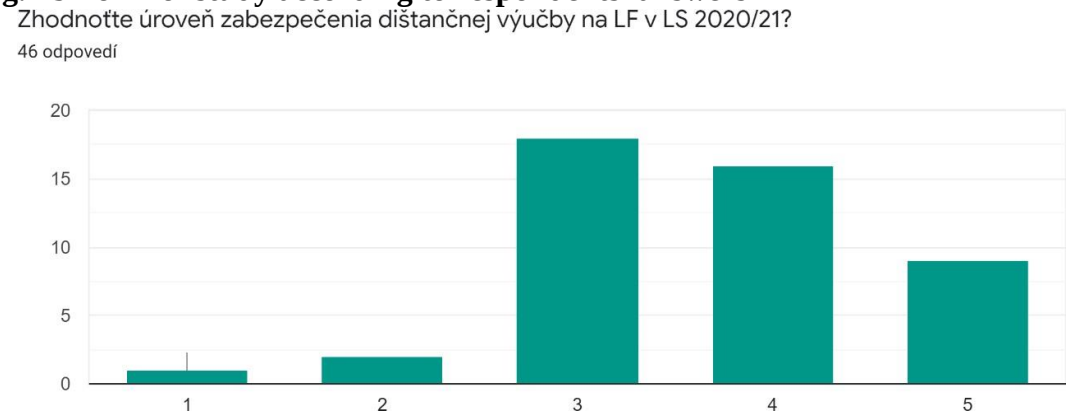


Fig. 4c Evaluation of distance learning provision according to respondents' answers (note: 1 - poor level, 5 - high level)

Next, students were given the opportunity to comment on the following questions (answers not given due to the range and diversity of responses, but were evaluated by members of the LF management).

Which 3 subjects do you consider to be the best mastered with regard to distance learning (subject, teacher, form of distance learning).
Which 3 subjects do you consider to be the least mastered with regard to distance learning (subject, teacher, form of distance learning). If these were not you do not need to give an answer.
Name specific problems in teaching specific subjects (if any). Name specific problems in the provision of the examination process (if any).
Make any comments not covered in the previous questions, e.g. the issue of conducting end-of-year theses, etc.

6. Evaluation of final state examinations

6.1 Evaluation of the State Examination in the Bachelor's Degree

The bachelor state examinations, which included the defence of bachelor theses, were held on 12 July - 14 July 2021 and the corrective state examinations on 17 August 2021. The defence of bachelor theses was attended by a total of 60 students in full-time study and 13 in part-time study. A total of 73 students participated in the bachelor thesis defences and the state examination. 2 students in the external form of study graduated with honours. The number of students according to the affiliation of the study programmes and the form of study, together with the evaluation, is a v a i l a b l e in Tab. 5 and Fig. 5a.

Tab. 5 Results of bachelor thesis defences and state examinations in the academic year 2020/21

Results of BP and ŠS defences	Full-time study			External study			**DŠ + ES SPOLU**
	Forestry	AZP	**DŠ SPOLU**	Forestry o	AZP	**ES SPOLU**	

of which with Honours	-	-	0	-	2	2	**2**
excellent (1) - A	1	-	1	-	-	-	**1**
very good (1-) - B	22	6	28	1	2	3	**31**
good (2) - C	18	5	23	5	3	8	**31**
satisfactory (2-) - D	4	3	7	1	1	2	**9**
sufficiently (3) - E	1	-	1	-	-	-	**1**
failed - FX							
S P O L U - students who have successfully completed their studies	46	14	60	7	6	13	**73**

Note: *4 full-time students of the forestry study programme took part in the remedial state examinations held on 17.08.2021,*

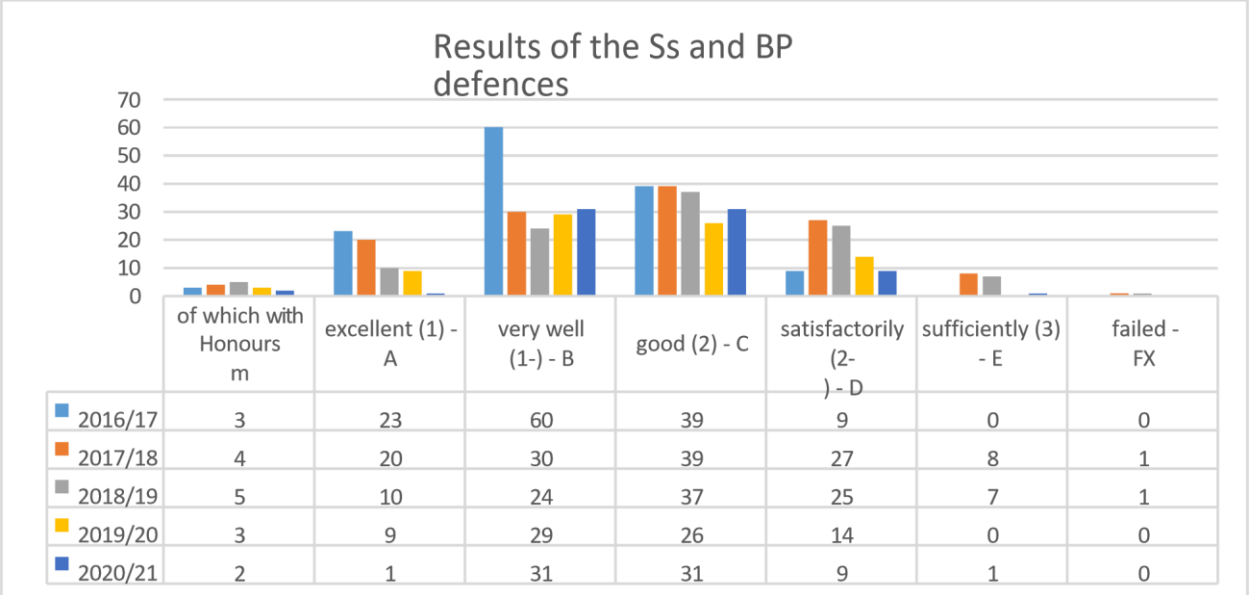


Fig. 5a Evaluation of the defences of BP and SS of 73 bachelor graduates

6.2 Evaluation of the State Examination in the Engineering Degree of Study

State examinations and thesis defences were held on 21-25 June 2021 and the remedial state examinations were held on 17 August 2021. A total of 92 full-time and part-time students took part in the defences (Table 6, Figure 5b). In the full-time form, the defence and the state examination took place in the study programmes Adaptive Forestry, Applied Zoology and Hunting and Forest Ecology. In the external form in the study programmes Adaptive Forestry

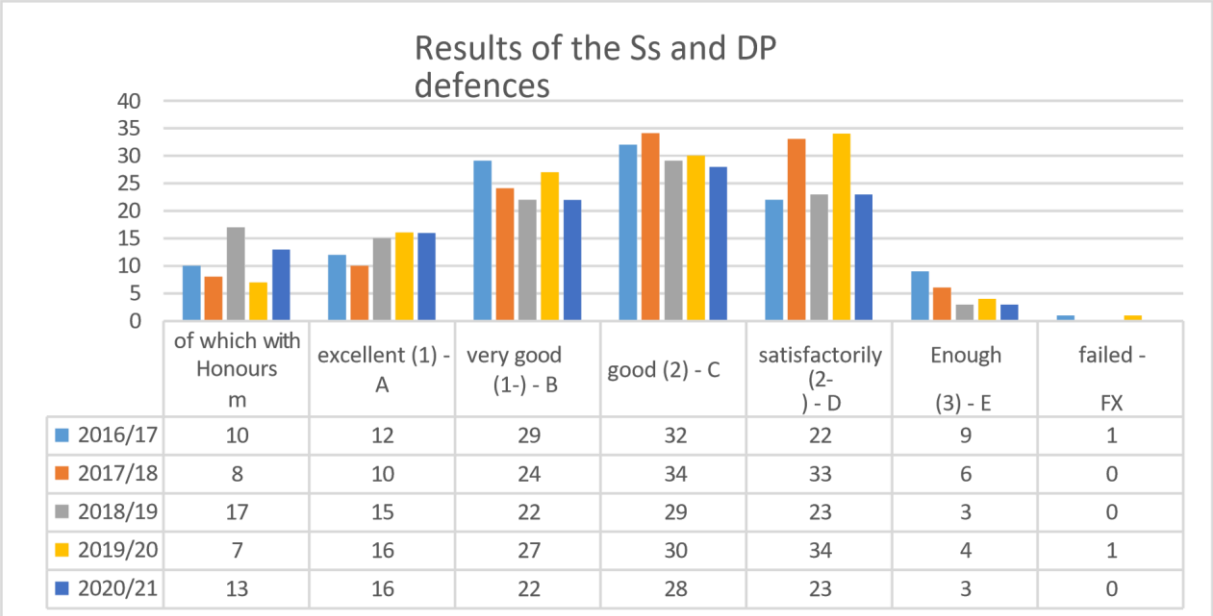
and applied zoology and hunting. 9 students graduated with honours in the full-time form of study and 4 in the external form of study.

Table 6 Results of thesis defences and state examinations in the academic year 2020/21

Results of the CS and DP defences	Full-time study				External study					ES+ES Together
	BUTS	EL	AZaP	MS Together	BUTS	EL	GMTL	AZaP	ES Together	
of which with distinction	3	4	2	**9**	3	-	-	**1**	**4**	**13**
excellent (1) - A	6	4	3	**13**	3			1	**3**	**16**
very good (1-) - B	9	4	5	**18**	3			2	**4**	**22**
good (2) - C	16	1	7	**24**	2			4	**4**	**28**
satisfactory (2-) - D	9	-	4	**13**	6				**10**	**23**
sufficiently (3) - E	1	-	1	**2**	1				**1**	**3**
failed - FX										
S P O L U - students who have successfully completed Study	**41**	**9**	**20**	**70**	**15**	**-**	**-**	**7**	**22**	**92**

Note: unsuccessful students at the SS - 13,

12 students appeared for the remedial state examinations held on 17/08/2021. 1 student did not appear for the remedial SS. There were 2 students from AZaP DS, 7 students from ALES DS, 3 students from ALES ES present for the remedial state examination.



	of which with Honours m	excellent (1) - A	very good (1-) - B	good (2) - C	satisfactorily (2-) - D	Enough (3) - E	failed - FX
2016/17	10	12	29	32	22	9	1
2017/18	8	10	24	34	33	6	0
2018/19	17	15	22	29	23	3	0
2019/20	7	16	27	30	34	4	1
2020/21	13	16	22	28	23	3	0

Fig. 5b Evaluation of the defence of the DP and SS of 92 engineering graduates

7. Qualifying Structure scientific and pedagogical of staff in the academic year 2020/21

In the academic year 2020/21, a total of 63 in-house research and teaching staff (64 in the previous AR) with a total working time of 61.07 (61.25 - AR 2019/20) provided teaching as of 31 October 2020. Of these, 16 professors (+3), 24 associate professors (+4) and 23 (-8) assistant professors (note the change from the previous AR in brackets). An overview of the internal scientific and teaching staff at the Faculty of Forestry of TU Zvolen is presented in Table 7.

Tab. 7 Number of internal teaching staff at the Faculty of Forestry - status by departments as of 31.

10. 2020

Department	Category				
	Professors		Associate Professors		Expert Assistants
	DrSc.	CSc., PhD.	Dr. Sc.	CSc., PhD.	CSc., PhD.
KPP		2 (2)		3 (3)	
KF	1 (1)	2 (2)			4 (4)
KPL	1 (1)			5 (5)	1 (1)
KAZMZ		1 (1)		2 (2)	4 (2,1)
KIOLK		1 (1)		4 (4)	3 (2,98)
KLŤLM		2 (2)		4 (4)	2 (1,99)
KPLZI		3 (3)		4 (4)	5 (5)
KERLH		3 (3)		2 (2)	4 (4)
Total	**2 (2)**	**14(14)**		**24 (24)**	**23 (21,07)**

Note: Figures in brackets represent actual working time

8 . Evaluation of the admission procedure

8.1 Admission procedure for Bachelor's studies

Candidates were admitted to Bachelor's degree programmes on the basis of admission procedures without personal participation and without entrance examinations, on the basis of the basic and additional conditions for admission (achievement of the specified grades according to the type of secondary school - annual report cards and matriculation examination grades), approved by the Academic Senate of the Faculty of Forestry.

Table 8 provides a detailed overview of the number of applicants to the Bachelor's degree programme at the Faculty of Forestry and the number of admitted and enrolled students

starting from the academic year 2020/21, Tab. 9 shows the numbers of students in the current AR 2021/22.

Tab. 8 Number of enrolled, admitted and enrolled students in AR 2020/2021 at 1. degree of study

Programme and form of study	Academic year 2020/2021			
	Number of applicants	Number of Participants	Number of accepted plan/actual	Number of Enrolled
full-time study - Bachelor				
Forestry	115	107	120/107	99
Applied zoology and hunting	56	53	60/53	48
Arboriculture and municipal forestry	5		20/0	
Applied geoinformatics and geodesy	0		20/0	
full-time study total	**176**	**160**	**220/160**	**147**
external study - bachelor				
Forestry	30	29	20/29	24
Applied Zoology and hunting	30	30	20/30	23
Arboriculture and municipal forestry	1		20/0	
external study total	**61**	**59**	**60/59**	**47**
ES + ES together	**237**	**219**	**280/219**	**194**

Tab. 9a Number of enrolled, admitted and enrolled students in AR 2021/2022 for the 1st cycle of studies

Programme and form of study	Academic year 2021/2022			
	Number of logged in	Number of Participants	Number of accepted plan/actual	Number of Enrolled
full-time study - Bachelor				
Forestry	110	110	110/110	80
Applied zoology and hunting	48	48	60/48	26
Arboriculture and municipal forestry	7	0	20/0	0
full-time study total	**165**	**158**	**190/158**	**106**

external study - bachelor				
Forestry	26	26	20/26	25
Applied Zoology and hunting	36	36	20/36	31
Arboriculture and municipal forestry	2	0	20/0	0
external study total	**64**	**62**	**60/62**	**56**
ES + ES together	**229**	**220**	**250/220**	**162**

Number of students enrolled in the current AR in the 1st cycle of study in full-time and part-time form decreased compared to the previous year by a total of 32 students.
Figure 6a gives an overview of the students admitted and enrolled in the current academic year and 5 academic years back.

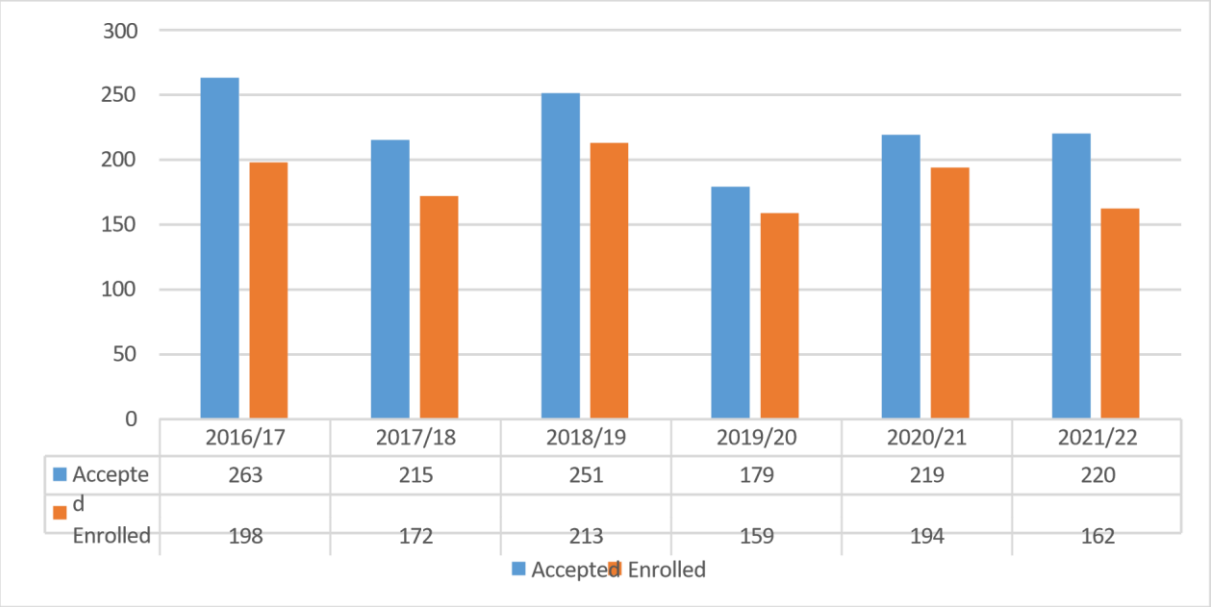


Fig. 6a **Number of enrolled students AR 2016/17 to 2021/22 in the first cycle of studies - full-time form**

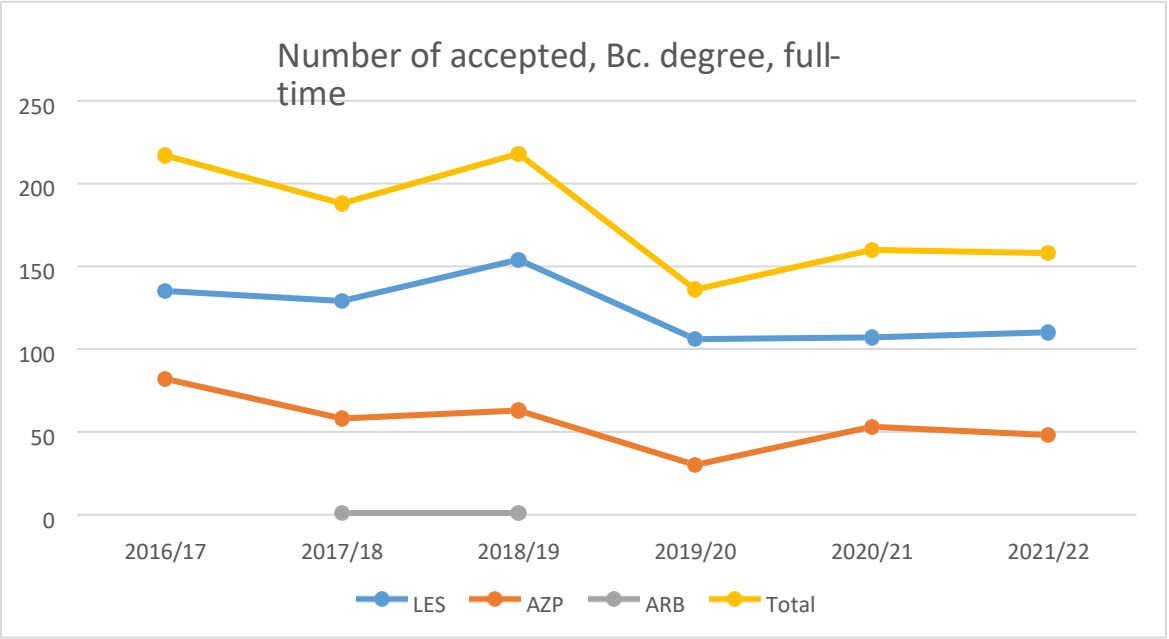


Fig. 6b Number of enrolled students AR 2016/17 to 2020/21 in the first cycle of studies - full-time form

Figure 6b shows an overview of students enrolled in individual study programmes in the first cycle of study. In the current academic year, we have recorded an almost identical number of applications for both open Bachelor's degree programmes as in the previous AR.

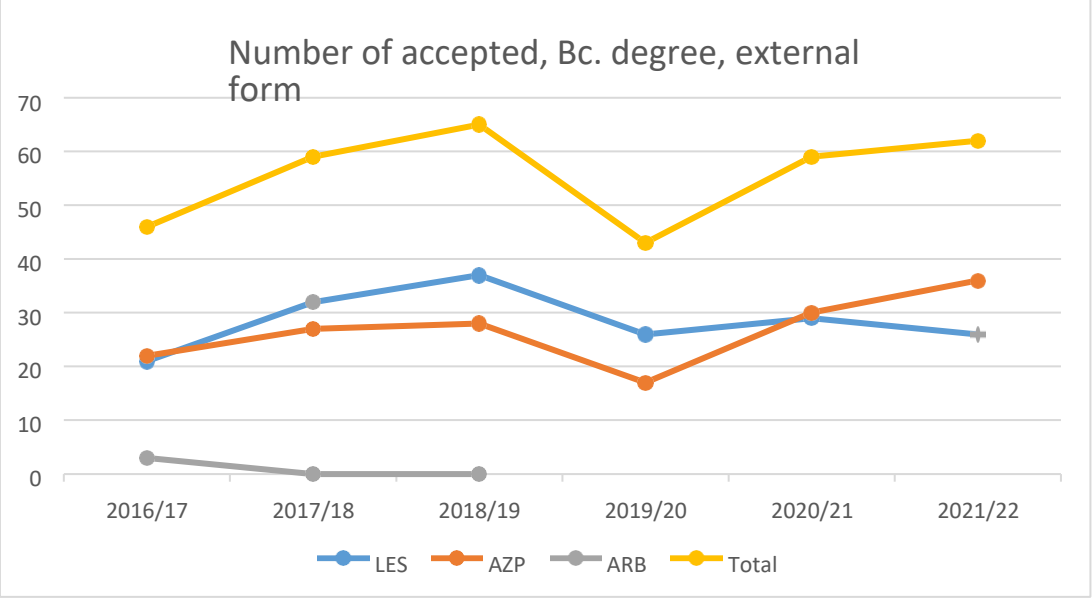


Fig. 6c Number of enrolled students in AR 2011/12 to 2019/20 in the first cycle of studies - external form

In the case of part-time study (Figure 6c), we have seen an increase in applications in both taught programmes in AR 2020/21. In the current AR, the increase is even more pronounced for the AZP study programme.

The tables and graphs presented so far informing about the numbers of admitted and enrolled students provided information about all students who were enrolled in the first year in the first cycle of studies. However, the data presented also include students who re-enrolled in the Faculty of Forestry after having been expelled (most often due to failing 2 times in the course they were enrolled in). These students are placed in the appropriate higher year after enrolment on the basis of examination recognition. In terms of newly enrolled students, there is a significant increase in the number of students in the external form of study. (Figure 6d).

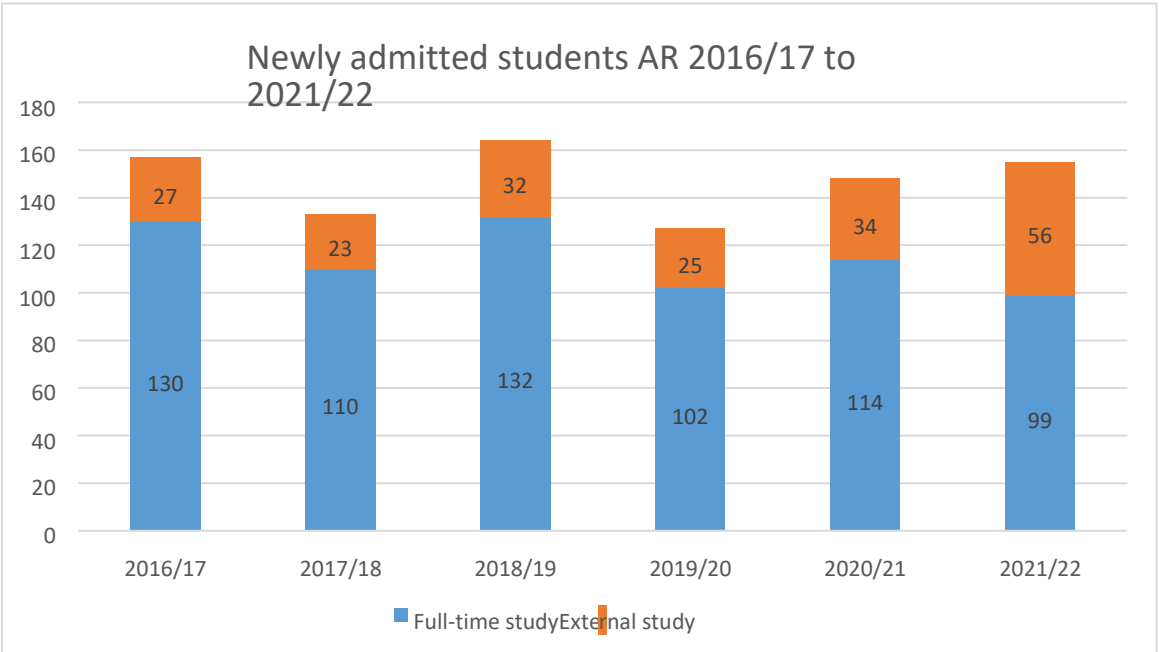


Fig. 6d Newly admitted students to the 1st cycle of studies at the Faculty of Forestry

Table 9b shows high school graduation rates from the perspective of newly enrolled students. Students graduated from forestry vocational secondary schools dominate, with a not insignificant part of them being graduates from grammar schools.

Tab. 9b New students enrolled in AR 2021/22 and their high school graduation

	Bachelor's degree, Engineering complete				
	Total	**Gymnasium**	**vocational secondary**	**secondary vocational school**	**Other**
from school	96	21	69	6	0
from workplaces and from elsewhere	3	1	2	0	0
Total	**99**	**22**	**71**	**6**	**0**

Traditionally, when enrolling students in the first year of the Bachelor's degree, students are approached through an anonymous questionnaire that focuses on the reasons for enrolment, the district from which the students come and how they obtained information about their studies.

In terms of newly enrolled students, the Banská Bystrica region dominates, while in the current AR we have seen a significant increase in the number of students. We are followed by regions from where we traditionally have a strong representation of students (Prešov, Žilina, Košice).

In the following figures we present the students' answers:

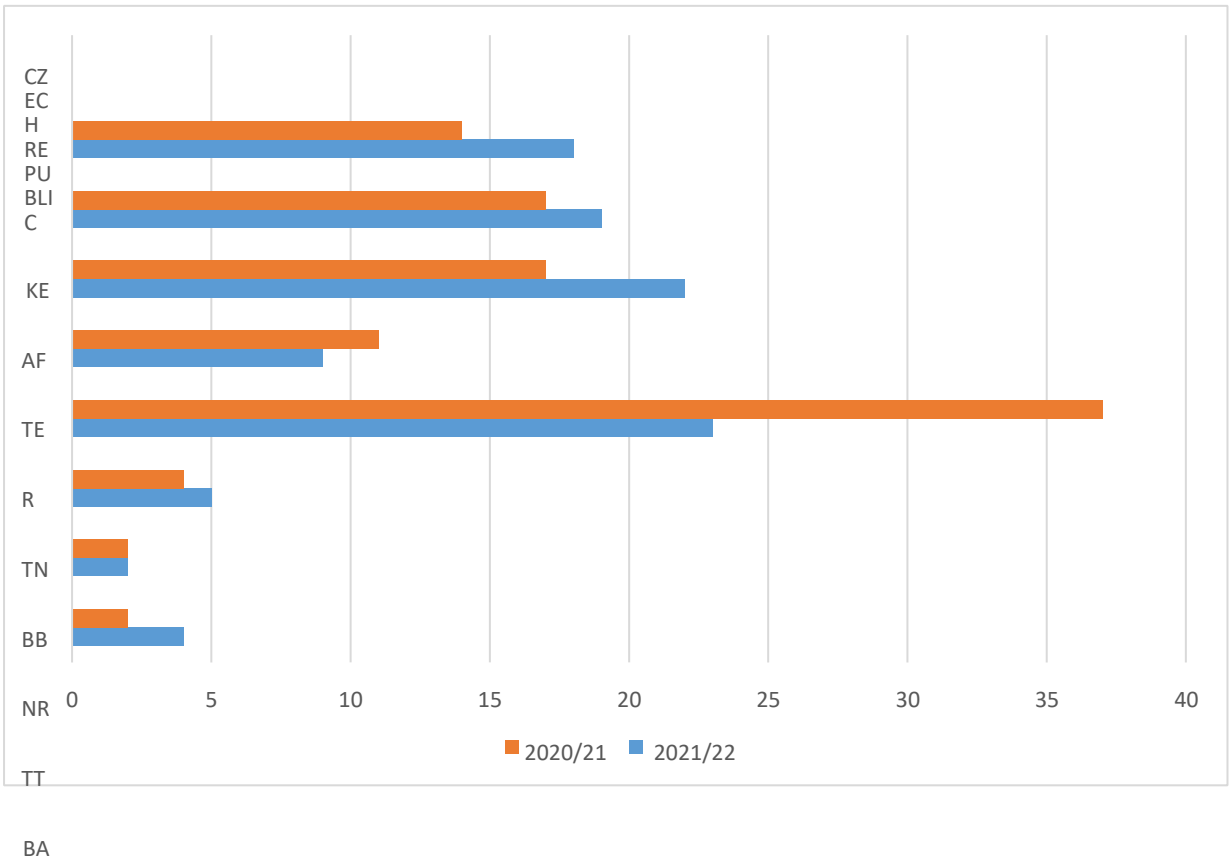


Fig. 6e Distribution of enrolled students by place of residence

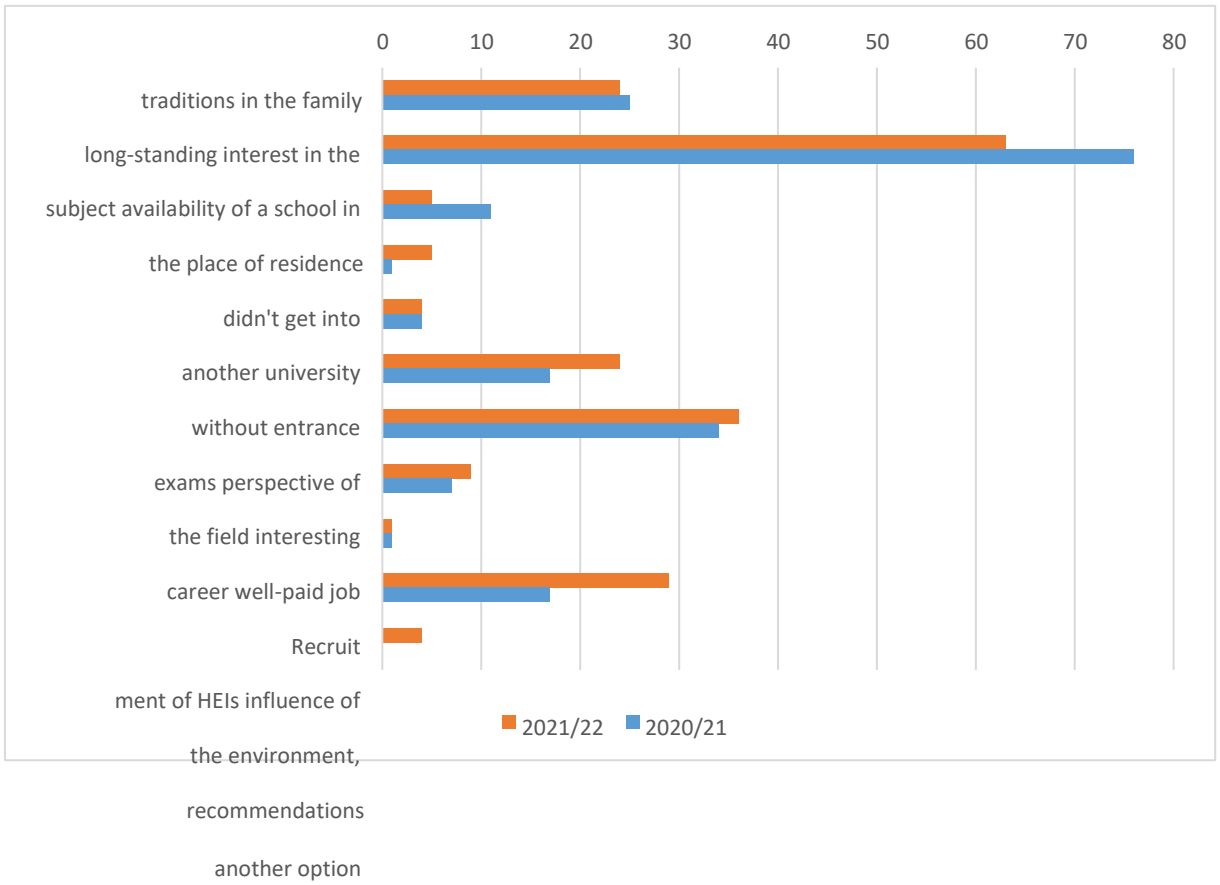


Fig. 6f Reasons for enrolment of students at the Faculty of Forestry in AR 2020/21

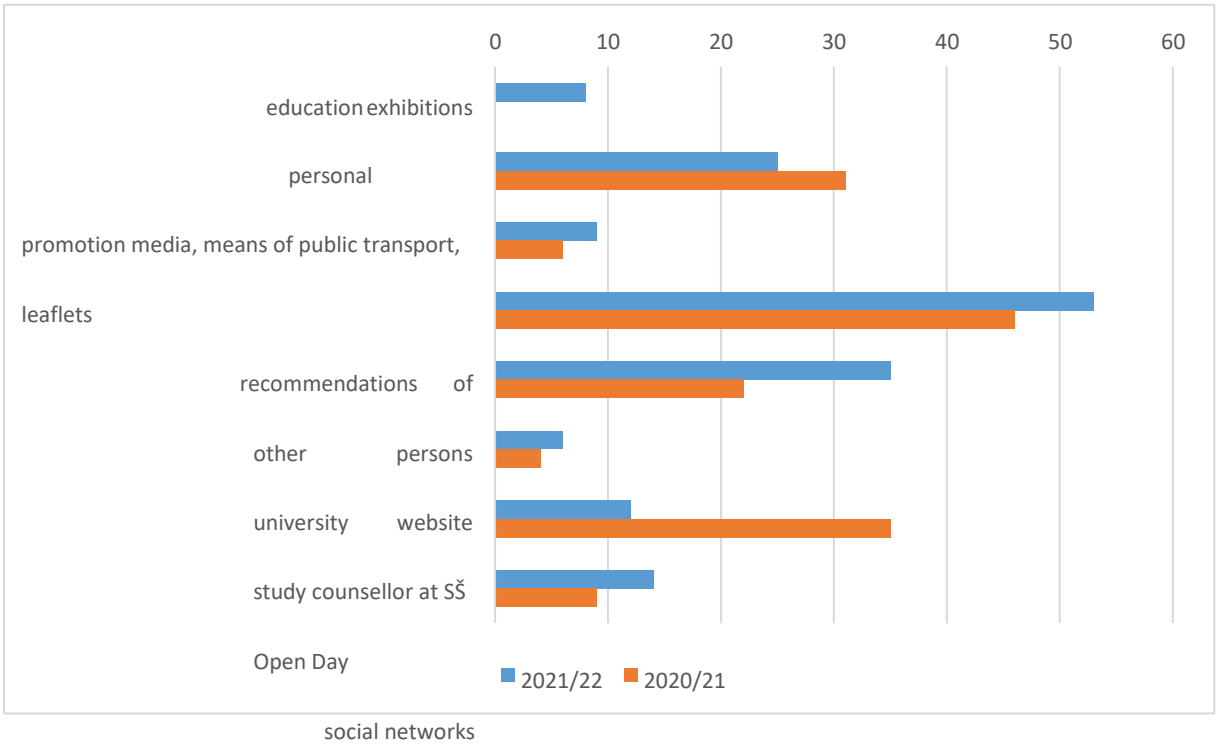


Fig. 6g Overview of students' responses to sources of information about studying at the Faculty of Forestry

8.2 Admission procedure for engineering studies

Table 10 provides an overview of the number of applicants enrolled, accepted and enrolled in engineering studies in the academic year 2020/21 and Table 11 provides data related to the current academic year 2021/22. In AR 2020/21, a total of 74 full-time students and 19 part-time students were enrolled in the first year of the second cycle of studies. 2 study programmes were opened in both full-time and part-time form (Adaptive Forestry, AAP) and one only in full-time form (Forest Ecology). In the current AR, 65 students were enrolled in the full-time form of study (Fig. 7a,b). There were 19 students enrolled in the part-time form, which is a total of 9 fewer students than in AR 2020/21.

Table 10 Overview of the number of applicants for the 2nd cycle of studies for AR 2020/2021

Programme and form of study	Academic year 2020/2021			
	Number of applicants	Number of Participants	Number of accepted plan/actual	Number of Enrolled
full-time study - engineering				
Adaptive forestry	53	53	80/53	50
Geoinformation and mapping techniques	4		15/0	
Forest ecology	10	10	15/10	9
Applied Zoology and hunting	15	15	30/15	15
Forestry technology	1		15/0	
Applied geoinformatics and	0		40/0	
Forestry and wildlife management	0		10/0	
full-time study total	**83**	**78**	**205/78**	**74**
external study - engineering				
Adaptive forestry	13	13	20/13	13
geoinformation and mapping techniques in forestry	0			
applied zoology and hunting	7	7	20/7	6

Forestry technology	1		10/0	
external study total	**21**	**20**	**50/20**	**19**
ES + ES together	**103**	**98**	**255/98**	**93**

Table 11 Overview of the number of applicants for the 2nd cycle of studies for AR 2021/22

Programme and form of study	**Academic year 2021/2022**			
	Number of logged in ch	**Number of Participants**	**Number of Received plan/actual**	**Number of Enrolled**
full-time study - engineering				
Adaptive forestry	49	47	80/47	46
Geoinformation and mapping techniques	4	0	15/0	0
Forest ecology	3	3	15/3	3
Applied Zoology and hunting	16	16	30/16	16
Forestry technology	0	0	0	0
Forestry and wildlife management	0	0	0	0
full-time study total	**72**	**66**	**140/66**	**65**
external study - engineering				
Adaptive forestry	15	15	20/15	13
Applied Zoology and hunting	6	6	20/6	6
external study total	**21**	**21**	**40/21**	**19**
ES + ES together	**93**	**87**	**180/87**	**84**

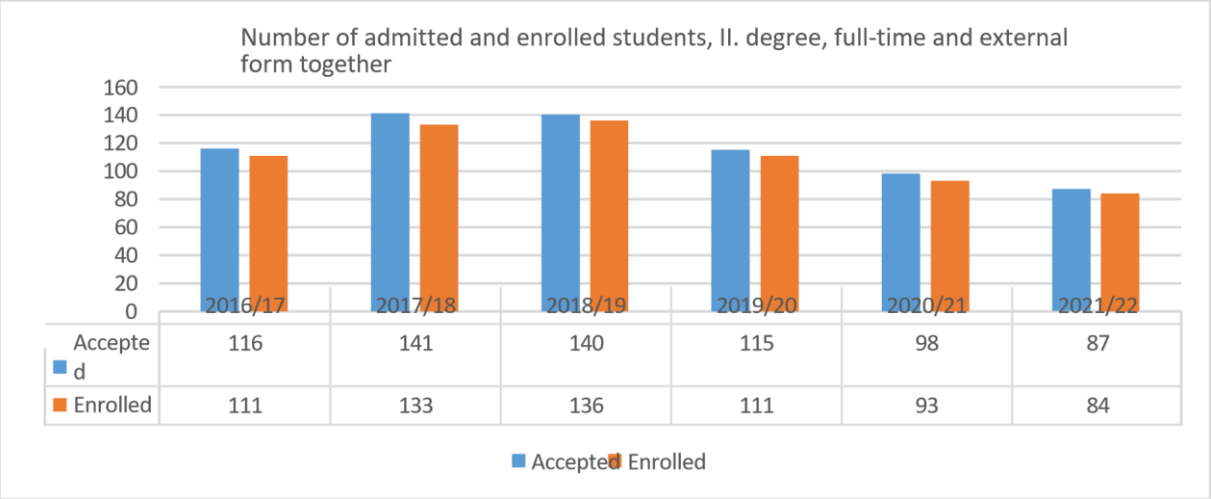


Fig. 7a Number of students admitted and enrolled in AR 2016/17 to 2020/21 at level II

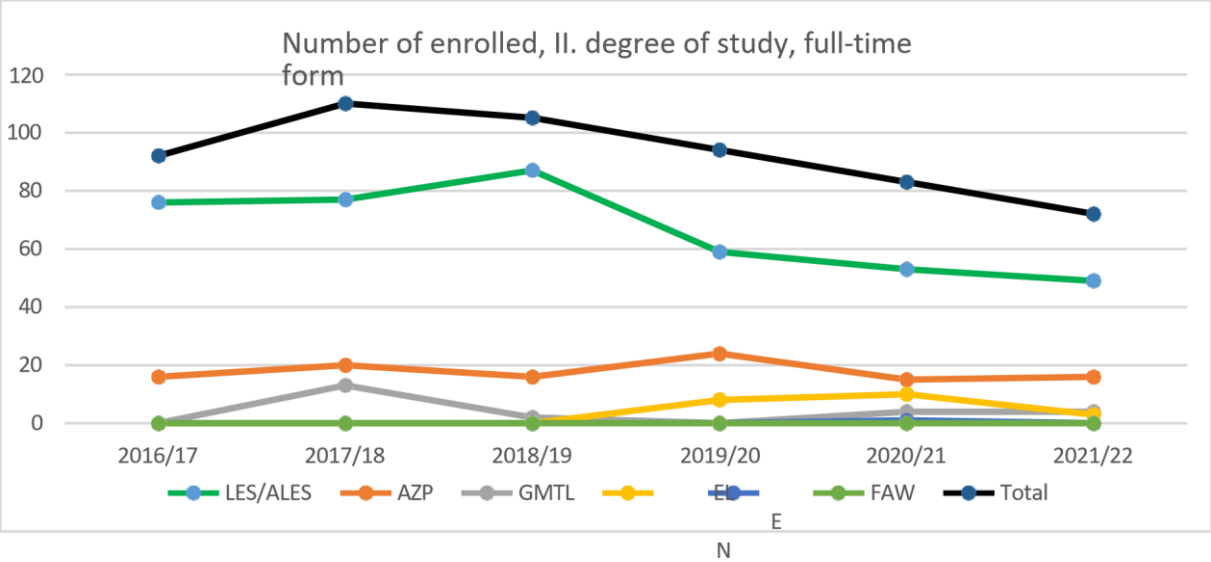


Fig. 7b Number of students enrolled in AR 2011/12 to 2019/20 for each study programme programmes in II. degree studies, full-time form

The greatest interest of students in the second cycle of study is traditionally in the study programme Adaptive Forestry, followed by the study programme Applied Zoology and Hunting. This year, after a long break, the study programme Forest Ecology was reopened thanks to the interest of students.

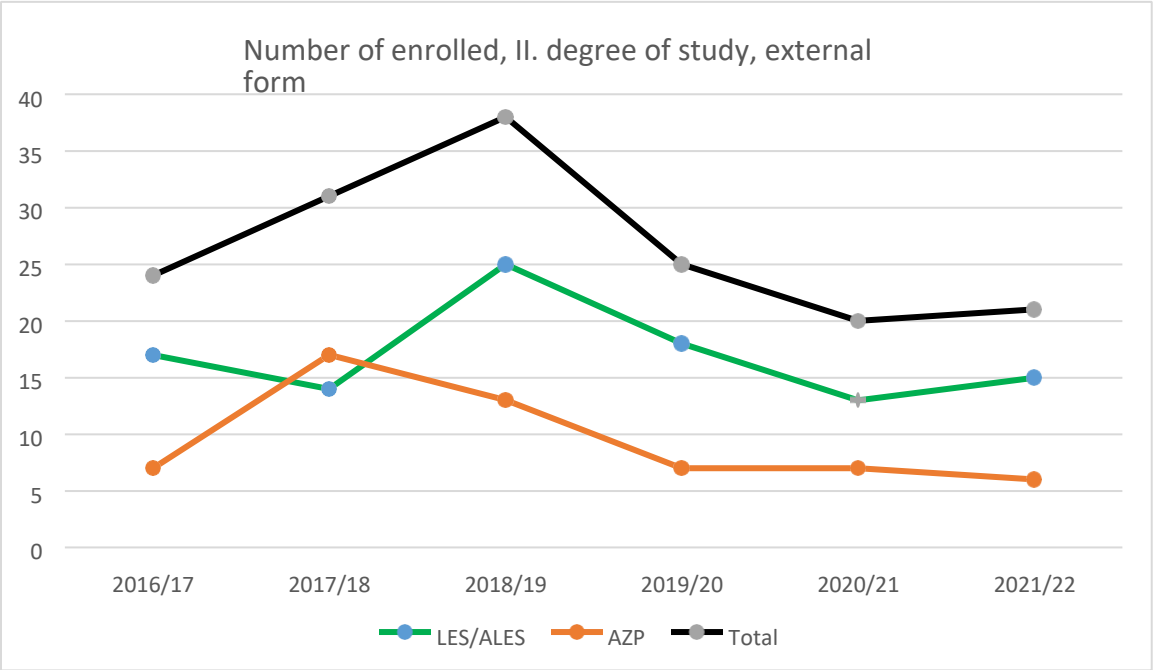


Fig. 7c Number of students enrolled in engineering studies for AR 2011/12 to 2019/20 for individual study programmes in II. degree of study, external form

9. Evaluation of full-time teaching positions at the Faculty of Forestry TU Zvolen for the academic year 2020/21

When calculating the teaching load, we used the university information system for the past academic year.

Deduction of full-time teaching positions at the Faculty of Forestry of the Technical University of Zvolen in the academic year 2020/21 is processed for the entire faculty and for individual departments (Fig. 8a,b,c). At the Faculty of Forestry, in the previous academic year 2020/21, there were a total of 63 internal scientific and pedagogical staff with a total teaching time of 61.07. Compared to the previous AR, there was a decrease of 0.5 teaching FTE, the number of internal staff remained the same.

The total full-time teaching activity in AR 2020/21 was 61 260 points. After subtracting the full-time teaching activity of external lecturers working at the Faculty of Forestry 53 159 points (59 078 in AR 2019/20).

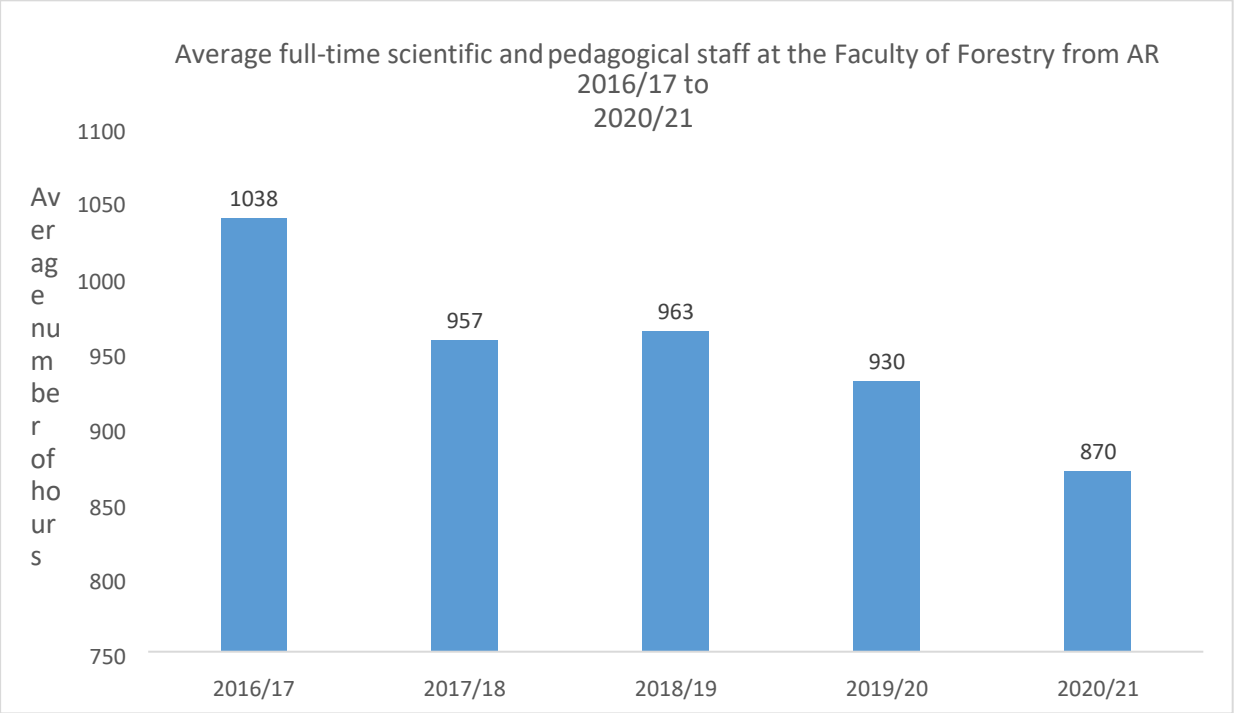


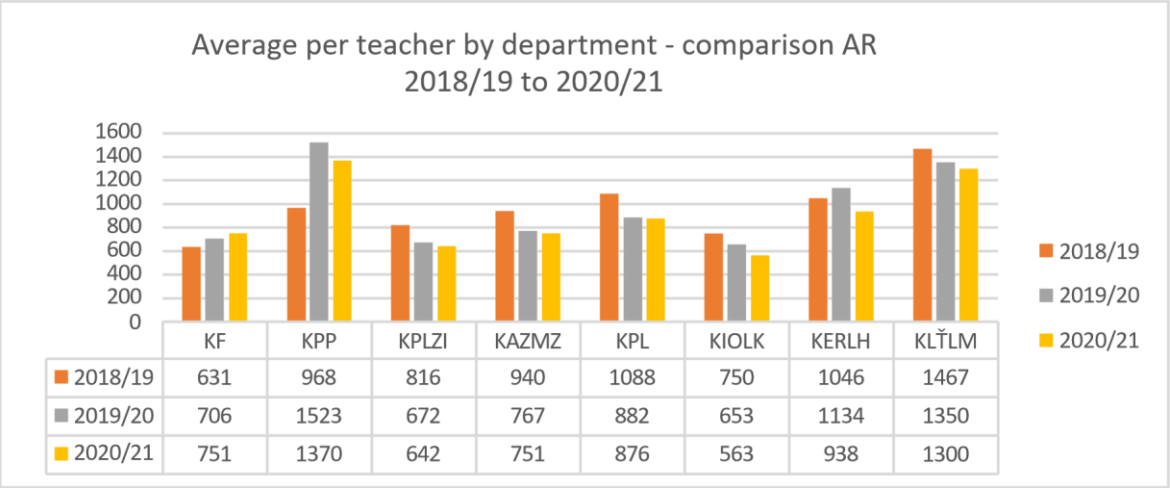
Fig. 8a Evolution of the average number of internal scientific and teaching staff LF for AR 2016/17 to 2020/21

The average teaching load reached 870 points, a decrease of 60 points from the previous AR (Figure 8a), and continues to trend downward due to the overall lower number of students in the faculty or the impact of distance education during the pandemic (optimization of HC, alternative HC solutions, increasing proportion of students who do not take the exam).

A total of 68 LF employees (including PhD students after the dissertation examination) participated in indirect teaching (69 thesis supervisors in the previous AR).

Fig. 8b shows the average time per internal lecturer in the department (related

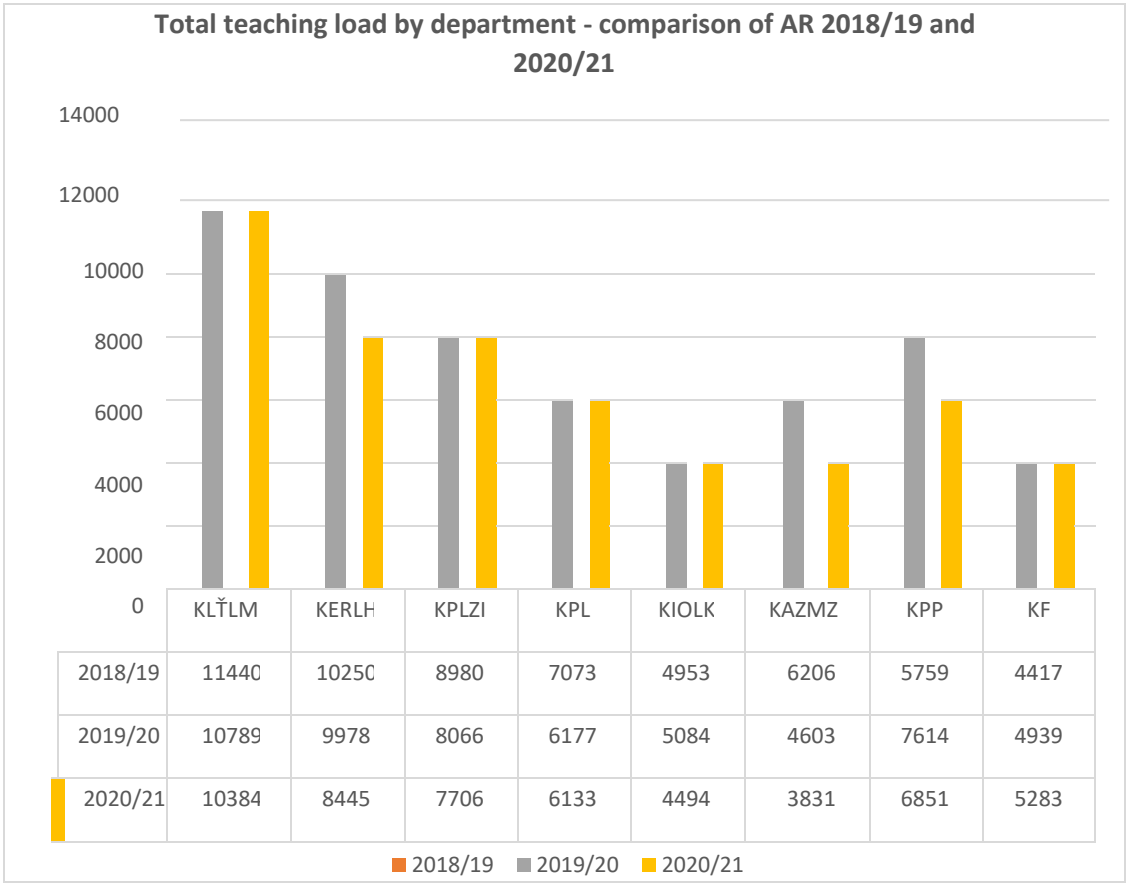
with the number of gestor courses especially in the Bachelor's degree). In this respect, they have the highest teaching load of the staff of the Department of Natural Environment and the Department of Forest Harvesting, logistics and land reclamation.



	KF	KPP	KPLZI	KAZMZ	KPL	KIOLK	KERLH	KLŤLM
2018/19	631	968	816	940	1088	750	1046	1467
2019/20	706	1523	672	767	882	653	1134	1350
2020/21	751	1370	642	751	876	563	938	1300

Fig.8b Average time per internal scientific-teaching staff member by department, comparison of AR 2017/18 and 2019/20

Fig. 8c shows the overall overview of teaching load by department, with a decrease in most cases, but an increase in the case of the Department of Phytology and the Department of Natural Environment (related to the continued teaching in the Forest Ecology programme at the engineering level).



	KLŤLM	KERLH	KPLZI	KPL	KIOLK	KAZMZ	KPP	KF
2018/19	11440	10250	8980	7073	4953	6206	5759	4417
2019/20	10789	9978	8066	6177	5084	4603	7614	4939
2020/21	10384	8445	7706	6133	4494	3831	6851	5283

Fig. 8c Overview of the total amount of full-time teaching staff (all research and teaching staff) by department, comparison AR 2018/19 to 2020/21

10. Tasks of LF TU in Zvolen in the framework of educational activities

Completion of tasks for AR 2020/2021

- **Organize an open day in the month of January.**
  The planned joint open day could not take place due to the persistence of strict antipandemic measures.

- **Promotion of LF in secondary schools. Updating of information materials on studying at LF**
  Due to the pandemic, it was not possible to continue personal visits to secondary schools in the summer semester, so we used other ways to reach students, e.g. by sending information via edupage and more intensive promotion via social networks, website, etc. All new print and visual documents were distributed through appropriate channels to potential applicants.

- **Implementation of other measures to optimise the pedagogical process**
  A seminar on thesis writing and the principles of thesis presentation in the winter semester was held. In the summer semester, we prepared an online concentration before the state exams for engineering students, which was attended directly by the tutors of the individual state exam thematic units. In cooperation with the Ministry of Education and Science of the Slovak Republic, a guideline as well as forms for securing practice for obtaining the OLH certificate for students of the Faculty of Forestry were issued.

Task plan for AR 2021/22

- **To organize a virtual open day of the Faculty of Forestry in the month of January.**
  Depending on the situation, organise a DOD in the framework of a joint LF DOD in the course of early 2022.
  Responsible: vice-dean for pedagogical work and vice-dean for external relations Term: january - february 2022

- **Promotion LF at secondary schoolsand education exhibitions . Updating of information materials on studying at LF**
  Online meetings with high school students, information about studying via edupage, updating information about the admission procedure on the LF website, TUZVO portal.

  Responsible: vice-dean for pedagogical work and vice-dean for external relations Term: september 2021 - march 2022

- **Implementation of measures to optimise the pedagogical process**
  Implementation of an online seminar on writing a thesis and principles of its presentation, as well as an online concentration before the state exams.

  Responsible: vice-dean for pedagogical work Term: november 2021 - june 2022

- **Alignment of the internal quality assurance system with the standards of the accreditation agency, formation of processes and structures to ensure the quality of study programmes, audit of the existing offer of study programmes.**

  Alignment of the study programmes at the Faculty of Forestry in the 1st and 2nd cycle of study with the standards of the accreditation agency. Preparation of accreditation files. Appointment of members of the Quality Council, members of the permanent working group in the study field of forestry, appointment of 5 persons responsible for the provision of the study programme.

  Responsible: vice-dean of LF for pedagogical work and management of LF
  Deadline: september 2021 - december 2021

4. Scientific research activity

Home

Scientific research activities and doctoral studies at the Faculty of Forestry of the Technical University of Zvolen are evaluated according to the relevant regulations of the Ministry of Education, Science, Research and Sport of the Slovak Republic and the requirements of the management of the Technical University. The annual evaluation is composed of the following parts:

- involvement and results of faculty and departments in projects in the field of scientific research activities at national and international level,
- Evaluation of scientific research and publication activities in 2021,
- Evaluation of doctoral studies and student scientific and professional activities in 2021,
- the implementation of the 2021 targets and the 2022 measures.

The report for the year 2021 is submitted to the members of the College of the Dean of the Faculty of Forestry, the members of the Scientific Council of the Faculty of Forestry of TU Zvolen and to the superior organizational units (the management of the Technical University) and contains information on the organization and basic results of the scientific research activities from the previous year. It is the basis for comparison of some parameters and indicators from the previous period. The results are the basis for periodic evaluation of the Faculty of Forestry of TU and improvement of research activities.

I. Basic characteristics of scientific research activities of the Forestry Faculty of TU in 2021

Scientific research activities at the Faculty of Forestry of the Technical University of Zvolen are related to the pedagogical activities of the departments in individual fields of study and programmes. Their content is based on the connection of pedagogical and scientific focus.

The implementation of scientific research activities is carried out through projects of domestic and foreign agencies. It should be emphasized that the Faculty of Forestry has its representatives in the commissions and councils of these agencies. An important contribution is also made by the scientific research activities through the international programmes of the European Commission and the Framework Programmes. The faculty's scientific research activities are complemented by the projects of the Internal Project Agency (IPA) and the faculty FL-project, which is mainly of an applied nature and is also complemented by projects within the specialpurpose activities of the VŠLP TU, respectively within the business activities. Also in 2020, we recorded some results in scientific research activities that are worthy of documentation.

The approved research direction of the Faculty of Forestry for the years 2011-2020: **adaptive management of forest ecosystems** is to ensure the continuity of scientific research activities and to innovate the priorities of scientific research activities with regard to new challenges in international and national forestry research, society and economy. To this end, the websites http://forestryhorizon.org and http://lesnickyvyskum.sk have also been set up to provide basic information on scientific research activities. The websites serve as information resources for other departments both at home and abroad.
Scientific research activities are provided by the departments of the Faculty of Forestry through national and international scientific research projects in natural, technical and social sciences:

- Department of Forest Economics and Management
- Department of Phytology
- Department of Integrated Forest and Landscape Conservation
- Department of Forest Resource Planning and Informatics
- Department of Forest Harvesting, Logistics and Reclamation
- Department of Applied Zoology and Game Management
- Department of Silviculture
- Department of Natural Environment

Department of Forest Economics and Management

Strategic research goal: ***Economic and social aspects of adaptive management of forest ecosystems***

The Department develops its scientific research activities with an emphasis on sustainable development of forestry and its adaptive management in the field of forest economics, management and financing of forest enterprises and forestry policy.

The field of forest economics

- Analyses of the economic and legal conditions for the functioning of markets in the forestry sector.
- Analyses of property rights and their limitations in forestry.
- Economic analysis of forestry projects in relation to specific forest land management risk.
- Mathematical Modelling Economic Vulnerability Forest a development efficient mathematical models for forest insurance against forest land management risk.
- Valuation and valuation of non-market forestry goods and services analysis of their internalization.
- Analysis of the use of renewable energy sources, economic analysis of the use of forest and agricultural biomass for energy purposes.

Forest enterprise management and financing

- Analysis and quantification of the externalities of the global economy on forest financial flows enterprises.
- Analyses of marketing tools to promote the use of wood as a renewable resource energy.
- Analysis of the possibility of obtaining financial resources in relationship k the operating conditions of forest land managers.
- Modelling and optimisation of the property and capital structure of forest enterprises in relation to legal forms of business and efficient organisational structures.
- Analysis of the use of renewable energy sources, individual energy systems and technologies, economic analysis of the use of forest and agricultural biomass for energy purposes.

Forestry policy area

- Formulation, implementation and evaluation analyses of public policy measures in forestry.
- Analyses of actors in forestry policy (public administration, interest groups, civil society associations).
- Analysis Processes in forestry policy (Hierarchy, Negotiation, participation, intersectoral coordination, interactive planning).
- Analyses of changes in the political system and their impact on forest policy (internationalisation, Europeanisation, decentralisation, multi-level governance).

Department of Phycology

Strategic research goal: ***Research on the structure and function of forest ecosystems on a broader natural science basis***

The Department develops its scientific and research activities with emphasis on sustainable development of forestry in the field of management and use of forest ecosystems.

Genetics and breeding of forest tree species

- Rating mechanisms Adaptation of forest of tree species at environment at based on provenance research and variability of adaptive genetic markers
- Identification of trends in neutral and adaptive genetic variation in forest tree species and hunting game or rare and protected animal species
- Analysis of the direction and extent of gene flow between genetically differentiated populations and taxa
- Assessment of evolutionary trends of forest tree species and animals
- Analysis of the functioning of seed orchards as a basic tool for forest tree breeding
- Analysis of ontogenetic trends, especially developmental lignification of trees
- The use of *in vitro* propagation methodologies as an efficient way of propagating breeding material

Botany and phytocenology and forest typology

- Research on taxonomy, variability and ecological requirements of selected woody plant species,
- Analysis of the impact of management interventions on the biodiversity of forest phytocenoses,
- Assessment of forest ecosystems in terms of ecological stability and proposal of conservation measures,
- Assessment of the response of forest phytocenosis diversity to e d a p h i c c l i m a t i c changes
  conditions in Slovakia,
- Use of empirical material from typological representative plots to assess the habitatecological suitability of tree species composition,
- Monitoring the dynamics of forest community development and change in the light of global climate change,
- Application of the results obtained in the field of nature conservation in the zonation of protected areas

The field of game and wildlife genetics

- Research of genetic diversity and differentiation of selected animal species as a basis for their species conservation or management of game populations,
- Research on population-level processes in wildlife populations (mating system and gene flow)
- Research on the application of non-invasive genetic research methods in the study of wildlife populations

Department of Integrated Forest and Landscape Conservation

Strategic research objective: ***Adaptive management of forest ecosystems under disturbance processes in changing ecological conditions for sustainable management and stability of forest ecosystems.***

The Department develops its scientific research activities with an emphasis on sustainable development of forestry and its adaptive management in the field of forest and landscape protection, disturbance ecology and ecophysiology of forest ecosystems.

Forest conservation and disturbance ecology

- Analyses of causes and consequences of disturbance processes caused by natural damaging agents in management and natural forests in relation to adaptive management of forest ecosystems.
- Analysis of the impacts of anthropogenic pollutants in forest ecosystems affected by changing climatic conditions.
- Analysis of population dynamics and gradation potential of insect pests in forest ecosystems under changing ecological conditions in order to forecast and effectively manage their overpopulation with special attention to destructive pest species.
- Analysis of the spectrum of macromycete species in forest stands under the influence of disturbance processes, the possibility of using fungi in the process of forest and landscape restoration, as well as improving the quality of human life.
- Analysis of the contribution of wood-destroying fungi to forest emergencies - wind calamities, forest fires.

Physiology and ecophysiology of forest trees and stands

- Research on the physiology and ecophysiology of forest tree species on the role of drought as a stress factor and other drivers of global change.
- Investigation of complex relationships between woody plants and the environment (mycorrhiza) in elucidating the growth of beech and spruce seedlings under soil water deficit.
- Research on physiological and growth variability as a basis for selection of drought tolerant forest tree ecotypes.
- Analysis of selected physiological and biochemical properties of forest ecosystem components in Slovak conditions in relation to Monitoring of forest health status of the Slovak Republic.

Area of nature conservation and landscape and countryside management

- Analysis Relationships Protection of nature landscape and environmental functions of forest ecosystems.
- Analysis of the functional potential and functional effect of the recreational function of the forest in relation to to the rational use of forests as a natural resource.
- Analysis of multifunctional agriculture and forestry in agro-tourism and rural development.
- Specially protected areas of nature and landscape in the forest fund and sustainable use woods.

Department of Forest Resource Planning and Informatics

Strategic research objective: ***Planning and control tools for adaptive management of forest ecosystems.***

The Department develops its scientific research activities with an emphasis on sustainable development of forestry and its adaptive management in the field of forest management, forest mapping, forest inventory, geoinformatics and forest modelling.

Forest management area

- Spatial, temporal and harvesting arrangements i n the current renewed ownership relations, with respect to permanent forest management,

- Harvesting regulation in forest spatial distribution units using finer management practices,

- Forest harvesting in irregular forest age structures in relation to the current spatial distribution of the forest,
- Multipurpose Sustainable Forest Management (MSFM) using forest modelling tools, decision support and information technology.

Forestry mapping area

- Assessment of the impact of varying forest environment conditions on the accuracy of Global Navigation Satellite Systems (GNSS), electronic tachymeters and field-mapping technology measurements,
- Optimal procedures for the determination of point field and forest detail, especially forest land boundaries, by a combination of GNSS and classical terrestrial measurement methods,
- Optimal procedures for the evaluation of aerial images of various types and other remote sensing materials by digital photogrammetry methods for the creation of forestry maps and other activities related to adaptive forest management.

Forest inventory area

- Selection designs and procedures for terrestrial forest inventory with respect to the needs of permanent
  and adaptive forest management,
- Sophisticated and efficient methods for non-contact forest inventory (terrain and airborne laser scanning, remote sensing methods) for sustainable and adaptive forest management,
- Use of biometrics, geostatistics and forest modelling methods to process data from terrestrial and non-contact forest inventory for the needs of forest function assessment, planning and control of forest management.

The field of geoinformatics

- Development of geoinformatics methods for spatial data collection and processing with respect
  to
  to more detailed information and precise forestry,
- Use of new sources of geographic information and procedures of their processing for the purposes of forest management, forest mapping and forest inventory,
- Use Resources geoinformatics for support spatial for decision making in adaptive forest management.

Forest modelling area

- Developing forest models with respect to empirical, process and structural approaches in forest modelling.
- Linking forest models to terrestrial and non-contact forest inventory methods.
- The use of virtual reality in forest modelling and forestry education.

Department of Forest Harvesting, Logistics and Reclamation

Strategic research goal: ***Thorough analysis and systematic processing of theoretical and practical knowledge from the sub-areas of the main research direction of forest harvesting and forestry mechanisation. Aspects of forestry structures, land reclamation and gully fencing in the context of adaptive management of forest ecosystems***

The Department develops its scientific research activities with an emphasis on sustainable development of forestry and its adaptive management in the field of harvesting, transport and production technologies,

forest mechanization, ergonomics and work safety, complex use of biomass, in the field of forestry constructions, bunding and land reclamation.

Mining, transport and production technologies

- Harmonization of biological and production requirements of harvesting and transport technologies in the Slovak Republic.
- Research on the efficiency of timber production and processing under forest land management risk conditions.
- Development of sophisticated approaches for forest ecosystem data collection and indepth analysis, including design and validation of a mobile system for data collection and processing as well as implementation of precision forestry applications.
- Refinement of the field and technological typing system based on the spatial decision support system.
- Validation of precision forestry applications and design of decision support systems for harvesting and logging technologies, forest access and fire management.
- Quantification and assessment of the negative impact of forestry machinery and technologies on the environment. Determination of exact methodologies and limits of environmental damage differentiated by functional forest types.

Area of forestry mechanisation

- Basic and applied research on environmentally clean and economically efficient equipment, including new technical principles.
- Research and development of special rope equipment, special rope trolleys and deltastats, including research and application of forestry robot principles.
- Research and development of principles and means for the use of alternative energy sources on the example of energy-saving devices - recuperation rope devices.

Ergonomics and occupational safety

- Analysis of occupational diseases and occupational illnesses in forestry and wood processing industry.
- Analysis of occupational injuries in the forestry and wood processing industry.
- Analysis of health and safety risks in biomass production, manufacturing and processing.
- Analysis of the state of forestry in the Slovak Republic in the field of implementation of the Community strategy on health and safety at work (EU Strategy 2007-2012).
- Formulation of recommendations and implementation of lessons learned for forestry actors in the Slovak Republic.

Area of comprehensive biomass utilisation

- Analysis and development of theoretical principles and practical methods for assessing the quality and quantity of raw wood assortments.
- Analysis of the possibilities of establishing plantations of fast-growing trees on forest land and low-productive agricultural areas.
- Evaluation of quality parameters of biomass fuels.
- Impact of selected factors on forest biomass degradation and health and safety risks associated with biomass processing for energy purposes.
- Evaluation of the economic efficiency of energy chips production in forestry.
- Modeling and optimization of forest chips production as raw material base for energy recovery.

Area of forestry structures, land reclamation and bunds

- Optimisation of forestry structures, land reclamation and stream protection activities in terms of cost-effectiveness, functionality, design, efficiency and integration into the landscape

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Analysis of forestry structures, land reclamation and gully fencing with regard to regional, ecological and environmental aspects.

- Integrated management of small river basins in the context of flood protection, with emphasis on the water management and water conservation function of forest ecosystems and increasing available water supply and quality.
- Integrated management of small watersheds in the context of erosion control with emphasis on the erosion control function of forest ecosystems.
- Integrated management of small river basins in the context of flood protection with emphasis on the flood protection function of forest ecosystems and nature-based flood protection measures

Department of Applied Zoology and Game Management

Strategic research objective: ***Adaptive management of game populations under the influence of disturbance processes in changing ecological conditions for biodiversity conservation.***

The Department develops its scientific research activities with an emphasis on adaptive management in the field of applied zoology, hunting, nature and landscape conservation and landscape care.

The field of applied zoology

- Diversity and ecology of insectivorous guilds of selected forest groups of higher animals
- Assessment of the damaging activity of selected vertebrate species on forest stands
- Diversity and ecology of selected forest vertebrates in natural forests of the Western Carpathians
- Ecology, management and conservation of selected game and carnivore species in forest ecosystems of the Western Carpathians

Hunting area

- Management and conservation of selected game species in forest ecosystems of the Western Carpathians from the aspect of ruminant abundance dynamics and environmental status and regional trophy quality of game animals.
- Management and conservation of selected carnivore species in forest ecosystems time-space and habitat requirements.

Department of Silviculture

Strategic goal of the research: ***research of the structure and lawful processes in forests of Slovakia, development, verification and optimization of cultivation models in forests with different functional focus, taking into account the changing climatic situation. Research on shape and growth variability of rare tree species.***

The Department develops its scientific research activities with an emphasis on sustainable development of forestry and its adaptive management in the field of silviculture, forest establishment and forestry dendrology.

Forest cultivation area

- Structure, texture, regeneration processes and disturbance regime focused on frequency and size of gaps /gap and patch dynamics/, history of their formation /dendrochronology/ of selected forest types in Slovakia.
- Research and optimisation of the cultivation models needed for shaping and structuring forests with different functional focuses, taking climate change into account.
- Optimisation and shaping of forest structure in the area of water reservoirs

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Research on the rhizosphere of basic tree species in forests and woodlands with different functional focus.

- Research of high mountain spruce forests, their disturbance dynamics, the size and frequency of stand gaps, the manner of their formation and the subsequent development of natural regeneration in stand gaps.

Forest establishment area

- Testing of stimulating (mainly microbial) preparations and artificial mycorrhization in the cultivation of generative and vegetative planting material of forest tree species.
- Testing Seedlings various tree species, term planting a preparations (soil conditioners) in planting areas with unfavourable environmental conditions.
- Comprehensive evaluation of the quality of planting material (biometrics, root system - ectomycorrhizae, chemical analyses, physiology) in relation to its uptake and initial growth.

The field of forestry dendrology

- Research on variability and ecology of selected tree species in Slovakia.
- Research on the variability of species, forms and cultivars of woody plants in the Borová hora Arboretum.

Department of Natural Environment

Strategic objective of the research: ***status and changes in the natural environment of forest ecosystems in Slovakia in the process of adaptive management of forest ecosystems***.

The Department develops its scientific research activities with an emphasis on adaptive management of forest ecosystems and sustainable development of forestry in the following areas: forestry and environmental applied geology and geomorphology, biometeorology and bioclimatology, water cycle in nature, soil science and forest ecology.

Geology, geomorphology and pedology

- Study of the reflection of geological structure and relief types in the diversity of potential vegetation
- Analysis of geobarriers in the natural environment from the perspective of risk analysis and management - with emphasis on the management of environmental burdens in the landscape
- Analysis of physicochemical and biological properties of soils - with emphasis on habitat (ecological) characteristics of soils and physiological depth of soils from the perspective of sustainable forestry development
- Study of the water regime of forest soils under changing environmental conditions, determination of vertical and horizontal permeability of soils
- Analysis of transformation, transport, distribution and accumulation processes in forest soils and the interaction of soil organic matter with the mineral fraction of soils from the perspective of sustainable forestry development, with emphasis on nutrient potential and stocks
- Use of modern geochemical and geophysical methods for express classification of forest soils in the morphogenetic classification system of forest soils of the Slovak Republic

Biometeorology, bioclimatology and landscape water balance

- Natural risk analysis of forest ecosystems under climate change:
- Drought and fire risk assessment in forest ecosystems and landscapes
- Analyses of water balance processes in forest ecosystems with respect to the occurrence of extreme drought and floods in the landscape
- Analysis of extreme rainfall, flooding, snow cover, mountain snow avalanche risk in changing weather conditions
- Analysis of the influence of bioclimatic stress factors on physiological processes, growth, phenological manifestations and health status of forest stands under climate change

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Undermining the protective functions of the atmosphere and impacts on adaptive forestry
- Modelling processes in the soil-plant-atmosphere system under climatic conditions changes

The field of forest geoecology
- Analysis of ecological functions of forest soils under climate change
- Studying the impact of global climate change on forest ecosystems and their ecological stability
- Study of the microbial community of forest soils as a determining factor in the cycle substances and energy in forest ecosystems
- Analysis and optimization of different land management practices in terms of their impact on the carbon balance in soils of temperate and semi-arid zones of climax and cultivated forests

  Elucidation of survival conditions and vitality of the forest biome under extreme conditions of the polar and semiarid zones

In 2021, the scientific objectives of the departments were addressed through the following Projects:

A. *2 international EU projects under Horizon 2020*
B. *1 international LIFE project within the Programme priority area - Nature and Biodiversity* ***C.*** *6 international EU projects - COST*
D. *19 APVV projects*
E. *22 VEGA projects of the Slovak Ministry of Education and Science and the Slovak Academy of Sciences*
F. *4 KEGA projects of the Ministry of Education of the Slovak Republic*
G. *1 independent institutional project of the Faculty of Forestry*
H. *4 business activity projects*
I. *1 IPA project*

These projects are as follows:

Faculty of Forestry

- Beech forestry VšLP - **prof. M. Saniga (FL)**

  The project was continued within the framework of the implementation of partial stages at individual departments of the Faculty of Forestry, mainly within the framework of the special-purpose activities of the VšLP.

Department of Forest Economics and Management

- **COST Action CA 20132** - Urban Tree Guard - Safeguarding European urban trees and forests through improved biosecurity, (UB3GUARD) - **JUDr. Z. Dobšinská, 2021-2025**

  Annotation of results for 2021:

  The project aims to bring together a pan-European and international network of scientists and stakeholders to improve the biosecurity of urban green infrastructure, especially trees and peri-urban forests. TUZVO staff are active in Working Group 3. Zuzana Dobšinská, is co-leader of the working group Integration: Informing policy, identifying barriers and designing actions for policy implementation in urban forest governance. An online kick-off

meeting was held in 2021 and the first Steering Committee meeting was held at the same time. A questionnaire on institutional conditions and governance on biosafety and nonnative species is being developed in WG3. The first meeting is planned for May 2022 in Turkey.
For more information, visit https://www.cost.eu/actions/CA20132/

- **COST Action CA 20123** - Intergovernmental Coordination from Local to European Governance, (IGCOORD) - **prof. J. Šálka, 2021-2025**

Annotation of results for 2021:
The project aims to link different research areas to provide systematic and comparable knowledge on institutions, mechanisms and processes of intergovernmental coordination horizontally and vertically, across levels of government, policy sectors and territorial units. The project is divided into five thematic units. KERLH staff are involved in three: Vertical Coordination, Horizontal Coordination and Actors. So far, only an online kick-off meeting has been held and nominations of members for the working groups are underway.

- **COST Action CA 15206** - Payments for Ecosystem Services (Forests for Water) - Payments for Ecosystem Services (Forests for Water), (PESFOR-W) - **prof. J. Šálka, 2016-2021**

Annotation of results for 2021:
The PESFOR-W COST Action aims to synthesise knowledge, provide guidance and promote collaborative research to improve Europe's ability to use Payment for Ecosystem Services (PES) to achieve the objectives of the Water Directive and other policy objectives through incentives for planting forests to reduce pollution from agriculture into watercourses.
The EU's Water Framework Directive (WFD) aims to ensure that Europe's water bodies are restored to "good ecological status" by 2027.
In 2021, the final conference of the project was held online, due to the ongoing pandemic. Meetings were no longer held.
Information is at https://forestry.gov.uk/fr/pesforw.

- **APVV-20-0429** Effective state forestry law - **JUDr. Z. Dobšinská, 2021 - 2024**

Annotation of results for 2021:
The subject of the research is the State Forestry Administration (SFA). The FSLH is a specialised public institution that takes decisions and implements concrete measures by means of substantive solutions, using legislative norms that regulate the different areas of forestry, hunting, land communities and forest reproductive material. The aim of the project is to evaluate the effectiveness of the current PES model using the example of the Forest Care and Hunting Planning Programme. The project is addressed in four phases: E1: Analysis of the theoretical basis of state administration, E2: Effectiveness of state forest administration, E3: Synthesis of findings and formulation of conclusions, and E4: Dissemination.
In 2021, work was carried out in three phases according to the approved project schedule. Work was carried out on phases 1, 2 and 4. A literature search of models of government was undertaken and key elements of each theoretical concept were identified. The theoretical framework for the analysis lies in theories of public administration performance (bureaucracy, new public management, governance theory, public policy analysis). The

- theories of state administration performance will allow to identify the individual elements in the system of state administration of forestry (SFLH) in Slovakia. One paper in a domestic scientific journal, two papers in domestic scientific conferences and one paper in a foreign scientific conference have been published. A scientific conference was organised with the participation of the State Forestry
  Administration, representatives of state forests, non-state forest owners

and other actors involved in forestry (https://kerlh.tuzvo.sk/sk/2021), and a Project website (http://www.ipoles.sk/efektles/).

- **APVV-17-0232** Testing of new policies and business models for the provision of selected forest ecosystem services (TestPESLes) - **prof. J. Šálka, 2018 - 2021**

Annotation of results for 2021:

Workshops were held with research subscribers and stakeholders. The whole process of developing the different management options and the design of payments for ecosystem services is, from the point of view of the responsible researchers, a successful example of stakeholder participation in decision-making processes related to forest management. The results of the work have confirmed the high demand of actors in both areas of interest for research results and solution proposals based on scientific outputs.

Publications and presentations from this project are published on the project website. For more details see http://www.ipoles.sk/testpesles.

- **APVV-18-0520** Innovative methods of performance analysis of forestry-logging complex using the principles of green growth (INECOFOWOS) - **prof. I. Hajdúchová, 2019 - 2022**

Annotation of results for 2021:

For 2021, the project has set the following stages:

E1: Modelling and forecasting of forest production possibilities and design of development scenarios vegetation under climate change with the support of the SIBYLA growth simulator. On the basis of the analysis of production possibilities, a model area was selected where the current ecological, economic and political influences of the external environment are most pronounced, and with the support of the SIBYLA growth simulator we tried to predict the development of forest stands as well as the development of the economic situation of forest enterprises in the area for the next 30 years.

E2: Analysis and design of economic policy instruments to promote the use of forest ecosystem services to achieve sustainable management. The aim of the stage was to economically evaluate special purpose forests by building tree houses in the tree canopy or using them to adjust forest management to comply with the rules of nature-friendly forest management and also to increase the efficiency of forest land management while respecting the principles of green economy and socially responsible business.

E3: Design of green growth indicators and indicators for quantifying the efficiency and performance of the forestry and wood processing industry. In Slovak conditions by its subgroups, which have been defined by the Slovak Environmental Agency. We used them as a basis for determining indicators for LH and DSP. We tested their application in forestry and timber enterprises by means of a questionnaire. The conclusions of the questionnaire survey showed that green growth and sustainable development are not sufficiently addressed in the LSP in Slovakia. The research will be further continued by analysing the indicators of green growth on the performance of LH and DSP.

- **APVV-19-0612** Modelling the impact of the risk of occurrence of destructive natural elements on the economic complex of forestry and timber in the conditions of continuing climate change (CLIMARISKFOR) - **prof. J. Holécy, 2020 - 2023**

Annotation of results for 2021:

The creation of a robust database containing historical data on physical and economic indicators of the economic performance of the Slovak forestry and wood processing industry in Slovakia in the period 1997-2019 has been completed.
The database also includes meteorological data and data on the development of climate in Slovakia and specifically in the Slovak Paradise region (meteorological stations Poprad and Telgárt) in the period 1951-2019. The collection of some groups of data on the occurrence of forest fires in Slovakia, which for technical or administrative reasons could not be carried out during 2020 under the conditions of the declared state of emergency, has been completed. In the second part of this phase, the researchers continued to transform analogue data from written records on the status and outputs of the forestry and wood processing industry older than 1997 into digital datasets so that they are compatible with Excel spreadsheets as well as with the database software used. A series of statistical analyses were carried out on the time series data obtained on the evolution of market prices for raw timber assortments as well as on the risk of occurrence of destructive natural elements, broken down into different biotic and abiotic damaging agents. Despite the worsened conditions resulting from the anti-pandemic constraints, project implementation during the period under review was on schedule and materially in line with the achievement of the project's stated objectives.

- **VEGA 1/0457/20** Economic and legal conditions of forest ecosystem services provision in land communities in Slovakia - **doc. R. Šulek, 2020-2022** *Annotation of results for the year 2021:*

  The aim of the project is to analyse the principles and conditions of sustainable and efficient provision of forest ecosystem services in specific economic and legal conditions of land communities as an important legal form of forest enterprises in Slovakia. The prerequisite for understanding the effective provision of forest ecosystem services is the analysis of individual economic instruments and legal conditions that determine the very nature of forest ecosystem services as a public good. In 2021, the identification and analysis of relevant legal institutes that influence the provision of ecosystem services of forests (regulatory instruments) was continued in the area of the comparison of selected indicators of sustainable forest management in the framework of the certification of forests of land communities with the relevant regulatory instruments of forestry and hunting legislation, nature and landscape protection legislation and legislation in the field of timber marketing. In addition, the identification and analysis of relevant economic factors that influence the provision of forest ecosystem services (economic and information tools) was continued, specifically the trends and directions of action of the most important economic, environmental and social factors that currently limit forest management in land-based communities in Slovakia were defined. In terms of public relations or other communication tools, attention was focused on the background of the media discourse on the requirements for the provision of forest ecosystem services.

- **VEGA 1/0655/20** Concept of bioeconomy in the conditions of forestry and forestry sector of the Slovak Republic - **Ing. B. Giertliová, 2020-2022**

  Annotation of results for 2021:

  The project in 2021 focused on the implementation of bioeconomy principles in EU countries. Slovakia, as part of the EU, has translated key areas of the European Bioeconomy Strategy into its own national documents. As a result of the analyses carried out, common areas and differences in the national strategies of the EU countries resulting from specific economic, economic and cultural assumptions were identified. The transition to a sustainable forest-based economy must be linked to the optimisation of resource use,

the adoption of innovative production and technological practices aimed at increasing the overall efficiency of the operation of business entities. The results achieved in 2021 were published in 2 scientific papers in foreign carentered journals, as well as in 3 scientific papers in domestic peer-reviewed scientific journals. The published works were 10 times cited in foreign publications, registered in citation indexes Web of Science and SCOPUS database.

- **VEGA 1/0665/20** Innovative potential of payments for ecosystem services - "water and forests" (InoVoLes) - **Ing. M. Štěrbová, 2020-2022**

Annotation of results for 2021:

The project InoVoLes - Innovative potential of payments for ecosystem services - "water and forests" aims to identify and model in a growth simulator differentiated forest management alternatives for a selected area relevant in terms of the impact of forest ecosystems on water quality and quantity through water quality and quantity indicators. In the second year of the project, a case study was developed to analyse the impact of forest management on water quantity and quality using the SIBYLA growth simulator in the selected area of interest. Subsequently, trade-offs between timber production and water quality and quantity were assessed through interactive decision maps. A survey of stakeholders' expert estimates was conducted to analyse the structure, relationships and functions of the innovation system (incentives, cooperation support and risk mitigation) to support PES mechanisms "water and forests". The available databases of case studies in the project CA15206 - PESFOR- W Payments for Ecosystem Services - Forests for Water were reviewed, focusing on the identification of existing PES "water and forests" models in European countries.

- **KEGA 009TU Z-4/2019** Modernization of teaching of environmental economics at technically oriented universities in the Slovak Republic - **prof. J. Šálka, 2019-2021**

Annotation of results for 2021:

In 2021, work was underway on the textbook and exercise guides. The e-learning module was already created last year. The following publications will be used as a basis for future exercises:

Báliková, K. et al. (2021). Payments for forest ecosystem services in Slovakia: forests and water. 1st ed. Zvolen: Technical University of Zvolen, 89s. ISBN 978-80-228-3272-4

Giurca, A. Herbener, M. (2020). Abendteuer von Alex und Bioman, comix, ISBN 978-3-9823511-2-4, Slovak translation by Korená Hillayová, M., Vyhnáliková Z., Šálka, J. (2021). Adventure of Alex and Bioman, 1st ed. Zvolen: Technical University of Zvolen, 56.p.

https://www.alex-bioman.de/_files/ugd/f9e671_345c4a77cd7c4c4091a4899d09bb01bb.pdf

- **IPA 6/2021** Theoretical and Methodological Framework for Research on the Interaction of International and National Forestry Policies in the Slovak Republic - **PhDr. L. Halušková, 2021**

Annotation of results for 2021:

The aim of the project was to set up a theoretical and methodological framework for examining the interaction of international forestry processes with national forestry policy in Slovakia based on actors' perceptions. The researchers participated in four scientific conferences (ŠVOČ LF TUZVO 14.04.2021, Meeting of economically oriented forestry and

timber departments from the Czech Republic and Slovakia 23-24.09.2021, "QUO VADIS forestry VI.? - Where are forestry economics and policy going?", "Where is forestry economics and policy going?" 09.12.2021, Current Issues in Forest Economics and Policy of the Slovak Republic 14.12.2021) and an abstract and a short presentation on the project topic were approved for the conference in Bonn, which will take place in April 2022.

- **Project of business activity:** action plan for the promotion of forest protection on the territory of the Bratislava Self-Governing Region in the sense of the Memorandum of Cooperation and Joint Procedure in Forest Protection - draft part - **prof. J. Šálka, 20212022**

Annotation of results for 2021:

The Technical University in Zvolen prepared for the Bratislava Self-Governing Region on the basis of the offer for the contract "Action plan for the promotion of forest protection in the territory of BSK - analytical part (hereinafter referred to as "BSK") in the sense of the Memorandum of cooperation and joint procedure in forest protection. On the basis of the analytical part, TUZVO was asked to prepare the second part of the document, the drafting part. The main objective is, on the basis of the analytical part of the Action Plan, to describe in detail the measures, the way they will be implemented and the financing options with specified time horizons, which will ensure the achievement of the objectives of the Memorandum of Understanding. Specific measures are to be proposed for specific forest management units to support forest ecosystem services. At the same time, model proactive measures will be proposed to retain water in forest communities in the form of proposals for forest management modification and model technical solutions. An inventory of forest infrastructure is also to be carried out and forest management modifications are to be proposed in the water harvesting area of the BSC to improve the quantity and quality of groundwater and surface water. In the first year, work started on the methodology for the inventory of forest roads and a survey was carried out among the signatories of the Memorandum on the need to provide forest ecosystem services in the BSK territory. The study is being carried out with the participation of TUZVO staff from four departments of the Faculty of Forestry: KERLH, KPLZI, KLŤLM and KAZMZ.

- **Project of business activity:** forecast of the development of capital value of land in the administration of LESOV SR, š. p., Muránska Planina affected by the decree of OU Banská Bystrica, Department of Environment of 24.01.2020 No. j. OU-BB-OSZP12020/007031-3-Ku - **prof. J. Holécy, 2021**

Annotation of results for 2021:

Determining the capital value of forest assets is a generally accepted way of assessing a forest's economic value. The value of a forest asset includes the value of forest land (as a factor of production, a resource that produces value) and the forest stand (in simple terms, the value of the timber mass). The method is based on the calculation of the Net Present Value (NPV) achieved over the harvesting period, i.e. the difference between all the income and expenditure incurred in each period of the forest stand's existence. The inputs to the calculations are based on the outputs of the Sibyl growth simulator. The analysis evaluated the impacts of retaining a defined part of the land (25%, 50%, 75% of the transferred area) on self-development in the territory of the Muránska planina NP by determining the difference between the capital value of the property in the case of nonimplementation of the proposal (variant $_{V1}$) and the capital value of the property in the case of the implementation of the proposal (variants V2, V3, V4). The results show that under the lowest management constraint considered (Option $V2$ - transfer of 25% of the area), this decision would result in a total economic loss over the forecast period of 30 years of EUR -319 113 344, which, when converted to an annual equivalent, amounts to EUR -13 402 331. The results also show that for the highest management constraint

considered (Option $V4$ -relocation 75% ofthe area), the decision to implement it would generate an economic loss of -€931 903 851, annualized at -€39 138 709.
The simulation results for the continuation of the business-as-usual option ($V1$) also indicate that neither ecological stability nor net management yields are impaired under unchanged future zoning.

Department of Phycology

- **COST Action CA 19128** - Pan-European Network for Climate Adaptive Forest Restoration and Reforestation (PEN-CAFoRR) - **prof. D. Gömöry, 2020-2024**

  Annotation of results for 2021:

  The COST Action focuses on reforestation and reforestation under climate change. In 2021, work continued on the harmonisation of terminology in the field of forest reproductive material, its cultivation and use, and afforestation techniques. The preparation of a meta-study on the impacts of artificial reforestation on tree genetic diversity is currently in the process of gathering literature and input. A review study on the use of introduced tree species in the European area has also been prepared as part of the action.

- **APVV-16-0306** Identification of environmental vulnerability and adaptive potential of spruce (Picea abies Karst. L.) populations under changing climate conditions - **prof. D. Gömöry,** (**RNDr. Ľ. Ditmarová**, **ÚEL SAV Zvolen)**, **2017-2021**

  Annotation of results for 2021:

  In the last year of the solution, no further experiments were carried out, but the data obtained were evaluated. Data from Sanger sequencing of candidate genes for drought stress in a set of 13 populations of Norway spruce along an elevational gradient from 550 to 1300 m a.s.l. showed significant associations with several bioclimatic variables, both temperature (minimum temperature of the coldest month, days with temperature >18°) and precipitation (precipitation in the wettest month, Hargreaves climatic moisture deficit). At the same time, the results of ddRAD sequencing of material from 5 populations of Norway spruce in a manipulative experiment on drought stress were evaluated. The results showed different associations of point polymorphisms with physiological or climatic parameters between stressed and control seedlings, highlighting the necessity of considering the environmental aspect in association studies.

- **APVV-19-0319** Importance of long-term human use of the landscape on the decline of species diversity of temperate forest vegetation in times of global environmental change - **Ing.**
  F. Máliš, 2020-2024

  Annotation of results for 2021:

  The project consists of three distinct parts that focus on three different temporal planes, namely i) paleoecological research, ii) replication of permanent plots from the last century, and iii) a contemporary field experiment. Within the paleoecological research, a study on postglacial vegetation development and human impact on forest ecosystems at the Biele skaly site in the Slovak Ore Mountains was prepared. The outputs of the research, which is based on repeated records on permanent plots, are mainly two new publications in cooperation with the ForestREplot initiative, but also corrections and management of the database of typological plots and restoration of additional plots in the field. Interesting results on changes in the diversity of vascular plants, bryophytes and soil microbiota under the influence of the applied interventions have been prepared from the data collected in the field experiment. On the basis of the results, a manuscript of a scientific publication was developed. Two new publications were published using data on microclimatic conditions at the experimental sites in collaboration with the SoilTemp platform.

- **VEGA 1/0624/21** Acceleration of changes in forest communities under the pressure of complex recent anthropogenic factors - **prof. K. Ujházy, 2021-2024**

  Annotation of results for 2021:
  This was the first year of the project. The project is based on analyses of repeated records of vegetation and environment in permanent representative plots of forest typology, which have already been repeated at least once. Therefore, in the first phase we inventoried existing historical material, including data in existing databases, and digitized data from plots that were not yet in the database. We were able to identify several areas with a number of suitable plots in terms of quality and preservation. The first series of plots in the beech forests on the Kysuce limestone karsts were obtained in advance of the project start, so we were able to carry out the first analyses in this pilot area. We confirmed the negative trend in the diversity and cover of the herbaceous synthesis and, in the case of cover, the predicted acceleration in the last two decades compared to the development in the second half of the
  20th century. In addition, this year we replicated plots in oak forests of vegetation stage 2.

- **VEGA 2/0132/21** Diversity of meadow and grassland biotopes in Slovakia after two decades in the European Union - **prof. K. Ujházy, (Mgr. K. Hegedüšová Vantarová, BÚ SAV), 2021-2024**

  Annotation of results for 2021:
  To address the project, we are using repeated records in plots established in grassland and grassland ecosystems prior to 2000. The repeated records are now intended to reveal the nature of community changes following the application of subsidy schemes after accession to the European Union. In the first year, we have made a selection of suitable plots where, according to the exact location, it is possible to repeat the phytocenological record and at the same time obtain management information from the agricultural records. On the basis of the selection, we have restored several dozen plots this year. In the repeated phytocenological records, bryophyte species that were not determined in the past were also determined, which will give a basis for revealing changes in the communities of this group of organisms in the future. In addition, the project is continuing research on the restoration of grassland communities after clearing of woody debris at the Príslopy site. As of 2017, the communities are fully engaged and species stable. At the same time, we completed the digitization of the data last year and will use the resulting database to analyze development processes for an upcoming paper this year.

- **VEGA 1/0450/19** Evaluation of hybrid poplars in terms of defence responses and wood cell wall composition under climate change - **prof. J. Ďurkovič, 2019-2022**

  Annotation of results for 2021:
  In the third year of the project, we evaluated the emission of volatiles from leaves of *Populus tremula* × (*Populus* × *canescens*) hybrid poplars after inoculation with the pathogens *Phytophthora plurivora* and *Phytophthora cactorum*. On day 9 after inoculation, we were able to identify 23 different volatiles, one of which was seasonally specific (ocimene). On day 99 after inoculation, 32 volatiles were already present, of which 10 were seasonally specific (phenylethyl alcohol, alpha-coubebene, undecenal, copaene, aloaromadendrene, germacrene D, alpha-muurolene, beta-muurolene, gammamuurolene, and naphthalene). The emissions of two substances were induced by the presence of phytophthora, namely alpha-coubebene and germacrene D. The emissions of two substances were induced by

the presence of phytophthora, namely alphacoubebene and germacrene D. The size of cortical necroses after infection correlated closely with the amount of emission of these two volatiles, which

are characterized by antifungal and antioxidant effects and probably function as signaling molecules to induce growth suppression of the hyphae of the mentioned oomycetes. The results of this study were published in Ďurkovič et al. 2021. Effects of *Phytophthora* inoculations on photosynthetic behaviour and induced defence responses of plant volatiles in field- grown hybrid poplar tolerant to bark canker disease. Journal of Fungi 7: 969. We also completed a manuscript focused on nanomechanical PeakForce QNM mapping and nano-FTIR characterization of lignin and polysaccharides in *Populus trichocarpa* cell walls, with emphasis on the distribution of these polymers across the wood fiber cell wall. We revealed a tight correlation between the AFM mechanical phase and the arbitrary nanoFTIR peak sizes of specific chemical functional groups of cell wall polysaccharides, specifically for C-O-C vibration at a wavelength of 1164 cm^{-1} , C-O stretching at a wavelength of 1036 cm^{-1} as well as for C-O vibration at a wavelength of 1058 cm^{-1} . The manuscript is currently under review.

- **VEGA 1/0029/20** Microevolutionary mechanisms shaping the spatial genetic structure of forest tree populations - **prof. D. Gömöry, 2020-2024**

  Annotation of results for 2021:
  In 2021, the project work is continued by processing the data obtained in the previous year of the solution, as new collections were prevented by pandemic constraints (ddRAD sequencing of Sticky Alder on the transect from the Pannonian region to southern Poland, Beech from the BFH Tále and Vrchdobroč provenance trials). Preliminary results suggest in the case of alder a correlation of genetic diversity of alder as an ecosystem edifier with species diversity of herbaceous synteny, it remains an open question whether this is a direct effect of the dominant species but a synchronized effect of the environment on both components of the ecosystem. In the case of beech, several polymorphisms have been identified, showing associations with climatic factors and physiological parameters.

- **Project R-4350/2016** "Determination of the subspecies affiliation of the sage grouse (relevant subspecies for the territory of the Czech Republic) and assessment of the degree of relatedness according to different biological samples on the example of artificial breeding (Moravian-Silesian Beskydy, Šumava) and samples coming from individuals from the wild." - **Ing. D. Krajmerová, PhD., 2016-2021**

  Annotation of results for 2021:
  In 2021, additional analyses of the individuals of the breeding flocks in Řepčonka and Boubíno were carried out. Relationships of individuals and potential parents originating from the Wisla, Boubin and Řepčonka breeding flocks were determined. Analyses were carried out to recommend individuals suitable as parental individuals for the breeding flock in Řepčonka in order to minimise the degree of relatedness between parental individuals.

Department of Forest Resource Planning and Informatics

- **H2020-SFS-2020, No. 101000289** Holistic management practices, modelling and monitoring for European forest soils (HoliSoils) - **Ing. M. Bošeľa, 2021-2025**

  Annotation of results for 2021:
  The importance of forest soils for human well-being and the global climate has already been recognised by several international agreements. Achieving the United Nations (UN) Sustainable Development Goals (SDGs) depends on a sustainable transformation of land management practices that reduce deforestation, mitigate erosion and landslides, maintain

or restore soil organic carbon (SOC), nutrients, microflora and water, and provide ecosystem services. Services

the world's growing population. In this context, the international climate goals set by the Paris Agreement (PA) of the United Nations Framework Convention on Climate Change (UNFCCC) require transformation to sustainable land management practices, that maintain forest carbon (C) sequestration capacity and conserve existing soil C stocks by mitigating greenhouse gas (GHG) emissions such as carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O), particularly on organic carbon-rich soils (including peat soils). The overall objective of HoliSoils is to develop a harmonised soil monitoring framework and new holistic land management practices that will help mitigate CC, adapt forests to cope with CC and sustain the provision of various ecosystem services essential for human livelihoods and well-being. To this end, HoliSoils incorporates new methodologies and expertise on analytical techniques, data sharing, soil properties and processes with model development to develop tools for soil monitoring, refine the assessment of GHG emissions in the LULUCF sector, increase the effectiveness of GHG mitigation measures, and improve numerical prediction of mitigation, adaptation and ecosystem services on soils. HoliSoils focuses on forest soils and considers soils as an essential - but often neglected - part of ecosystems, with rich biodiversity determining overall ecosystem functionality and the provision of ecosystem services (e.g. wood resources, water supply, C sequestration). In 2021, we established an experiment at the Dobroč site to monitor carbon and methane fluxes in soil. Soil respiration will be compared between a spruce monoculture and a mixed natural forest. The data obtained will also be used to establish a European network for measuring carbon fluxes in forest soils in Europe and to improve global models.

- **APVV-20-0408** Innovation of management plans for participatory decision-making in forest ecosystem services - **doc. R. Sedmák, 2021- 2025**

Annotation of results for 2021:

The project started in the second half of 2021 with the design and preliminary validation of a system for indicating the fulfilment of key ecosystem services and biodiversity. The results of the preliminary analyses were presented at the final workshop of the Alterfor project, 9.9.2021, Kráľová near Zvolen. At the same time, 3 case study areas (forest units) were selected for optimization of ecosystem service delivery and communication activities were initiated to prepare the first workshop necessary for participatory setting of management objectives by a representative sample of stakeholders interested in forest management outcomes. In addition, work has started on the development of a methodology for spatial mapping of the demand and supply of ecosystem services in an area.

- **APVV-19-0183** Relationship between biomass production and biodiversity in fir-beech forests under changing environmental conditions- **Ing. M. Bošeľa, 2020-2024**

Annotation of results for 2021:

Europe has the most extensive network of protected areas in the world. However, these areas were established in the past without taking into account the potential impact of climate change. The question therefore arises to what extent these areas will be able to fulfil their function of biodiversity protection under changed environmental conditions in the future. This European network also includes very important mixed-species forests made up of Norway spruce (Picea abies (L.) Karst.), white fir (Abies alba Mill.) and beech (Fagus sylvatica L.). The forests made up of these three species cover 10 x 10^6 ha in Europe at altitudes between 600 and 1600 m above sea level. Despite the high ecological and economic importance of these forests in Europe, relatively little attention has been paid to them so far. Moreover, the relationship between

biomass production and biodiversity, i.e. between mitigation potential and biodiversity conservation, has not yet been investigated in these ecosystems. The present project thus aims to provide new insights into the ability of individual components of fir-beech ecosystems to adapt to ongoing climate change and to continue to provide many ecosystem services. The results will thus inform the development of national biodiversity conservation strategies for fir-beech ecosystems. In 2021, we established long-term monitoring of microclimatic conditions and seasonal tree growth in the Dobroch Forest. Incremental probes were taken from spruce, fir and beech trees to analyse their past growth and to reconstruct disturbances in the forest. Soil respiration is measured at regular intervals and the water regime in the soil is monitored using tomography and soil meters. In 2022, similar monitoring will be established in the Badin Forest.

Diversity of birds and small mammals was surveyed both in the core forest and in adjacent management forests with similar tree composition. According to preliminary results, a higher diversity of birds was confirmed in the reserve compared to the management forests, especially in terms of the occurrence of rare forest species (forest specialists). The diversity of habitat generalists did not differ significantly between census points in the management and natural forest. No differences in diversity were found for small mammals, only biomass differed between natural and management forest, probably due to the higher food supply in the reserve

- **APVV-19-0035** Simulation and visualization analytical tool for forestry planning (SAVANT)- **prof. M. Fabrika, 2020-2024**

Annotation of results for 2021:

The main objective of the project is to develop a software solution for a forest condition prediction tool, to release it free of charge to the general public and to enable it to be implemented for forest planning and use in routine forestry operations. In 2021, the following objectives were achieved:

a) complex algorithms were developed for importing data from the PSL care programmes according to the structure of data from the National Forestry Centre in Zvolen as well as the structure of data from the forest user information system of the Itersoft company in Zvolen. The algorithms were developed in the form of standardized SQL queries and converted to the RAD studio environment (DELPHI Object Pascal). Algorithms and SQL queries were also developed, including a solution in the RAD studio environment for importing data from terrestrial mapping with the IFER FieldMAP kit. [MODULE AGENT]
b) Algorithms for the processing of terrestrial laser scanning data and their implementation in the DENDROCLOUD tool were developed. This involved the addition of new algorithms for the derivation of tree thickness and tree height. Data collection from aerial drone scanning and terrestrial laser scanning was also performed as a service. Their software implementation will be continued in 2022 [MODULE SUPERMAN].
c) New algorithms for the calculation of production, economic and ecological characteristics of stands (biodiversity indices) were redesigned and added after growth simulation. The original SQL queries were found to be suboptimal in terms of computation time and were thus redesigned into Object Pascal procedures and functions.

[CALCULATOR MODULE]

d) a new tool for forest visualization using the Unity 3D game engine was created (link: https://www.youtube.com/watch?v=ub1zXUYebJo). [CAVEMAN MODULE]
e) algorithms for simulations of forest development in large areas have been developed in the form of a methodology

"divide and conquer". [EMPEROR MODULE]

f) natural rejuvenation algorithms were modified and implemented in the form of a software module. [FOSTERER MODULE]
g) algorithms for modelling tree competition were modified and supplemented and implemented in the form of a software module. [RIVAL MODULE]
h) algorithms for forest evolution analysis from time series growth simulations were modified and implemented in the form of a software module. [ANALYST MODULE].

- **VEGA 1/0777/21** Optimization of functionally integrated forest management based on data from forest care programmes - **doc. R. Sedmák, 2021-2023**

Annotation of results for 2021:

In 2021, the project started with the completion of a partially developed system for indicating the performance of the most common ecosystem services (ES), mainly from the group of regulating and cultural services as defined by the CICES classification (Haines-Young, Potschin 2018). The indication of the fulfilment of services related to water flows in the landscape (regulation of floods, droughts, water supply continuity, or quality and yield of water resources) and climate regulation services, as well as the indication of the fulfilment of the whole block of cultural services and biodiversity, has been completed. At the same time, during the course of the solution, 4 case study areas of interest and forest units were selected, for which the obtained PSL data were processed in the form of databases usable for the project solution. At the same time, contacts were established with expert forest managers in the selected areas and the collection of non-PSL data suitable for objective quantification of the most important ECs was started.

- **VEGA 1/0868/18** Innovative methods of mapping of anthropogenic and natural landforms and relief in the survey of the state of the landscape- **doc. F. Chudý, 2018-2021**

Annotation of results for 2021:

The scientific objectives for the year 2021 of the project have been met and even exceeded in view of the allocated funds. Their scope was planned in line with the requested funds, but the funds provided were significantly lower. The achievement of the results was also made possible by the accumulation of the necessary funding from other sources (cooperation with practice, ...). The airborne DPZ data - airborne piloted photogrammetry and laser scanning - were obtained from previous projects. Newly acquired data were ground and remotely piloted photogrammetry, handheld ground scanner (for tree and vegetation characteristics detection, creation of detailed digital models, mapping of anthropogenic and natural landforms and relief, ...).

- **KEGA 011TU Z-4/2019** Visualization of forest using Unity 3D game engine for e-learning, **- prof. M. Fabrika, 2019-2021**

Annotation of results for 2021:

The aim of the project was to create an application for displaying a virtual reality forest in the game engine Unity 3D, which will be dynamically created from an external database. In 2021, the software application itself was completed and an educational computer game was created as a bonus to the project for students of the Forest Modelling course. The results of the project were presented, discussed and published within the Ertragskunde group of German and German-speaking research institutes as well as consulted with representatives of forestry education at the Georg August University Goettingen.

Department of Integrated Forest and Landscape Conservation

- **APVV-17-0644** Carbon balance of differentially managed forest ecosystems of TANAP after natural disturbances - **doc. P. Fleischer, 2018-2022**

  Annotation of results for 2021:

  The year 2021 was prioritized to measure CO2 fluxes and to monitor the factors that most influence the individual fluxes and consequently the C-CO2 balance in the monitored ecosystems with processed (EXT) and unprocessed (NEX) wind field from 2004 in the High Tatras. At both sites, measurements were made using the eddy covariance method. Soil respiration was continuously measured on the treated windfall site during the growing season using 5 automated devices. At both study sites, soil respiration was also monitored manually using a portable gasometer. C flux records from the ECs were processed using TOVI software. Data from the automata were processed and evaluated in the software environment R. The results of the fluxes and C balance in 2021 indicated a reversal of the previous stand development in the calamity area. For a number of years, both areas have been a C depot, with relatively few differences. In 2021, the balance (the difference between C input and C output) was higher in the untreated calamity area, by up to 25%. The result is all the more remarkable because the unmanaged calamity area had up to 30% less C uptake than the managed area. As a result of the momentary higher biomass and more intensive growth in the managed calamity area, respiration, i.e. C emission, was also much higher. This result very clearly confirms the necessity to monitor both C fluxes between the atmosphere and the ecosystem, which is hardly done in practical assessment, especially if the objective of forest ecosystem assessment is to reduce the risks of climate change. Another remarkable result was the determination of C fluxes and balances in undamaged mature vegetation from data recorded by Italian and German researchers in the High Tatras in 2006-2008, which were uploaded to the European database of EC measurements at the beginning of the year. We derived the results using the same procedure as we interpret the current measurements and confirmed the positive C balance of the mature stands at that time. Today's coppice in the calamity plots is almost reaching the same sequestration capacity. However, it is questionable whether the current, heavily thinned adult stands in the Tatra Mountains are sequestering C as they did in 2006-2008. Multi-year monitoring of radial increments rather indicates the occurrence of growth and physiological disturbances in older stands. We monitored the potential impact of climate change on spruce seedlings. Evaluation of the physiological response of experimentally warmed spruce seedlings under natural conditions yielded relatively favourable findings this year. Whereas last year seedlings were stressed by elevated temperature (by an average of about 3^{o} C) and responded with reduced growth and physiological disturbances in photosystem II, in 2021 the responses were much less stressful and indicated a considerable degree of adaptation to the altered conditions.

- **VEGA 1/0535/20** How are adaptive traits of physiological resistance of woody plants influenced by climate, inter- and intraspecific variation? - **doc. D. Kurjak, 2020-2023**

  Annotation of results for 2021:

  In 2021, we established five research plots along a gradient of elevations. Economically important species (beech, oak, maple, fir, spruce, pine) were planted to quantify phenotypic plasticity of physiological traits of individual species. Planting took place in the spring months and during the autumn months we assessed mortality, growth characteristics, and sampled to assess interspecific differences in leaf morphology and stomatal characteristics.

We also published the results of research on intraspecific variability of vent and leaf characteristics for beech forest (10 provenances) growing on contrasting sites (Slovakia and Bohemia). We monitored the values longitudinally between 2016 and 2020. We assessed the influence of temperature and precipitation in both the current and previous year. Vent length was lowest and vent density was highest during 2018. We also found that environmental conditions in the previous year influenced the physiological characteristics tested more than conditions during the spring of the current year. This suggests the influence of a memory effect.

Department of Forest Harvesting, Logistics and Reclamation

- **APVV-20-0391** Monitoring of forest stands in three-dimensional space and time using innovative near-reach approaches (LES4D) - **Ing. M. Mokroš, 2021-2025**

  Annotation of results for 2021:

  The APVV project started on 1.7.2021. Two postdoctoral fellows Juliana Chudá and Jozef Výbošt'ok were recruited within the project from 1.9.2021. During the autumn we worked on establishing research plots on the territory of VŠLP and Dobročský Forest. A total of 24 research plots were established, which will be imaged in the coming year with several close-range technologies.

- **APVV-18-0305** The use of progressive methods to assess the impact of logging and transport process on forest ecosystems and road network - **doc. J. Merganič, 2019-2022**

  Annotation of results for 2021:

  Intentional logging, carried out in accordance with the Forest Care Programme, or accidental logging (calamity), both of which are carried out by means of forest ground equipment, which concentrates the harvested timber in a forest store. However, current technologies have a relatively wide variety of chassis, the negative impact of which is reflected in the passage on the ground surface and, under certain conditions, can cause considerable ecological damage. The project addresses two research objectives, i.e. monitoring the impact of forestry technology on selected components of the forest ecosystem and monitoring the impact of forestry technology on the condition of forest roads. In 2021, we focused on continuous measurements of CO2 concentration changes at 10 and 30 cm depth in a permanent research plot established in 2020 at the Štagiar site. It consists of two parts, a compacted area and a control area. Repeated surveys of the amount and parameters of natural rejuvenation were also carried out, and hemispherical images were taken. Changes in the surface layers of the forest soil caused by different numbers of tractor passes were analysed. Repeated profilometric scanning of selected sections of forest roads was carried out, which is also monitored for overpasses (phototape).

- **VEGA 1/0241/20** Optimization and environmental impact of technological procedures of logging and timber harvesting in nature-oriented forest management - **doc. J. Merganič, 2020- 2022**

  Annotation of results for 2021:

  The nature-based management system represents an alternative option for managing forest ecosystems in a period of ongoing climate change. However, this different management system requires the adaptation of all technologies and the optimisation of technological procedures to ensure the implementation of the harvesting and transport

process. Timber transport is an important link in this chain, as it requires a significant amount of energy and costs. A large part of timber transport is carried out by lorries. In the framework of the project we focused on the evaluation of the efficiency of three types of trucks (SCANIA P450, G500, G440) monitored by the RMC system. The analyses confirmed a negative correlation between timber transport productivity and the hauling distance.

- **VEGA 1/0335/20** Prototype of multicamera system as a tool for creation of highly detailed model of individual trees and forest stand - **Ing. M. Mokroš, 2020-2022**

  Annotation of results for 2021:
  In the second year of the VEGA project we worked on processing and evaluating the data that we collected in the first and second quarters of the year or the previous year.

We have published a paper in a peer-reviewed journal (IF 5.9, Q1) where we focused on the use of ground-based mobile laser scanning, smart device laser scanning, and mobile photogrammetry using our prototype for forest inventory. The article had a great response and according to Altmetric it has an attetion score that ranks in the top 5% of articles out of up to 20 million articles tracked.
We attended the *Silvilaser 2021* conference, where we were also invited to a benchmarking session where we presented the prototype we created. We also presented partial results of the VEGA project at the conference.
We also participated in the *6th International Conference on Smart Data and Smart Cities*, from which a peer-reviewed paper was published. The lead author was Xiaoling Wang from Normal China University, who was on placement at our department thanks to a grant received under the NRC.

- **KEGA 007TU Z-4/2019** Laboratory of forestry mechanization and automation means - **doc. V. Štollmann, 2019-2021**

Annotation of results for 2021:

On 08.09.2021 the modern laboratory of forestry mechanization and automation equipment was inaugurated with the participation of the Dean of the Faculty of Forestry and the Vice-Dean of the Faculty of Forestry for Pedagogy. Functional workplaces were created for teaching - mechanical and hydraulic transmission of machines, workplace for checking the purity of hydraulic oils, construction of portable chain saws, special recuperative rope devices Relaz, special forestry robots Deltastat, etc. The laboratory was equipped, among other things, with a system for visualizing miniature experiments in front of the auditorium.
On 20.-21.09.2021 in the newly opened laboratory there was an excursion of pupils of the 7th and 9th grades of the First Primary School on ul. P. Jilemnického in Zvolen, focused on ecological solutions of machines.
On 26-31.08.2021 the Summer School Yakutsk 2021 was held at the partner Arctic State University of Agro-technology Yakutsk. Assoc. V. V. Stollmann took part in it as a lecturer. Two TUZVO students - Lena Przybylová and Andea Bat'ková - also participated in the summer school.
With the financial support of the project, the Winter School 2021 was organized from 15.10.2021 to 31.12.2021 in cooperation with Izhevsk State Technical University
M.T. Kalashnikova (IzhGTU). It took place in distance form and was attended by 14 students of LF.
Active participation in the IGC "Theory and practice of dental gears and reductorostrojenija 2021" dedicated to the memory of prof. Goldfarb, IzhGTU, 19.21.05.2021 and further at the IGC "Lesnaya inženerija, materiovedenije i dizajn", Belarusian State Technological University Minsk, 01.-13.02.2021.
We also consider as a success the participation of 2 students from IžGTU at the conference ŠVOČ at TUZVO and also the arrival of 1 student from the partner University of Forestry S.M. Kirova at the Faculty of Forestry, Master's degree. The solution was characterized by a rich publishing activity.

Department of Applied Zoology and Game Management

- **LIFE16 NAT/SI/000634** Preventing the extinction of Dinario-SE Alpine lynx population through reinforcement and long-term conservation - **Dr. h. c., prof. R. Kropil, 2017-2024**

Annotation of results for 2021:

Within the LIFE LYNX project another opportunistic year-round monitoring of the Lynx lynx (*Lynx lynx*) was carried out in the territories of central and eastern Slovakia. Deterministic (systematic) monitoring of lynx with photo traps and censusing with the method of spatial estimation of population size (SCR) in the Volovské vrchy Mountains was continued. Three lynx individuals were captured in the Veporské vrchy and Vtáčnik mountains and subsequently released as part of population restitution in Croatia and Slovenia.

- **VEGA 1/0797/19** Spatio-temporal requirements, habitat preferences and management of selected groups of forest vertebrates - **Dr. h. c., prof. R. Kropil, 2019-2021**

Annotation of results for 2021:

A tool for faster categorization of plant fragments, fully or partially digested by cervids, was also created. For this purpose, we evaluated and photographically documented the microstructures of 92 plant species that are preferred by cervids from the Western Carpathian region. We summarized, consolidated and expanded the information on microcharacteristics of plants consumed by wild cervids and evaluated the most useful characteristic traits.

Antler size in polygamous male cervids is a result of their genetic potential and food quality and is considered a reliable indicator of fitness and habitat quality. We found that total antler value, including number of branches, antler weight and antler length, was higher in areas with higher availability of CaCO3, P and N in soils. In addition, we found no evidence of declines in total value or number of branches under high CaCO3 availability, in antler length under high P availability, and in antler weight under high N availability. Game density had a negative effect on antler size, including number of branches and antler length, and had no effect on the onset of climax or rate of decline in value except for antler weight.

- **VEGA 1/0532/21** Assessment of the impact of forestry on biodiversity and biotic homogenization of forest habitats by bioindicating species of birds and mammals - **doc. P. Lešo, 2021-2023**

Annotation of results for 2021:

In 2021, field research was carried out i n economic and natural forests with similar tree species composition. The aim was to compare the diversity of model animal groups in different forest categories and subsequently the impact of forest management on biodiversity will be analysed. Diversity of birds and small ground mammals, vegetation structure of stands were investigated. According to preliminary results, a higher functional diversity of birds in the reserve compared to the management forests was confirmed as expressed by the community specialization index, reflecting a higher average degree of species specialization or a higher proportion of forest specialists compared to the management forests. These preliminary results are likely to indicate biotic homogenization taking place in forest communities as a result of forest management. No differences in diversity were found for small mammals, only biomass differed between natural and managed forests, probably due to the higher food supply in reserves where stands are older and seed production is higher.

- **Project of business activity:** analysis of impacts/modification of forest management induced by strengthening of recreational functions on LC Lesy SR Bratislava - doc. Ing. R.Sedmák, PhD.

Annotation of results for 2021:

In 2021, the analytical part of the expert project continued to be elaborated according to

the requirements of the client - DG ŠL Banská Bystrica. It was mainly about recalculations

compensation needs of several modified management options agreed upon between City representatives and SL staff on the ground. The recalculations involved not only substantial refinements of the expected timber sales revenues based on more detailed information on the actual monetisation of the different product ranges, but also refinements of the impacts of the cessation of timber harvesting. The refined calculations of expected logging revenues then served to determine more objectively the compensation requirements of the SL for a number of sub-variants of compensation resulting from the fact that part of the stands managed by the SL are managed under lease. The project is implemented in cooperation of three departments of the Faculty of Forestry - the Department of Forest Resource Planning and Informatics, the Department of Forest Economics and Management and the Department of Applied Zoology and Game Management.

Department of Silviculture

- **APVV-18-0195** Economic optimization of target state models for forests close to nature **- prof. M. Saniga (Principal Investigator NLC Zvolen), 2019-2022**

  Annotation of results for 2021:

  The main task of the project was the question of the temporal change of the thickness structures of mixed forests (Dobročský prforest and Badínský prforest) in relation to the creation of framework transition models of forest thickness classes. The solution also included the analysis of the structure of stand gap areas as a basis for defining the area framework for mosaic mixed stands. The transformation of the thickness structures of forests was compared with the thickness structure of selected stands of special-purpose forests at VšLP TU Zvolen, which are in the long-term phase of conversion to a selection or mosaic forest. The analysis of the thickness structure of the Dobročský forest obtained by analysing the data sets in the individual years of measurement confirmed the dominance of beech in the lower layer. A significant decrease over the period under study was recorded for fir and spruce species. For both tree species this was a long-term disturbance of the dynamics of regeneration processes. In the upper layer of the forest, a slight increase in the abundance of beech was recorded, and a significant decrease in the representation of spruce due to biotic damage (*Ips typographus*). And it was confirmed that Norway spruce is a risk tree species and is receding from the forest tree composition under the simultaneous influence of deer and bark beetles. The thickness structure of the Badínský prforest, with a gradual decline in the representation of fir, shows elements of stability and its tree species composition creates preconditions for the creation of a model of a selection forest or a mosaic structure for managed forests of similar tree species composition.

  The final area of the project solution in 2021 was the issue of stands with a dominant representation of spruce in the conversion to a selection forest. The subject of the analysis are data sets of repeated measurements from the stand complex of the Pro Silva Mistriky object. The results of the research of the analysed stands confirmed that the stands, depending on the type of soil nutrient supply over a period of 40 years, have reached the stage of structuring or even the stage of refinement of the selection structure. The proposed model of a selection forest with a dominant protective function on the ranker soil assumes an optimum stock of 320 m3 ha-1 and a target thickness of d1.3 =66 cm. The model of a selection forest with a dominant production function is derived for an optimal stock of 385 m3. ha-1 with a target thickness of d1.3 = 62 cm.

- **VEGA 1/0564/19** Structural Diversity, Growth Potential and Predictors of Woody Plants Distribution in Forest-Steppe Communities under Changing Ecological Conditions - **doc.**

I. Lukáčik, 2019-2021

Annotation of results for 2021:

The most important outcome of the project in 2021 is the development of a set of methodological procedures for assessing the influence of natural, climatic and other conditions on tree growth potential, stand structure and, consequently, natural regeneration in selected forest communities. The results show that the individual sites differ significantly from each other in stand structure, stand health and in the abundance, composition and damage to natural regeneration. Vegetative and generative reproductive plant material was collected from selected specimens of Quercus pubescens and Quercus cerris and other endangered xerothermophilous oak and tree species of these sites and propagated in the Borová hora Arboretum in order to monitor the biology of their growth and development. A methodology for the assessment of intraspecific variability was developed and validated and the heritability of Betula pendula var. carelica traits was evaluated when transferred from in situ to ex situ conditions.

- **VEGA 1/0385/20** Developmental, disturbance and regeneration dynamics of mixed natural and near-natural forests under conditions of climate change - **doc. P. Jaloviar, 2020-2023**

Annotation of results for 2021:

In the second year of the project, changes in the structure and especially in the tree species composition of the fir-beech forest over a period of 48 years were analysed. From the data obtained by long-term measurements on 4 permanent research plots in the National Nature Reserve Badínský prforest, a decreasing trend in the relative importance of fir in the adult stand and in natural regeneration was confirmed. In particular, the relative importance of beech and ash increased at the expense of fir. In the last three decades there has also been a more significant decline of elm in the stand. The change in stand structures in permanently multi-stemmed stands in the Low Tatras has confirmed that they have entered a phase or a refinement of the selection structure, depending on the type of soil nutrient supply, over a period of 40 years. The model of a selection forest on a ranker soil assumes an optimum stock of 320 m3 ha-1and a target thickness of 66 cm. Such a model creates preconditions for the measured dynamics of regeneration processes of fir and spruce and smooth regrowth into the lower layer of the selection forest. The model of the selection forest in volume 1631, which has a dominant production function, is derived from natural factors. Analysis of longitudinal time series showed their importance for understanding historical changes in stand structures of natural forests. The results suggest that differences in past development interact with a complex of historical disturbances to cause imbalances in dynamics in temperate natural forests. It also implies that current anthropogenically driven climate change will also have a significant long-term impact on forest ecosystem dynamics.

- **VEGA 1/0567/21** Optimization of technologies of production and planting of reproductive material of forest tree species under conditions of climate change - **doc. I. Repáč, 20212024**

Annotation of results for 2021:

The effect of application of mycorrhizal biopreparation and hydroabsorbent on the development of Norway spruce seedlings under simulated drought stress conditions was investigated. Irrespective of the product applied, as expected, seedlings with readily available moisture survived best, seedlings with reduced irrigation survived worse, and all seedlings without irrigation died. Although seedlings treated with hydroabsorbent had

higher root dry weight, no significant complex effect of the hydroabsorbent or the mycorrhizal bio-preparation on seedling development was observed.
Three years after planting open-rooted and cover-rooted seedlings of Norway spruce and lodgepole pine, more mature seedlings, regardless of seedling type, survived and grew better in the fall and spring. Pine showed higher drought tolerance

and better growth potential than spruce, indicating the need for a higher representation of this tree species in groves exposed to potential moisture deficiency. An autumn planting date may be an equivalent alternative to a spring planting date if necessary. Hydrogel and a combined mycorrhizal-hydrogel formulation applied at spring planting significantly increased the survival of cover-rooted spruce in a year with a more significant summer rainfall deficit. Additional experiments were established and maintained to monitor the effects of drought stress and product application on Norway spruce and beech seedlings under regulated and natural conditions.

Department of Natural Environment

- **H2020** MSCA-ITN-EID-2019-RISE-WELL, No. 860173: Critical solutions for elderly wellbeing RISE-WELL - **prof. V. Pichler (Principal Investigator FEE - Ing. M. Pichlerová), 2020- 2024**

  Annotation of results for 2021:
  A research methodology was developed to investigate forest recreation on subjective well-being, stress, and cognitive function in a scared population. Approval was obtained from the independent bioethics committee at the BBSSK to conduct the research, a research cohort was assembled, and an experiment was conducted during which all relevant parameters were continuously determined in the research participants. Results and samples were continuously processed laboratory and statistically at the home institution and partner institutions. At the same time, the data was analysed from a database on the quality of life of the elderly in EU countries. Two foreign researchers and PhD students were involved in the above topics.

- **COST Action CA15226** - Climate-smart Forestry in Mountain Regions (CLIMO) **- doc. K. Střelcová, 2017-2021**

  Annotation of results for 2021:
  Climate Smart Agriculture (CSA) integrates the three dimensions of sustainable development (economic, social and environmental), as well as the goals of sustainably increasing agricultural productivity and profit, while adapting to climate change and reducing greenhouse gas emissions. The CLIMO project seeks to apply this concept to climate "smart" forestry (CSF). Three main pillars of the project have been identified: to improve the livelihoods of people in mountain regions by improving forest ecosystem services, increasing the adaptation and resilience of mountain forests to climate change, focusing on the most effective mitigation measures. The main objective of the project is to define CSF in a European context, which requires the identification of key growing characteristics and the harmonisation of CFS in mountain areas in order to create a common platform at European level. Articles have been published in the Canadian Journal of Forest Research and a monograph published by Springer with the team of authors involved in the project entitled Climate-Smart Forestry in Mountain Regions. The project ended in the spring of 2021 after an extension due to the pandemic.

- **COST Action CA18237** -European Soil-Biology Data Warehouse for Soil Protection (EUdaphobase) **- doc. E. Gömöryová, 2019-2023**

  Annotation of results for 2021:

During the year, the COST project EUdaphobase focused on defining the basic concepts and procedures needed to create a pan-European databank for soil biodiversity. The main focus was on reaching a pan-European consensus on all basic data structures and procedures. Webinars were also held to inform on
practices for populating and exploiting the current data structures of the platform. Data upload software has been developed to facilitate the import of soil and biodiversity data into the databank. The data platform used in this project was originally developed for soil invertebrates (fauna). At the request of the wider scientific community across Europe, it was agreed to extend this platform to include soil fungi and bacteria. Due to the pandemic situation, the activity under this COST Action in 2021 was limited to on-line communication.

- **APVV-16-0325** Extreme manifestations of climate change and their impacts on forest growth and production
  plantations **- doc. K. Střelcová, (Ing. Zuzana Sitková, LVÚ NLC Zvolen), 2017-2021**

  Annotation of results for 2021:
  The aim of the project was to create a long-term sustainable web application for on-line biometeorological monitoring. The application is to be used for operational assessment of a range of climate-related risks in forest ecosystems (drought, fire occurrence, changes in population dynamics of insect pests, etc.) for the needs of forestry practice, state administration, the general public and for use in the educational process. The aim was to develop frameworks for the use of biometeorological monitoring of forest ecosystems for early identification of adverse climate impacts on forests and thus contribute to the development of adaptation measures. Integration of two currently independent biometeorological monitoring systems managed by the applicant and a co-investigator. The development of a web-based operational biometeorological monitoring application and the establishment of frameworks for its use in practice. Assessing the impact of recent climate variability on the growth and production of different tree species in a national network of permanent monitoring plots. Assessment of the impact of climate stress factors on the ecophysiological processes of selected tree species. v An integrated online forestry meteorological monitoring website with the domain www.forestweather.sk was completed, which integrates the meteorological monitoring of the two research organisations on one common platform. A final online seminar on "Extreme climate change manifestations and their impacts on forest growth and production" was organised on 31.11.2021, where presentations were made by the project investigators on the results of the project, with the participation of both experts and students, about this application and the results of the project.

- **APVV-17-0676** Vegetation gradients and soil carbon stocks at the tree line in the polar region of Siberia **- prof. V. Pichler, 2018-2021**

  Annotation of results for 2021:
  Terrain relief, in addition to elevation, is a major determinant of the upper limit of forest and tree biomass along the northernmost outcrop of the forest biome in the Putoran Plateau region. Similarly, terrain relief and especially slope were surprisingly determinants of soil carbon content, with this effect mediated by the thickness of the surface layer of organic material with thermal insulating properties. The quality of organic matter, represented by the stable isotope^{15} N content but also by the C/N ratio in the deeper soil layers, was correlated with above-ground biomass. Analyzing soil weathering indicators, they found that Putorana soils fix not only soil carbon by stabilizing on the mineral soil component, but

also atmospheric CO_2 in the process of soil weathering. In the case of favorable conditions for weathering of more silicate rocks (e.g., basalts), it is highly likely that forest-tundra expansion may not decrease but may increase soil C stocks due to the high stabilizing capacity of soil weathering products, especially in the presence of reactive pedogenic Al and Fe minerals, or Al-substituted pedogenic Fe oxides and hydroxides. A common factor limiting the existence of permanently involved forests of Putorana and the High Tatras are storms with katabatic winds
and the pines. The forest-tundra vegetation structures of Putorana can be successfully imitated in the conditions of the so-called extraterritorial taiga of the High Tatras.

- **APVV-18-0347** Climate change and natural hazards: vulnerability and adaptive capacity of forest ecosystems of the Western Carpathians **- prof. J. Škvarenina, 2019-2022**
  Annotation of results for 2021:
  In 2021, Stage 3: Experimental field and laboratory GIS and DPZ research on primary and secondary natural hazards as well as Stage 4: Analysis and assessment of impacts of natural hazards on forest ecosystems were addressed. Major outputs include:
  - Hydrochemical balance of mercury cycling in an ecosystem contaminated by historical cinnabar mining in the Malachovsky brook basin, Kremnické vrchy.
  - Effect of mature spruce forest on canopy interception under subalpine conditions during three growing seasons using synoptic weather classification.
  - Regional and altitudinal aspects in summer heatwave intensification in the Western Carpathians.
  - Influence of selected meteorological elements on the moisture content of forest litter in relation to the degree of fire hazard.
  - Analysis of the impact of climatic extremes on the quality of hare habitat in a planar and colline landscape type.
  - Phenological manifestations of woody plants in relation to weather extremes and prophecies.
  - The northernmost European outbreak of the spruce bark beetle Ips typographus: modelling tree mortality using DPZ and meteorological data.
  - Effect of forest cover on the hydrochemical characteristics of surface runoff in small river basins.
  - Hydrological modelling aimed at assessing the impacts of climate change on runoff regimes.
  - Assessment of surface and root zone soil moisture information from advanced dispersion into the calibration of the semi-distributed hydrological model.
  - Impact of climate change on design values of short-term rainfall intensities at Slovakia.

  The project counted publications in the following categories: ADD 2, ADC 5, ADN 1, ADM 2, ADF 1 and also 14 conference papers. 28 SCI citations were registered for the publications reported in the project.

- **APVV-18-0390** Growth and production of ecosystems under conditions of climate aridization **- doc. K.**
  Sagittarius, 2019-2023

  Annotation of results for 2021:
  Climate aridification and changes in the precipitation regime in Central Europe as one of the main factors influence the growth and production of ecosystems, the transport of substances and energy in the soil-plant-atmosphere (PRAT) system through physiological, growth and production processes. Expected climate change is likely to trigger a range of

changes and disturbances not only in these processes but also in the functions, health and evolution of temperate terrestrial ecosystems. In the first year of the project, we focused on testing methodological approaches, creating databases and establishing and replenishing research plots for field and laboratory research, in particular on: - water flow processes in terrestrial ecosystems, water balance, precipitation regime, transpiration and evaporation and their quantification with respect to the importance of water in the sequestration and CO_2 release by plants and soil in the processes of photosynthesis and respiration as part of the energy flows in the ecosystem, - the impact of drought as a stress factor acting on physiological processes, growth and production and health status through water uptake, management and expenditure, photosynthesis, respiration of ecosystems. These processes will be addressed in the context of climate change, in particular the increase in average temperature, changes in the amount and distribution of precipitation with consequent changes in the water balance and

changes in the frequency and intensity of extreme events (extreme warm or cold periods. ecosystems. In 2021, the results of the project were published in 4 scientific papers registered in CC and in one on-line paper at the EGU conference in Vienna and in 4 scientific papers in the proceedings of the Poster Days conference in November 2021.

- **APVV-19-0142** Soil microbiota in natural forest ecosystems: its response to changing biotic and abiotic habitat factors - **doc. E. Gömöryová, 2020-2024**

Annotation of results for 2021:

The aim of the proposed project is to analyse and elucidate how the response of soil microbiota to changes in abiotic and biotic factors of their habitat in natural forest ecosystems varies at the local level (stand level) and to determine whether the "pattern" of this response differs at the regional and global level. In the second year of the project we carried out the research in the Bukovské vrchy mountains in NPR Havešová. On 40 plots distributed in a regular network with a sampling distance of 140 m, we surveyed tree cover characteristics and collected soil samples for the determination of basic physicochemical and microbial soil properties. We found a significant effect of tree stand structure on soil microbial and chemical properties. With the increase in the relative abundance of the optima stage, an increase in the concentration of C, N, P and Mg in the organo- mineral A-horizon was also observed. Statistical analyses showed a significant correlation between the relative abundance of developmental stages and the functional diversity of soil microbiota in both soil horizons. Positive correlations were also demonstrated between stand density index on the one hand and basal respiration, microbial biomass and N-mineralization on the other hand. In the second year of the project, we also completed soil, environmental and vegetation data from several spruce and beech ecosystems within Slovakia in order to analyse soil data on a regional scale.

- **APVV-19-0340** Connectivity and dynamics of flood runoff generation in peak Slovak river basins (CONTROL) - **prof. J. Škvarenina, (STU Bratislava), 2020-2024**

Annotation of results for 2021:

In 2021, we continued to address stage (1) to evaluate the performance of the metering network aimed at detecting hydrological connectivity in the pilot and upland microwatersheds. Further, on acquiring data on snowpack and soil water regime in mountain forest and agricultural watersheds. In stage (2), we were concerned with the determination of snow and soil water storage at critical times (for the development and occurrence of connectivity); we also quantified the spatiotemporal variability of water storage at different spatial scales.

In 2021, we intensively worked on the evaluation of the interception process of mountain spruce forest in the newly established research area in the ridge part of Lúčanská Mala Fatra (1355 m). The interception loss varies significantly in different zones of the stand. The highest interception was recorded in the zone near the trunk, followed by the stand gap. In the canopy drip zone, we recorded negative intercept in most cases throughout the period, that is, understory precipitation exceeded the precipitation recorded in the open area. The high negative intercept can be explained by the frequent occurrence of mist precipitation that accompanies vertical precipitation and the specific canopy habitus of the spruce trees at this study site, where this precipitation is combed out. The total interception loss of precipitation over the study period was 66% (485 mm) in the neartrunk zone and 12% (89 mm) of the total free-area precipitation in the stand gap. On the contrary, in the sub-crown zone, a total increase of up to 50% was found in the total rainfall compared to

the free area, amounting to 373 mm. The total interception loss of vegetation precipitation for the growing season was therefore
only 9 % of the free area precipitation. The results of this work confirmed the extreme variability of sub-crown precipitation and canopy interception already in microscale individuals in a montane climax forest stand. The experiment also highlighted the key importance of horizontal precipitation from fog and low cloud cover on the perhumid hydrological balance of mountain ridge spruce ecosystems. However, this important positive hydric effect only fully operates in healthy and preserved montane spruce forests. The LF research team contributed 2 ADC publications to the joint project in 2021, 1 ADF and 5 conference papers.

- **VEGA 1/0370/18** Evaluation Vulnerabilities of selected natural and disturbed ecosystems to hydrometeorological extremes - **doc. J. Vido, 2018-2021**

Annotation of results for 2021:

Within the field research of forest microclimate, soil microclimate and soil hydrology, extremely valuable knowledge was obtained, especially about the mining-damaged forest complexes in the vicinity of Cígeľ and Sebedražie (Prievidza district). It has been found that the damage to the subsoil results in a loss or decrease of the groundwater level and thus also in drainage of water from the soil environment. The impact of drought is amplified when compared to reference forest ecosystems in the immediate vicinity. New knowledge of forest microclimate and water dynamics in the unsaturated zone was also obtained from the research station in the Bienska Valley (Zvolen). The results, in addition to highlighting the temporal response of the onset of soil drought in forest ecosystems compared to the open area at the level of 3- 4 weeks (forest resilience potential), also showed the advantage of using the REW (Relative Extractable Water) index compared to the more traditionally used climatic index of irrigation. Extremely rare data were obtained in the context of high mountain research on the occurrence of snow algae in the highest mountains of Slovakia.

- **VEGA 1/0836/18** Adaptation of forest landscapes as a source of ecosystem services to uncertainties of future development by tools of ecological rationality -prof**. V. Pichler, 2018-2021**

Annotation of results for 2021:

Disturbance of forest ecosystems represents one of the most significant risks to the delivery of forest ecosystem services in terms of both regulatory and cultural functions. This risk exists not only towards the most vulnerable tree species and their stands, e.g. spruce monocultures, but also towards those species that are counted on as edifiers and reinforcers of forest ecosystems capable of adapting to the conditions of climate change, i.e. beech in particular. Due to the nature of the root system, beech trees are often affected by upheavals. Within the framework of the project, the possibility of predicting the risk of disturbances of beech ecosystems in the form of upheavals was developed and verified using the non-destructive geophysical method of electrical resistivity tomography (ERT). Low ERT values indicated bedrock and soil characteristics that overlapped with zones of scattered wind calamity in beech stands. The method can be used on long transects or large areas. Its results are directly applicable in the preparation of forest management plans.

- **VEGA 1/0500/19** Climate change, ecosystem vulnerability and natural hazards - **prof. J. Škvarenina, 2019-2022**

Annotation of results for 2021:

In 2021, Stage 2: Monitoring and experimental research on natural hazards was addressed, as well as Stage 3: Analysis and assessment of the impacts of natural hazards on ecosystems and landscapes. Stage 4: focusing on adaptation and mitigation measures to the increasing natural risks associated with a changing climate was launched. Interesting results were obtained from the analysis of the occurrence and intensity of spring frosts and their impact on summer oak flowering in a long-term time series of 30 years (1987-2016) in selected oak vegetation stages in Slovakia. Despite a significant decrease in the occurrence of spring frosts, there is an increase in the risk of damage to generative organs due to the earlier onset of spring phenological phases of oaks. Also, heat waves are one of the indicators of climate change in Slovakia. We used an index method to regionalise the areal distribution of extreme heat waves from lowlands to mountain areas of Slovakia. The frequency of heat waves according to Mann- Kendal test showed a strong trend of exceeding the maximum air temperature at most stations of the studied region. The greatest intensity of the heat wave was confirmed in the last decade with an absolute maximum in 2015. The impact of changes in temperature and precipitation regimes was observed in beech stands. The indices confirmed increasing meteorological drought with uneven areal distribution in areas up to 700 m altitude, which significantly influenced the autumn phase of beech leaf yellowing in the last decade. For phenological monitoring of forest beech we used the NDVI satellite method of measuring leaf area spectra. Spring phenological displays showed a strong dependence on altitude, autumn phenological displays showed only a weak relationship. Heat waves with both tropical and supertropical days are a temperature shock for some autochthonous tree species (forest beech, small-leaved lime, hazel), which is phenologically manifested by an early onset of leaf yellowing.

- **VEGA 1/0115/21** Disturbances of forest ecosystems induced by climate change and properties Soils: linkages and interactions - **doc. E. Gömöryová, 2021-2024**

Annotation of results for 2021:

The main objective of the project is to clarify the role of soil in relation to the risk of natural disturbances in forest ecosystems. In the first year of the project we carried out soil tomography measurements and soil sampling on sandy soils in the Záhorie region. The field work was carried out in an area with a decaying pine stand, in a classically managed healthy stand and in a stand with close-to-nature management. The results showed that while there were no significant differences in soil chemical properties between the areas with dying and classically managed pine stands, the soils in the closeto-nature-managed stands were characterized by higher humus content (higher carbon and nitrogen concentration), C/N ratio and also higher soil moisture compared to the others. On the contrary, soil reaction was the lowest in these stands, with an average value of only pH (CaCl2) = 3.36 in the uppermost 10 cm of soil. Also, available phosphorus was at its lowest concentration in soils close to the managed stands. For Mg, Ca and K contents, no significant differences were found between stands. Differences in these soil characteristics between stand types were observed practically only in the top 0-10 cm of soil.

- **VEGA 1/0810/21** Critical area and biomass of monodominant forest ecosystems in terms of natural risks - **prof. V. Pichler, 2021-2023**

Annotation of results for 2021:

The increasing trend in the frequency and magnitude of forest ecosystem disturbances

under conditions of climate change allows for a more comprehensive assessment of their association with the abundance, structure and other characteristics of forest tree populations. Although scenarios have been published

The necessary adaptation of managed forests to climate change has not yet taken place to the necessary extent. The causes of this are explained by the theories of bounded or ecological rationality and antifragility, which were the basis for the first stage of the solution. To address the problem of ecosystem disturbance, we used the panarchy model and Metcalfe's law, which characterizes the so-called value of a system (in this case, the risk of disturbance) as the number of connections between the elements of the system (trees at the stand-to-landscape scale). We have mathematically modified Metcalfe's relation to cover all configurations in which insect infestation and dispersal of bark beetles can occur at the individual tree level in different directions . With this form of the relationship, in the next stage we will model the probability of bark beetle calamities and compare the statistical estimates with the situation on the ground.

- **KEGA 011TU Z-4/2021** BioMeteorological laboratory on-line - **doc. J. Vido, 2021-2023**

Annotation of results for 2021:

In 2021, we conducted a reconnaissance of the anticipated areas for the construction of the biometeorological laboratory infrastructure. On the basis of a preliminary assessment of the possibilities on the basis of the allocated subsidy, we decided to build two new buildings and to complete one building, the biometeorological (physiological) component of which will be technically connected to the already existing meteorological infrastructure of the Department of Natural Environment, Faculty of Forestry, Technical University of Zvolen. This will increase the efficiency of the project and increase the spatial coverage of the laboratory within the Slovak Republic. Three areas for the construction of the laboratory facilities were identified by the reconnaissance. West, Centre and East. The "West" area will be represented by an object in the area of the Vtáčnik Mountains, the "Centre" will be represented by an object built in the Borová hora Arboretum (Zvolen) and the East, which will be represented by an object on the eastern edge of the Volovské vrchy Mountains in the vicinity of the Lubenicko-Margecanska line.

For the completed projects, an annotation of the following most significant results can be given :

- **COST Action CA 15206** - Payments for Ecosystem Services (Forests for Water) - Payments for Ecosystem Services (Forests for Water), (PESFOR-W) - **prof. J. Šálka, 2016-2021**

Annotation of the most significant results:

The project was carried out in four working groups. KERLH staff was active in WG1 "PES Governance". This resulted in several publications in CC journals and conference papers (4). The project was also the basis for the domestic project VEGA 1/0665/20 InoVoLes: Innovative potential of payments for ecosystem services - "water and forests". The main outputs of the project include: a database of water-focused PES schemes (www.forestresearch.gov.uk/research/pesforw/case-studies/), a user manual for the implementation of water-focused PES (https://www.forestresearch.gov.uk/research/pesforw/user-manual/), which was also translated into Slovak, publications in CC journals (Báliková K., et al. How Do Stakeholders Working on the Forest-Water Nexus Perceive Payments for Ecosystem Services?. Forests **2019**, 11, 12, 1-19. doi:10.3390/f11010012), analysis of the institutional basis for supporting the implementation of PES in European countries (scientific article in preparation).

- **COST Action CA15226** - Climate-smart Forestry in Mountain Regions (CLIMO) **- doc. K. Střelcová, 2017-2021**

  Annotation of the most significant results:
  Climate Smart Agriculture (CSA) integrates the three dimensions of sustainable development (economic, social and environmental), as well as the goals of sustainably increasing agricultural productivity and profit, while adapting to climate change and reducing greenhouse gas emissions. The CLIMO project seeks to apply this concept to climate "smart" forestry (CSF). Three main pillars of the project have been identified: to improve the livelihoods of people in mountain regions by improving forest ecosystem services, increasing the adaptation and resilience of mountain forests to climate change, focusing on the most effective mitigation measures. The main objective of the project is to define CSF in a European context, which requires the identification of key growing characteristics and the harmonisation of CFS in mountain areas in order to create a common platform at European level. Articles have been published in the Canadian Jounal of Forest Research and a monograph in Springer publishing with the team of authors involved in the project entitled Climate-Smart Forestry in Mountain Regions. The project ended in the spring of 2021 after an extension due to the pandemic.

- **APVV-17-0232** Testing of new policies and business models for the provision of selected forest ecosystem services (TestPESLes) - **prof. J. Šálka, 2018 - 2021**

  Annotation of the most significant results:
  The strategic objective of TestPESLes was to contribute to the sustainable development of the Slovak Republic by increasing incentives for the provision of forest ecosystem services (ESL).
  Based on a literature search on the inter-linkages between policies, business models and ESL provision, economic forecasts according to the selected priorities were generated using the SIBYLA growth simulator and available data. The results were translated into business models for ESL payments. Feasibility and acceptance testing at the case study level was conducted in the regions for all selected ESLs based on the priorities identified by the stakeholders. Acceptance testing of the proposed payment schemes led to a preference for public mechanisms.
  An important contribution is the proposal of methods for transferring scientific knowledge in the field of ecosystem services support to forestry policy and support schemes, for example in the context of the current Decree of the Ministry of Forests and Forestry No. 226/2017 Coll. on the provision of support in forestry for the fulfilment of non-productive functions of forests.
  Planned outputs were achieved or exceeded in every indicator and dissemination activities continue beyond the project duration and in the framework of international cooperation.

- **APVV-16-0306** Identification of environmental vulnerability and adaptive potential of spruce (Picea abies Karst. L.) populations under changing climate conditions - **prof. D. Gömöry,** (**RNDr. Ľ. Ditmarová**, **ÚEL SAV Zvolen)**, **2017-2021**

  Annotation of the most significant results:
  The project was aimed at assessing the physiological variability of Norway spruce in the context of climatic conditions, and identifying its genetic determinants. When assessing the physiological response to temperature variations, differences in the diurnal and seasonal behaviour of stem girth were found between the different conifers, with spruce not

representing an outlier in any direction. Physiological evaluation of spruce individuals on the height gradient in TANAP showed similar levels in N, P, K, Na Zn and Fe content, but on the other hand a decrease in Ca, Mg and Mn content. Chlorophyll concentration was stable over the growing season, except at the highest elevations, where it increased with time. The simulated effect of high temperatures showed a decrease in photosynthetic performance, again

depending on altitude. Two methodological approaches were used to identify DNA point polymorphisms of adaptive significance in terms of climate adaptation: sequencing of candidate genes and sequencing of stretches randomly selected from the genome. 103 point polymorphisms were identified in candidate genes in a set of 13 populations of Norway spruce from central Slovakia, several of which were associated with temperature and precipitation characteristics of the place of origin. The second approach was based on mapping a significantly larger part of the genome by next-generation sequencing (NGS, Illumina) using the ddRAD procedure. Material from 5 provenances of Norway spruce (a subset of populations from the previous experiment) was used, subjected to drought stress (stress + control group) and evaluated on the phenotyping line of AgroBioTech SPU Nitra. Sequencing produced 34127 SNPs used for subsequent analyses. Identification of polymorphisms showing signs of adaptive variation based on outlier differentiation identified 5 adaptively significant SNPs. Phenotypic differentiation in several traits was significantly higher compared to neutral markers, evidence of local adaptation by natural selection, but differed between drought stressed seedlings and the control group. At the same time, 64 consistently significant associations were found between SNPs and physiological traits, of which 22 significant relationships were found for stressed seedlings and 42 for control seedlings; again, the associations differed between the two groups. The differences between the two groups of seedlings suggest that interpretation of relationships between polymorphisms in the genome and any phenotypic traits is only possible in the specific context of the environmental conditions in which the experiment was conducted.

- **APVV-16-0325** Extreme manifestations of climate change and their impacts on forest growth and production
  plantations **- doc. K. Střelcová, (Ing. Zuzana Sitková, LVÚ NLC Zvolen), 2017-2021**

  Annotation of the most significant results:
  The aim of the project was to create a long-term sustainable web application for on-line biometeorological monitoring. The application is to be used for operational assessment of a range of climate-related risks in forest ecosystems (drought, fire occurrence, changes in population dynamics of insect pests, etc.) for the needs of forestry practice, state administration, the general public and for use in the educational process. The aim was to develop frameworks for the use of biometeorological monitoring of forest ecosystems for early identification of adverse climate impacts on forests and thus contribute to the development of adaptation measures. Integration of two currently independent biometeorological monitoring systems managed by the applicant and a co-investigator. The development of a web-based operational biometeorological monitoring application and the establishment of frameworks for its use in practice. Assessing the impact of recent climate variability on the growth and production of different tree species in a national network of permanent monitoring plots. Assessment of the impact of climate stress factors on the ecophysiological processes of selected tree species. v An integrated online forestry meteorological monitoring website with the domain www.forestweather.sk was completed, which links the meteorological monitoring of the two research organisations on one common platform. A final online seminar "Extreme climate change manifestations and their impacts on the growth and production of forest stands" was organised on 31.11.2021 on this application and the results of the project solution, where presentations were made by the project researchers with the results of the project solution, with the participation of both experts and students.

- **APVV-17-0676** Vegetation gradients and soil carbon stocks at the tree line in the polar region of Siberia - **prof. V. Pichler, 2018-2021**

Annotation of the most significant results:

Terrain relief, in addition to elevation, is a major determinant of the upper limit of forest and tree biomass along the northernmost outcrop of the forest biome in the Putoran Plateau region. Similarly, terrain relief and especially slope were surprisingly determinants of soil carbon content, with this effect mediated by the thickness of the surface layer of organic material with thermal insulating properties. The quality of organic matter, represented by the stable isotope^{15} N content but also by the C/N ratio in the deeper soil layers, was correlated with above-ground biomass. Analyzing indicators of soil weathering, they found that Putorana soils fixed not only soil carbon by stabilizing on the mineral component of the soil, but also atmospheric $_{CO2}$ in the process of soil weathering. In the case of favorable conditions for weathering of more silicate rocks (e.g., basalts), it is highly likely that forest-tundra expansion may not decrease but may increase soil C stocks due to the high stabilizing capacity of soil weathering products, especially in the presence of reactive pedogenic Al and Fe minerals, or Al-substituted pedogenic Fe oxides and hydroxides. A common factor limiting the existence of permanently involved forests of Putorana and the High Tatras are storms with katabatic winds and bores. The forest-tundra vegetation structures of Putorana can be successfully imitated in the conditions of the so-called extraterritorial taiga of the High Tatras.

- **VEGA 1/0868/18** Innovative methods of mapping of anthropogenic and natural landforms and relief in the survey of the state of the landscape- **doc. F. Chudý, 2018-2021**

Annotation of the most significant results:

The scientific objectives for the year 2021 of the project have been met and even exceeded in view of the allocated funds. Their scope was planned in line with the requested funds, but the funds provided were significantly lower. The achievement of the results was also made possible by the accumulation of the necessary funding from other sources (cooperation with practice, ...). The airborne DPZ data - airborne piloted photogrammetry and laser scanning - were obtained from previous projects. Newly acquired data were ground and remotely piloted photogrammetry, handheld ground scanner (for tree and vegetation characteristics detection, creation of detailed digital models, mapping of anthropogenic and natural landforms and relief, ...).

- **VEGA 1/0797/19** Spatio-temporal requirements, habitat preferences and management of selected groups of forest vertebrates - **Dr. h. c., prof. R. Kropil, 2019-2021**

Annotation of the most significant results:

Forest bird assemblages are similar in both management and protected areas of the Western Carpathians in terms of diversity indices. However, these forest types differ in terms of species composition. However, geographic location as well as management intensity, together with forest complexity, contribute most to explain the diversity of bird assemblages. The greatest differences were observed for rare species, especially those listed in the European Commission's Birds Directive (especially woodpeckers and flycatchers), and these species occurred either exclusively or in much greater numbers in nature reserves. Management intensity, forest complexity and topography best explain the diversity of rare species. The cultivation systems applied in the management of the forests of the Western Carpathians are sufficient to protect the overall diversity of bird assemblages. Reduced forest fragmentation and increased proportion of dead wood contribute to higher diversity.

Ecological parameter and behavioural patterns together with a microhistological key for detecting foraging behaviour of cervids and the influence of density and soil on antler parameters of cervids, results of spatio-temporal demands, knowledge of daily and seasonal behavioural migrations in cervids are important for determining environmental demands and application of

principles for rational and sustainable management of forest populations of higher vertebrates.

- **VEGA 1/0564/19** Structural Diversity, Growth Potential and Predictors of Woody Plants Distribution in Forest-Steppe Communities under Changing Ecological Conditions - **doc. I. Lukáčik, 2019-2021**

  Annotation of the most significant results:
  Knowledge about the microclimate of model biotypes on Krupinská planina was obtained, biomorphological classification of tree species, their potential varieties and hybrids was carried out. The growth processes of tree species and their sociological position within the communities, health status and the proportion of living and dead individuals were evaluated. Relevant indicators (anthropogenic, ecological, including wildlife damage) affecting the status of these stands and natural regeneration in the given landscapeecological conditions were identified. Dendrochronological analyses were evaluated with an outline of changes in the species structure of forest-steppe communities. Original results on their potential development have been obtained, many of which can be used in predicting the development of other similar ecosystems in the future. Progressive methods of generative and vegetative reproduction have been used to rescue and preserve the gene pool of woody plants of extreme habitats under ex situ conditions in order to monitor the biology of their growth, trait inheritance and development.

- **VEGA 1/0836/18** Adaptation of forest landscapes as a source of ecosystem services to uncertainties of future development by tools of ecological rationality -prof**. V. Pichler, 2018-2021**

  Annotation of the most significant results:
  Disturbance of forest ecosystems represents one of the most significant risks to the delivery of forest ecosystem services in terms of both regulatory and cultural functions. This risk exists not only towards the most vulnerable tree species and their stands, e.g. spruce monocultures, but also towards those species that are counted on as edifiers and reinforcers of forest ecosystems capable of adapting to the conditions of climate change, i.e. beech in particular. Due to the nature of the root system, beech trees are often affected by uprooting. Within the framework of the project, the possibility of predicting the risk of disturbances of beech ecosystems in the form of upheavals was developed and verified using the non-destructive geophysical method of electrical resistivity tomography (ERT). Low ERT values indicated bedrock and soil characteristics that overlapped with zones of scattered wind calamity in beech stands. The method can be used on long transects or large areas. Its results are directly applicable in the preparation of forest management plans.

- **VEGA 1/0370/18** Vulnerability assessment of selected natural and disturbed ecosystems to hydrometeorological extremes - **doc. J. Vido, 2018-2021**

  Annotation of the most significant results:
  The most important result achieved during the project is the elucidation of fundamental differences in the climatology of drought and its spatio-temporal distribution within the orographic units of the Danube Upland and the Slovak Central Highlands. The result is a fundamental contribution to the ongoing basic research in the fields of forestry, agriculture and water management, which need this knowledge for practical adjustment of

climateadaptation management measures. It is clear from the results that drought in the Inner Carpathian basins will occur mainly in the spring and autumn seasons (a matter of adjusting agricultural and forestry production), whereas in the open lowland landscape its occurrence will be practically year-round. It should be noted, however, that it is most abundant in April. This is due to the lack of convective rainfall in the open countryside.
However, from

further research, it is clear that the resilience potential of the landscape, or anthropogenic disturbance, will determine the adaptive capacity of local natural and socio-economic structures.

- **KEGA 009TU Z-4/2019** Modernization of teaching of environmental economics at technically oriented universities in Slovak Republic - **prof. J. Šálka, 2019-2021**

Annotation of the most significant results:

The project was designed to modernise the teaching of environmental economics. A textbook on environmental economics was developed, which reflects the latest developments in this field and includes didactic innovations. An effective didactic form of the comic strip "The Adventures of Alex and Bioman" is used as a guide for the exercises, which introduces students to bioeconomics in an unpretentious way. The whole teaching process has been complemented by a high-quality e-learning module consisting of presentations, videos and an e-learning test. In addition, the teaching innovation is linked to the basic and applied research of the research team. The project has produced 5 ADC publications, 1 ADM publication, 1 ADN publication, 1 ACB publication and 1 AAB publication, in addition to several other publications (AFG, AFA, EAJ and others).

- **KEGA 011TU Z-4/2019** Visualization of forest using game engine Unity 3D for e-learning, - **prof. M. Fabrika, 2019-2021**

Annotation of the most significant results:

The aim of the project was to create an application for displaying a virtual reality forest in the game engine Unity 3D, which will be dynamically created from an external database. 1) Create tree trunk prototypes for different tree species, age stages, quality classes and damage levels based on models obtained from near ground photogrammetry in the Agisoft PhotoScan environment. 2) Create complex tree models with branches and assimilation organs in the SpeedTree environment. 3) Program a virtual reality forest application in the Unity 3D game engine environment. All planned project objectives were met. The result of the project is an application for displaying the virtual reality of the forest in the game engine Unity 3D. The application allows: (a) display the current state of the forest or the future development of the forest from growth simulations, (b) the forest cover is displayed in a very detailed and realistic way, including a terrain model, vegetation cover of the terrain and objects on the terrain (rocks, dead wood, fallen trees), (c) it allows the visualization of 24 species of trees, including their dead versions and stumps, (d) the dimensions of the trunks and the trees follow the specified dimensions, e) the visualization is linked to a relational database and is therefore universal, e) the visualization is interactive, which means that it allows interventions in the forest (identification of trees and their parameters, tree labeling, tree felling), f) the visualization includes physical phenomena (wind, shadows, reflections) as well as weather (e.g. clouds and rain). A video of the application is at this link: https://www.youtube.com/watch?v=ub1zXUYebJo. In addition to the originally planned application, a bonus educational game has been developed to make the subject of forest modelling accessible to students and the public in an entertaining way. The video application is at this link: https://www.youtube.com/watch?v=F6EAok5TFo4.

- **KEGA 007TU Z-4/2019** Laboratory of Forestry Mechanization and Automation means - **doc. V. Štollmann, 2019-2021**

Annotation of the most significant results:

A modern laboratory of forestry mechanisation and automation equipment was built at the Technical University in Zvolen with the financial assistance of the Ministry of Education, Science, Research and Sport of the Slovak Republic. It will significantly contribute to the expansion and improvement of the quality of teaching of technical subjects at all three levels of study at the Faculty of Forestry. The establishment of the laboratory will enable the use of illustrative teaching aids, functional models, sections of aggregates and various experimental devices in teaching to a greater extent than before, which will enable students to better understand the principles of machinery and equipment used in forestry. The project was characterised by a rich international activity. A new cooperation agreement with the Arctic State Agrotechnological University of Yakutsk was developed and concluded. As part of the internationalisation of education, various courses, summer and winter schools were conducted for students, which after the outbreak of the corona virus pandemic switched to distance forms. A total of 42 students from TUZVO took part in them. Extensive publishing activities were carried out with the financial support of the project. Let us mention the granting of 1 patent for an invention, writing of 3 book publications, publication of one work indexed in VAK (in Russian-speaking countries analogous to coronavirus), publication of 3 articles indexed in SCOPUS, creation of a solution for which 2 new patent applications for invention have been filed.

- **IPA 6/2021** Theoretical and Methodological Framework for Research on the Interaction of International and National Forestry Policies in the Slovak Republic - **PhDr. L. Halušková, 2021**

Annotation of the most significant results:

The project objective as well as the individual sub-objectives have been achieved. The theoretical approach of the Policy Arrangements Approach (PAA) was used to describe the historical context of international forest policy arrangements and was also applied to describe a selected global level process. The results were presented at the Student Scientific Conference of the Faculty of Science of the Faculty of Science of the Faculty of Science of the University of Latvia and the paper was awarded the third place. The PAA approach was also applied to describe the national forestry policy in Slovakia and at the same time the relevant actors to be interviewed as part of the applied research were defined. Cooperation was established with researchers in five European countries and they promised to collect data domestically for the applied research, which will be based on the theoretical-methodological framework.

The results of the project are summarized in a publication registered in Web of Science (Halušková et al. 2021 Theoretical and methodological framework for the analysis of international forest political processes by stakeholders' perceptions at national level. In Central European Forestry Journal. 2021. no. 4 , pp. 230--239. ISSN 2454-034X.

- **Project R-4350/2016** "Determination of the subspecies affiliation of the sage grouse (relevant subspecies for the territory of the Czech Republic) and assessment of the degree of relatedness according to different biological samples on the example of artificial breeding (Moravian-Silesian Beskydy, Šumava) and samples coming from individuals from the wild." - **Ing. D. Krajmerová, PhD., 2016-2021**

Annotation of the most significant results:

During the five years of the project, we extracted DNA from 1165 collected samples, from which we identified 831 genotypes by fragmentation analysis of samples amplified on nuclear DNA microsatellite markers. In total, we genetically identified 639 individuals. Of these, we statistically processed 69 samples for the purposes of studying the

phylogeography of ruffed grouse. The analysis of the genetic structure and diversity of the Great Hornbill was considered for the Czech Republic, in the European context and with respect to the genetic status of the nurseries in Boubin, Řepčonka and Wisłe. The genetic status of the Boubin, Řepčonka and Wisła breeding sites was tested by analyses in Structure and principal coordinate analysis (PCoA). Analyses of relationships within the breeding flock in the Řepčonka and Boubín nurseries were performed in the ML-Relate program on the basis of the relatedness index.

In order to reconstruct the genetic structure of recent and historical largely extinct populations in the Czech Republic, we tested the assignment of individuals to genetic groups. We identified samples derived from museum specimens and recent samples collected during the last five years in the Beskydy Mountains, a peripheral mountain range of the Western Carpathians, as a separate genetic group with minimal introgression of alleles from West Bohemian populations. The historical population in the Jeseníky Mountains showed a similar genetic structure to the Beskydy population. In the two-group test, even individuals from the historical populations in the Giant Mountains and Jizera Mountains were more similar to the Beskydy and West Carpathian populations, respectively, than to the West Bohemian populations, and can be considered as a contact zone between the West Carpathian and West Bohemian populations of deafhornbill. We found that the population in the breeding facility in Šumava and in the breeding facility in Boubin is genetically different from the population in the Western Carpathians. The breeding flock in Řepčonka and in Wisłe belong to a common genetic group with the Western Carpathians, and thus also the Beskydy Mountains.
Relationships were identified in the breeding flock in Řepčonka, where due to the availability of genotypes of almost all individuals of the breeding flock, these relationships could also be relatively accurately identified. The identification of parents and offspring in Boubin was not reliable, as we do not have all the parent individuals of the breeding flock. In both breeding flocks, the determination of parental relationships was complicated by the relatedness between individuals of the breeding flock. Recommendations have been made regarding the expansion of the breeding flocks. As part of the project, a seminar was organised in Ostrava on 2.9.2021
"Use of genetics in artificial breeding of sage grouse" with the participation of foresters and conservationists from Slovakia, Czech Republic and Poland.

II. Organisational, personnel, material-technical and financial support of science and technology at the Faculty of Forestry

1. Organisational, personnel and financial security

The structure of research and teaching staff (Table 1) has changed slightly compared to the previous year, with a total of 115, representing a slight increase in the total number of staff compared to the previous year of 113. The management of the Faculty of Forestry pays due attention to the qualification growth of LF staff, also in terms of providing supervisors and co-guarantors of accredited study programmes.

Table 1. Structure of the Faculty of Forestry staff according to individual departments

(as at 31.12.2021)

Workplace	Cvalification			Total	of the total
	pedagogical workers	scientific research work.	Other		

	prof.	doc.	rep.as.	Scientists (PhD.)	Department of Higher Education	Answer. SŠ	tech.		DrSc.	CSc. PhD., Dr.
KERLH	3	2	5	4				14		14
KF	3	2	2	3	1		3	14	1	9
KPLZI	3	4	5	2	2	2	1	19		15
KIOLK	1	4	3	2			2	12		10
KĽTLM	2	4	2	6		1	1	16		14
KAZMZ	1	2	4	5		1	1	14		12
KPL	1	5	1	2		1	2	12	1	9
KPP	2	3		5		1	3	14		12
S p o l u	**16**	**26**	**22**	**29**	**3**	**6**	**13**	**115**	**2**	**95**

Table 2 shows the number of staff per department by full-time equivalent in 2021. We use the numbers of staff with higher education degrees by full-time equivalent in the calculation of CC outputs per creative worker because they most faithfully represent reality. **Table 2. Structure of the Faculty of Forestry staff according to individual departments (working time)**

Workplace	C v a l i f i c a t i o n							Total	of the total	
	pedagogical workers			scientific research work.			Other			
	prof.	doc.	rep.as.	Scientists (PhD.)	Department of Higher Education	Answer. SŠ	tech.		DrSc.	CSc. PhD.,Dr.
KERLH	3	2	5	1,7				11,7		11,7
KF	3	2	2	3	0,6		3	13,6	1	9
KPLZI	3	4	5	2	1,4	2	1	18,4		14,8
KIOLK	1	4	2,98	1,5			2	11,48		9,98
KĽTLM	2	4	1,99	5,18		1	1	15,17		13,17
KAZMZ	1	2	2,1	3,56		1	1	10,66		8,56
KPL	1	5	1	2		1	2	12	1	9
KPP	2	3		4,98		1	3	13,98		11,98
S p o l u	**16**	**26**	**20,07**	**23,92**	**2**	**6**	**13**	**106,99**	**2**	**88,29**

As in previous years, the research capacity is concentrated on solving grant tasks from the Ministry of Education and Science of the Slovak Republic, both by teaching and research staff

(Table 3). The capacity table also includes the capacity of PhD students and secondary school staff. At

grant projects account for over 92.62% of capacity and other projects, including international projects, account for 7.38% of total capacity. The average capacity per teaching staff member is 1450.49 hours and per researcher is 1200.75 hours.

Table 3. Research capacity of LF departments for scientific research projects in 2021

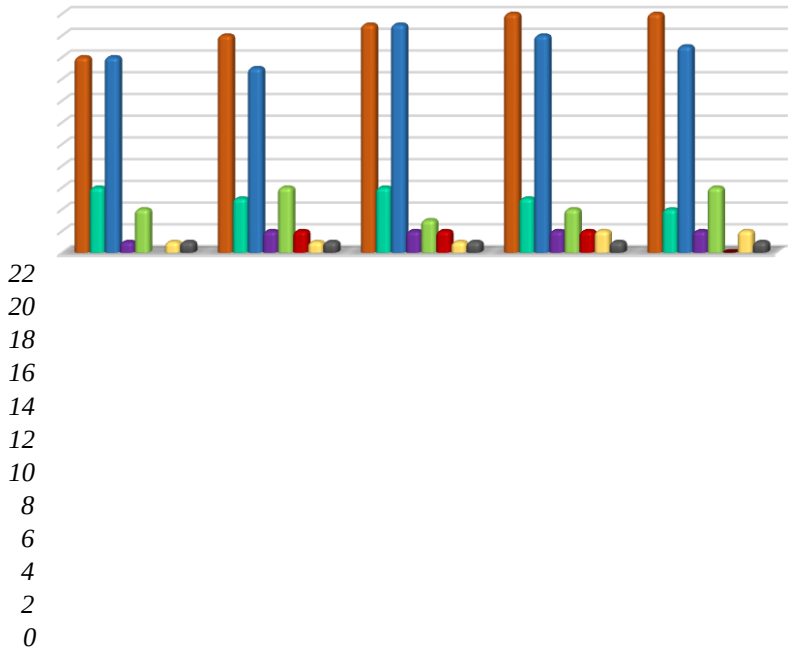
Department	Research capacity in hours Research projects				Spolu		
	Grant projects		Other projects		Educator. Staff	Scientific research workers./Doc.	Pedag. + Researchers + Doctor.
	Educator. Staff	Scientific research workers./Doc.	Educator. Staff	Scientific research workers./Doc.			
KERLH	18900	2350/12850	2229	0/5	21129	2350/12855	36334
KF	10300	6100/3800	200	1950/0	10500	8050/3800	22350
KPLZI	13700	3514/1600	549,5	0/0	14249,5	3514/1600	19363,5
KIOLK	10575	1525/3100	83	48/0	10658	1573/3100	15331
KLŤLM	7650	7300/1200	0	0/0	7650	7300/1200	16150
KAZMZ	8650	8500/0	100	2045/0	8750	10545/0	19295
KPL	8400	2100/450	0	0/0	8400	2100/450	10950
KPP	10400	6150/5900	1095	4044,55/0	11495	10194,55/5900	27589,55
LF total	**88575**	**37539/28900**	**4256,5**	**8087,55/5**	**92831,5**	**45626,55/28905**	**167363,05**
	155014		**12349,05**		**167363,05**		

Financial support for research and development at the Faculty of Science is mainly provided through projects of the Agency for Research and Development Support (APVV), projects of the Scientific Grant Agency of the Ministry of Education and Science and the Slovak Academy of Sciences (VEGA) and applied research of the Ministry of Education and Science in connection with pedagogical activities through projects of the Cultural and Educational Grant Agency (KEGA) and development projects of the Ministry of Education and Science of the Slovak Academy of Sciences. It should be stressed that the Faculty of Forestry has representatives on the committees and boards of these agencies. Scientific research activities through international programmes of the European Commission, especially Horizon 2020 and COST programme, are also an important contribution. Figure 1 shows the evolution of the number of scientific research projects for the years 2017-2021. In 2022, a total of 56 different projects were under way at the Faculty of Physical Sciences, while in 2021 the number of projects was 58. A decrease was observed in the number of APVV and KEGA projects, and EFI projects were terminated. There was an increase in the number of COST projects. The evolution of the funds allocated in absolute terms, which is shown in Figure 2, documents an increase of EUR 370 000 in 2021 compared to 2020 (EUR 1 352 000 compared to EUR 982 000). The increase is mainly in international and APVV projects. In percentage terms, the largest share is still allocated to APVV projects. In absolute and percentage terms, this amounts to EUR 711 000 and represents 52.6 % of all project funding allocated to the Faculty (Figure 3).

However, it should be critically noted that, as in the past, we are not able to apply the transfer of knowledge from the faculty environment to the level of practical industrial use at an adequate level. This should be primarily the commercial or industrial exploitation of patent solutions through a university spin-off company. The potential for utility of patents and utility models is undeniable also in establishing cooperation with leading commercial domestic and

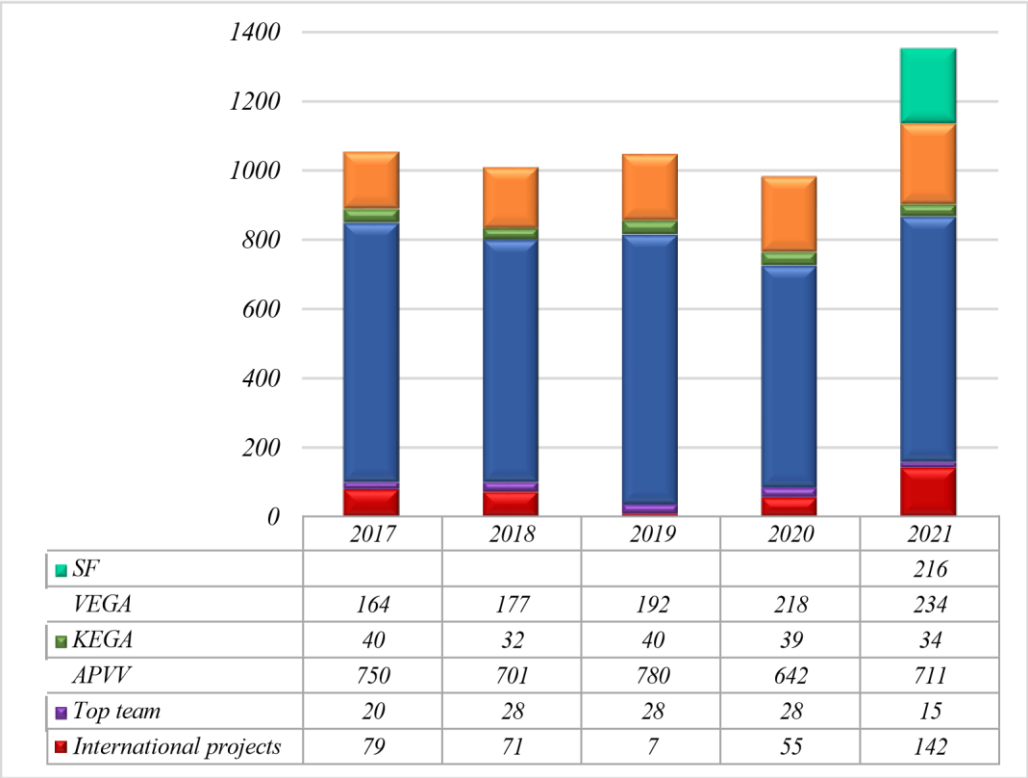
foreign scientific research institutions. Software solutions and products that cannot be patented under the European Union's legal regulations also have innovation potential. They are governed by the principles of copyright law and intellectual property. Examples include the forestry-oriented point cloud processing products DENDROCLOUD and the SIBYLA growth simulator. Both products have been included as tools in the forthcoming IT cluster under the jurisdiction of the Banská Bystrica Self-Governing Region. The SIBYLA growth simulator will also be introduced into the forest user's information system in cooperation with the external sub-enterprise ITERSOFT.

Fig. 1. Evolution of the number of research projects in 2017-2021



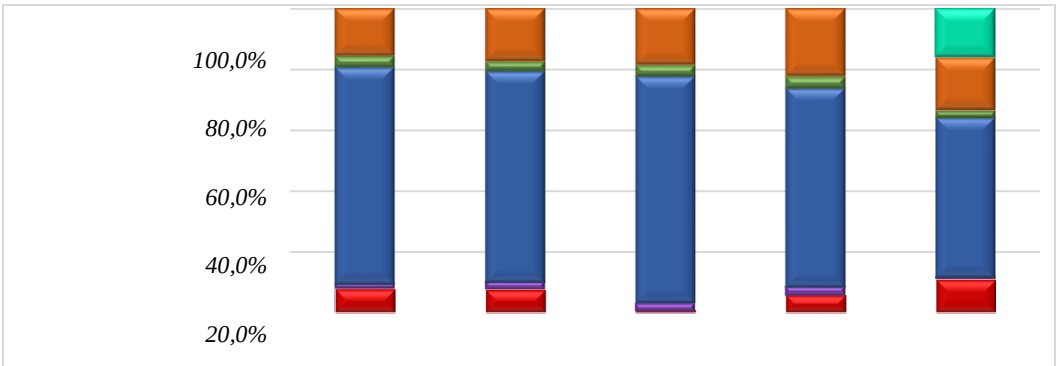
	2017	2018	2019	2020	2021
VEGA	18	20	21	22	22
KEGA	6	5	6	5	4
APVV	18	17	21	20	19
Top team	1	2	2	2	2
MP COST	4	6	3	4	6
MP EFI		2	2	2	0
MP Horizon 2020	1	1	1	2	2
MP LIFE 16	1	1	1	1	1

Fig. 2. Development of funding for scientific research projects in 2017-2021 in thous. EUR



	2017	2018	2019	2020	2021
SF					216
VEGA	164	177	192	218	234
KEGA	40	32	40	39	34
APVV	750	701	780	642	711
Top team	20	28	28	28	15
International projects	79	71	7	55	142

Fig. 3. Development of funding for research projects in the years 2017-2021 in percentage

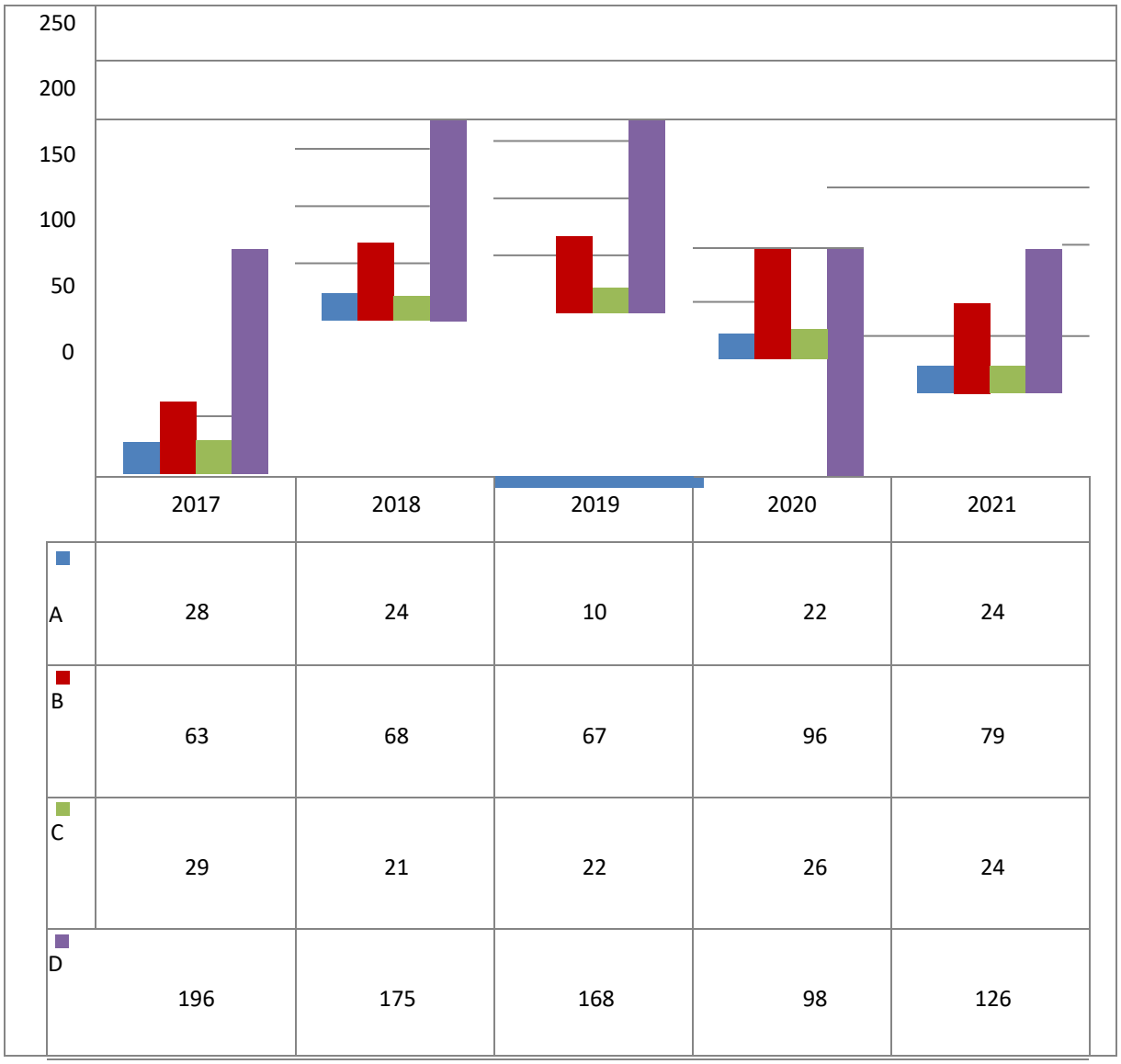


	2017	2018	2019	2020	2021
SF					15,98%
VEGA	15,6%	17,4%	18,50%	22,20%	17,31%
KEGA	3,8%	3,2%	3,80%	3,97%	2,51%
APVV	71,2%	69,4%	74,3%	65,38%	52,59%
Top team	1,9%	2,7%	2,70%	2,85%	1,11%
International projects	7,5%	7,3%	0,7%	5,60%	10,50%

2. Publication activity

The results of the publication activity of the Faculty of Forestry in 2021 by individual categories in comparison with previous periods are shown in Figure 4. From 2018 onwards, the quartiles of journals within the respective research areas in which articles have been published are now also taken into account in university funding. From a faculty perspective (but not taking into account the co-authorship of individual department members in the publication output), a total of 79 papers were published in 2021 in peer-reviewed journals, including 72 papers in foreign peer-reviewed journals and 7 papers in domestic peerreviewed journals.

Fig. 4: Evaluation of the development of publishing activity at the Faculty of Forestry, TU in 2017-2021 from the library's data



	2017	2018	2019	2020	2021
A	28	24	10	22	24
B	63	68	67	96	79
C	29	21	22	26	24
D	196	175	168	98	126

Figure 5 presents the trend in the publication of faculty-created articles over the period 2017-2021, with a decrease of 15 faculty-created publications in 2021 compared to 2020. The figure also provides a comparison of the trend in publication of peer-reviewed articles with that of scholarly monographs (code designations AAA, AAB). From the point of view of individual departments, the distribution of publication of papers in peer-reviewed journals in 2021, taking into account the co-authorship of members of individual departments in the publication output, is as follows: KPLZI - 18, KF - 21, KIOLK - 10, KERLH - 10, KPP - 14, KPL - 8, KLŤLM - 10, KAZMZ - 6 (of which, however
4 papers are still pending registration in CREPČ) (Figure 6). From the point of view of the long-term trend erasing the year-to-year fluctuations in the publication of peer-reviewed articles by international publishers, it is both more promising and more correct to assess the publication in CC journals on a multi-year basis. Therefore, Figure 6 provides comparisons of the publication performance of individual departments in the ADC and ADD category of peerreviewed articles for the period 2019- 2021, where the effect of year-to-year fluctuation is quite evident for more or less all departments.

The proportion of articles published per creative worker per department but calculated on the basis of the full-time equivalent of departmental staff in 2021 is shown in Figure 7. More than an average of 1 carented article per creative worker in the department was achieved by 4 departments in 2021 (KF, KIOLK, KPP, KPLZI), while in 2020 it was up to 5 departments.

Fig. 5: Overview of the development of publication of scientific monographs and peer-reviewed articles at the Faculty of Forestry, TU in 2017-2021

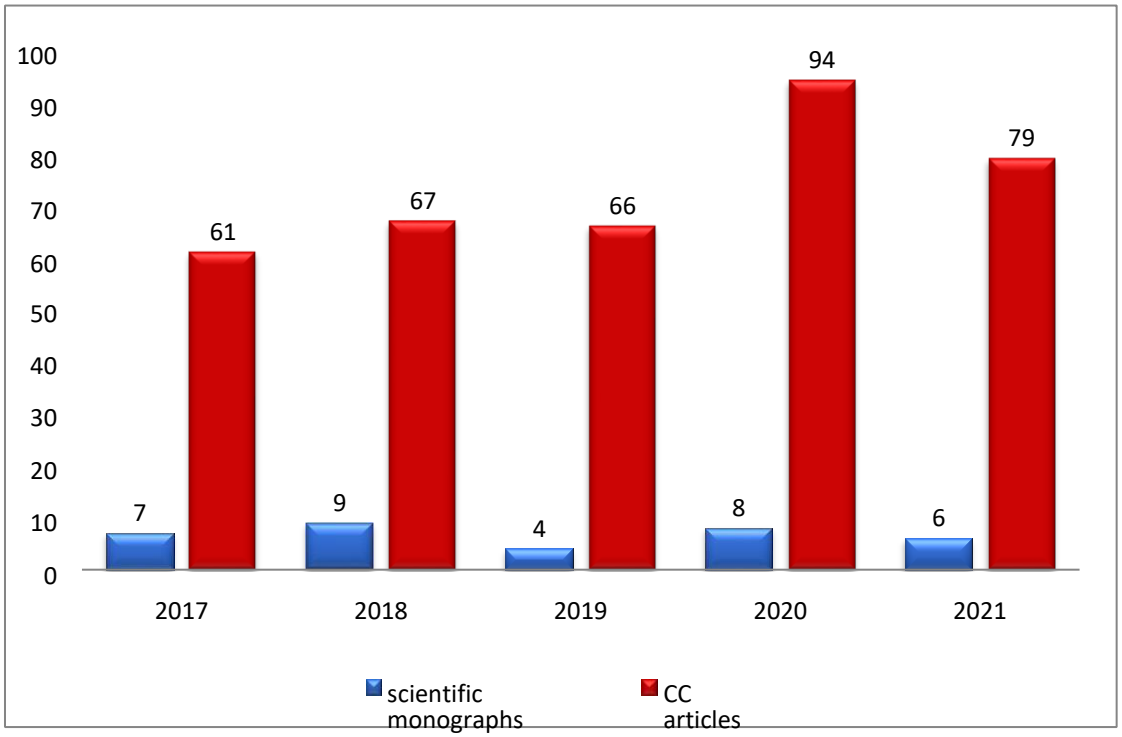
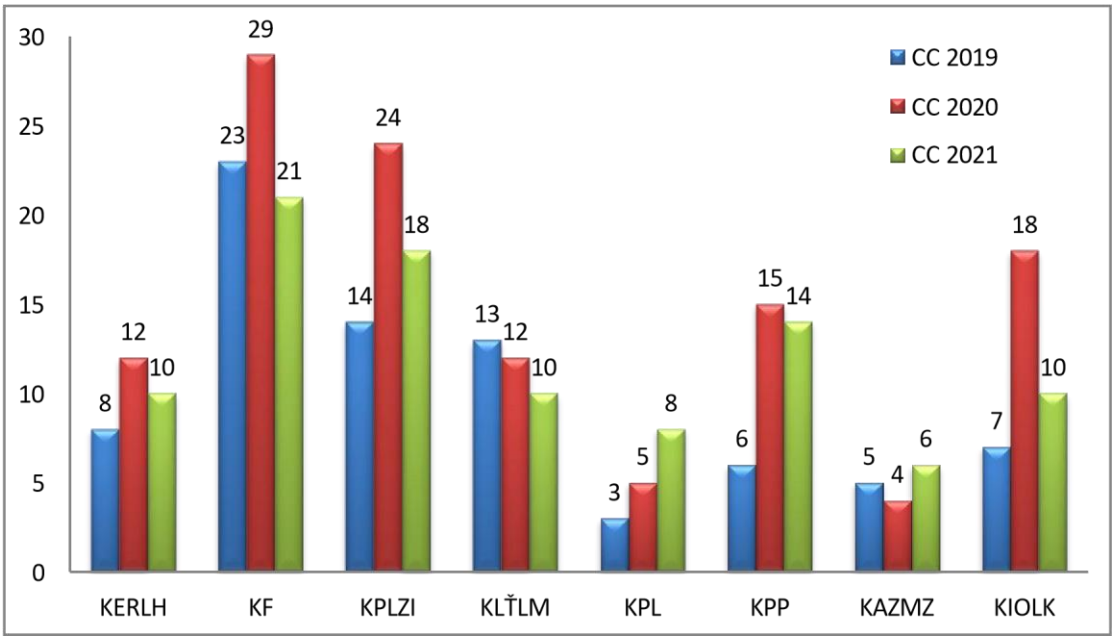


Fig. 6: Number of scientific papers in peer-reviewed journals by department for 2019-2021



The management of the Faculty of Forestry aims to motivate creative faculty staff to publish more papers, especially in the quartile Q1 or Q2, by means of an incentive-based remuneration system, and thus to change the overall structure of publication activity with the aim of achieving a predominant share of publications in the first two quartiles. It is particularly pleasing that

the largest proportion of published articles in the ADC, ADD and ADM categories were in the first quartile, as assessed by the Journal Citation Reports (JCR) database. Specifically, there were 49 papers in Q1, 24 papers in Q2, 7 papers in Q3, and 6 papers in Q4 (Figure 8). A summary of the publication activity of all departments by quartiles set by the JCR database for 2021 is given in Fig. 9.

Fig. 7: Number of CC outputs per creative worker by individual departments, calculated on the basis of full-time equivalent staff in the departments in 2021

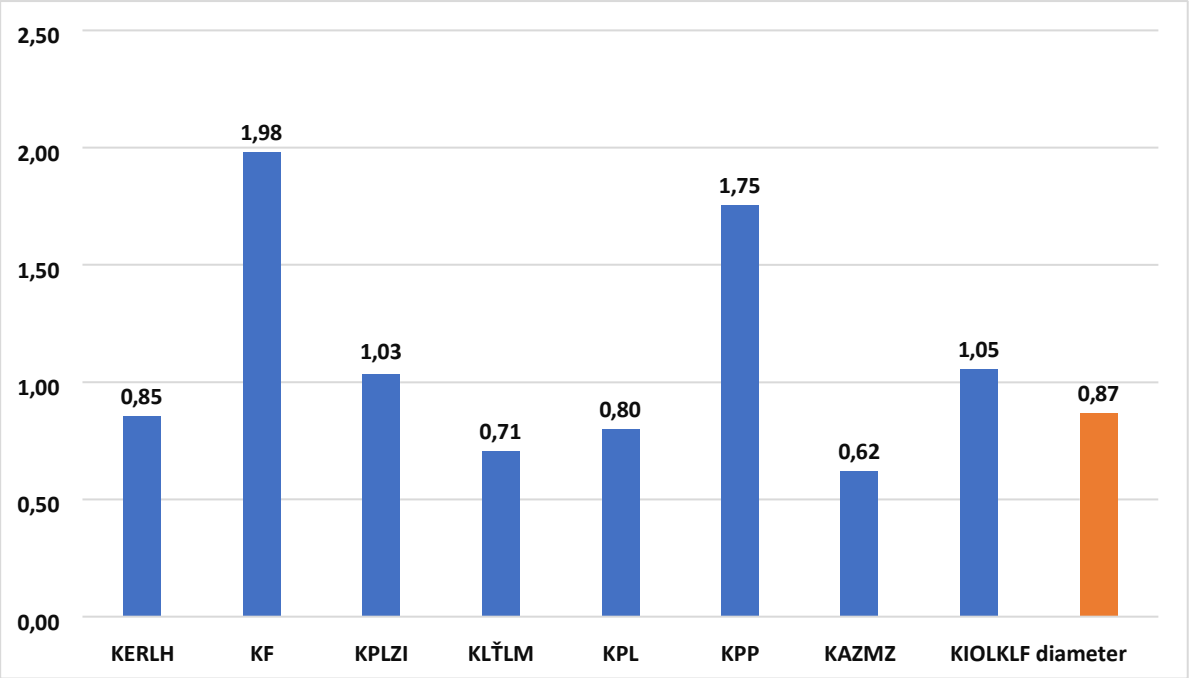


Fig. 8: Number of LF publications by quartiles set by the Journal Citation Reports (JCR) database for the ADC, ADD and ADM categories for 2021

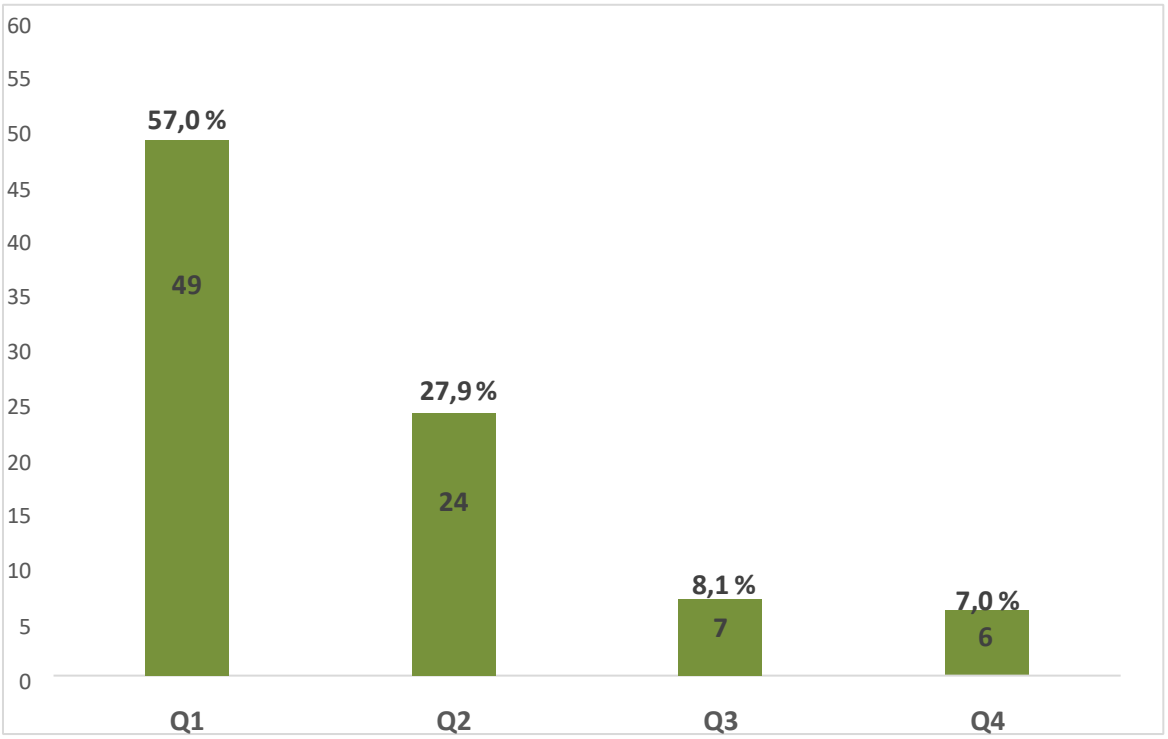
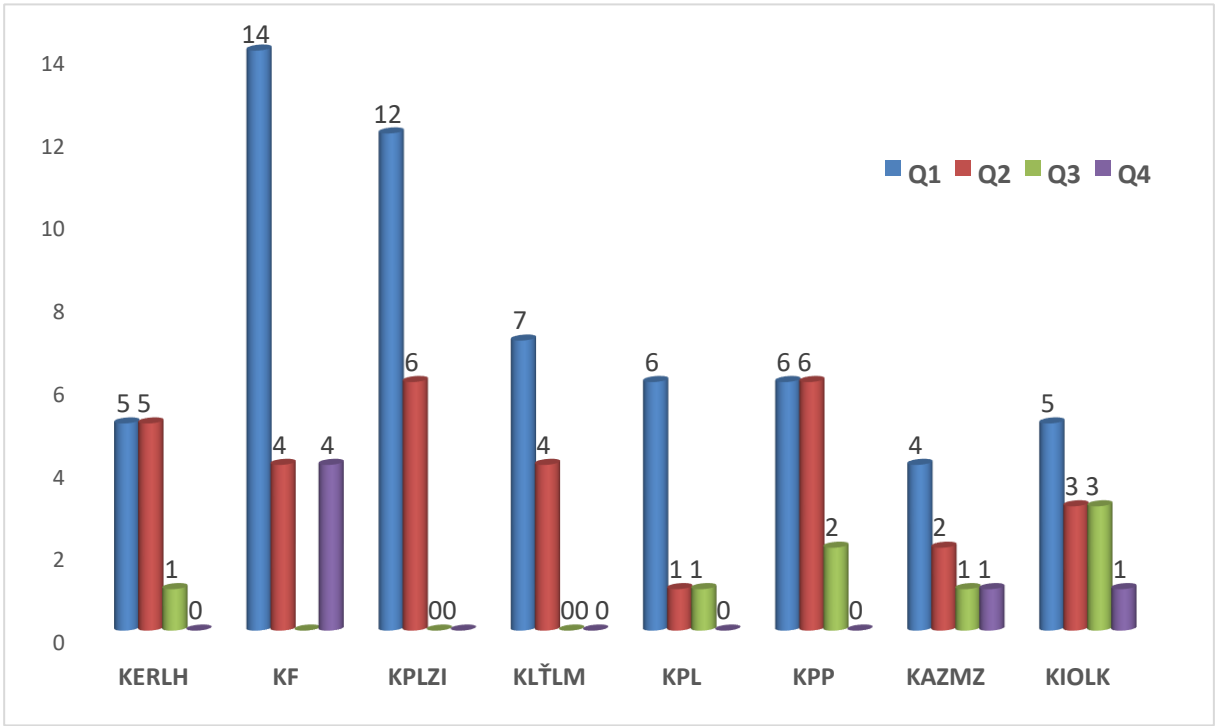
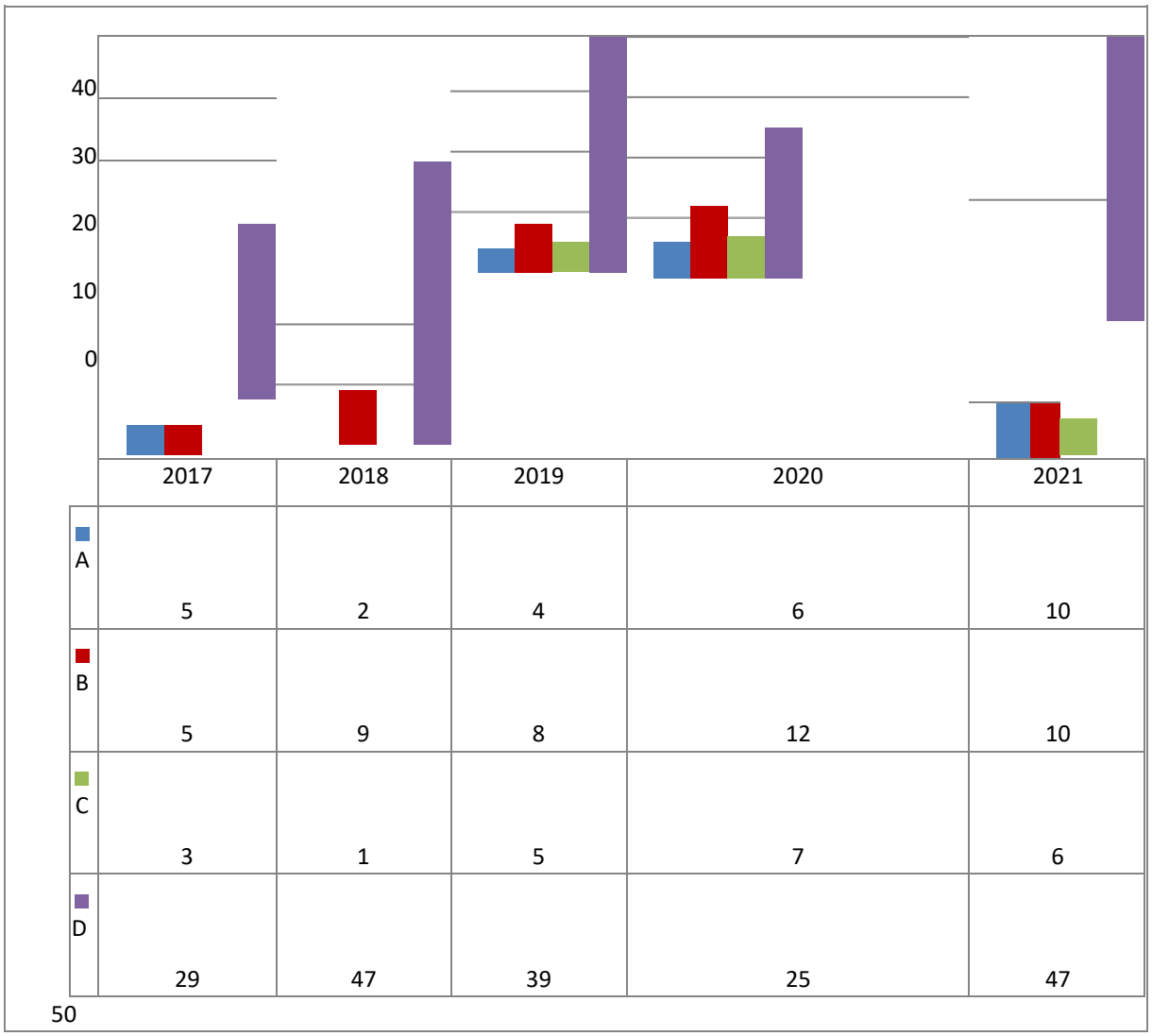


Fig. 9: Number of publications of LF departments by quartiles set by the Journal Citation Reports (JCR) database for the categories ADC, ADD and ADM for the year 2021



The development of publication activity in terms of publication categories A to D by individual departments during 2016-2020 is shown in Figures 10 to 17. A summary overview of the publication activity of all departments for 2021 is given in Figure 18.

Fig. 10: Evaluation of the development of publication activity at KERLH in 2017-2021 from the data Libraries



	2017	2018	2019	2020	2021
A	5	2	4	6	10
B	5	9	8	12	10
C	3	1	5	7	6
D	29	47	39	25	47

Fig. 11: Evaluation of the development of publication activity at the Faculty of Forestry in 2017-2021 from the data Libraries

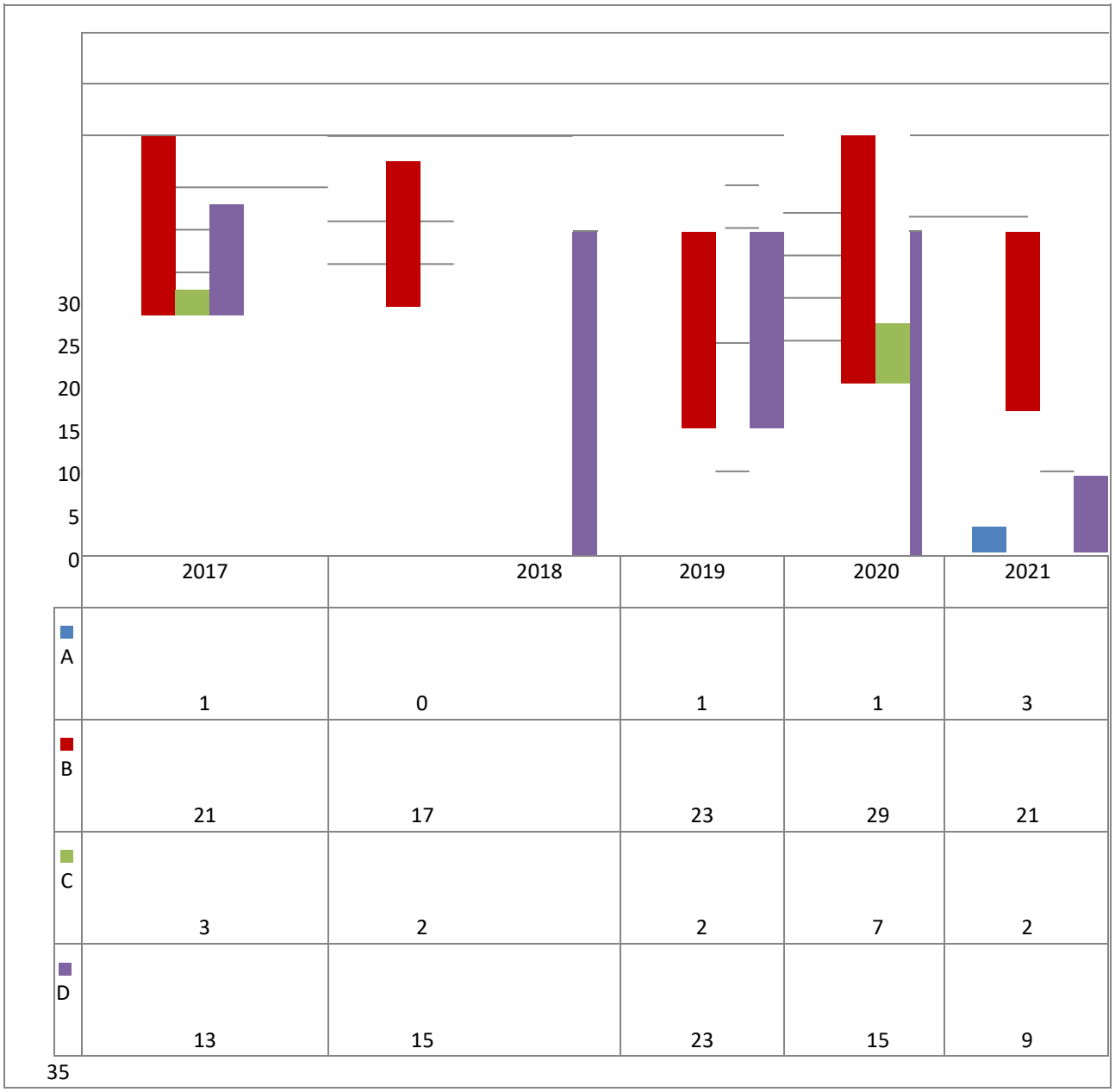
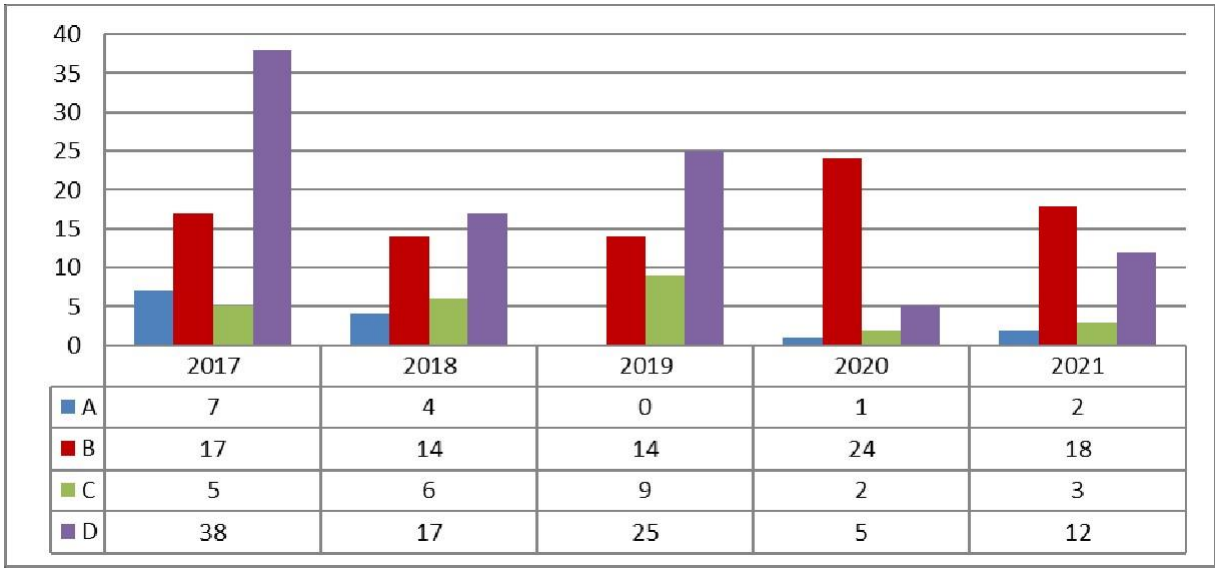
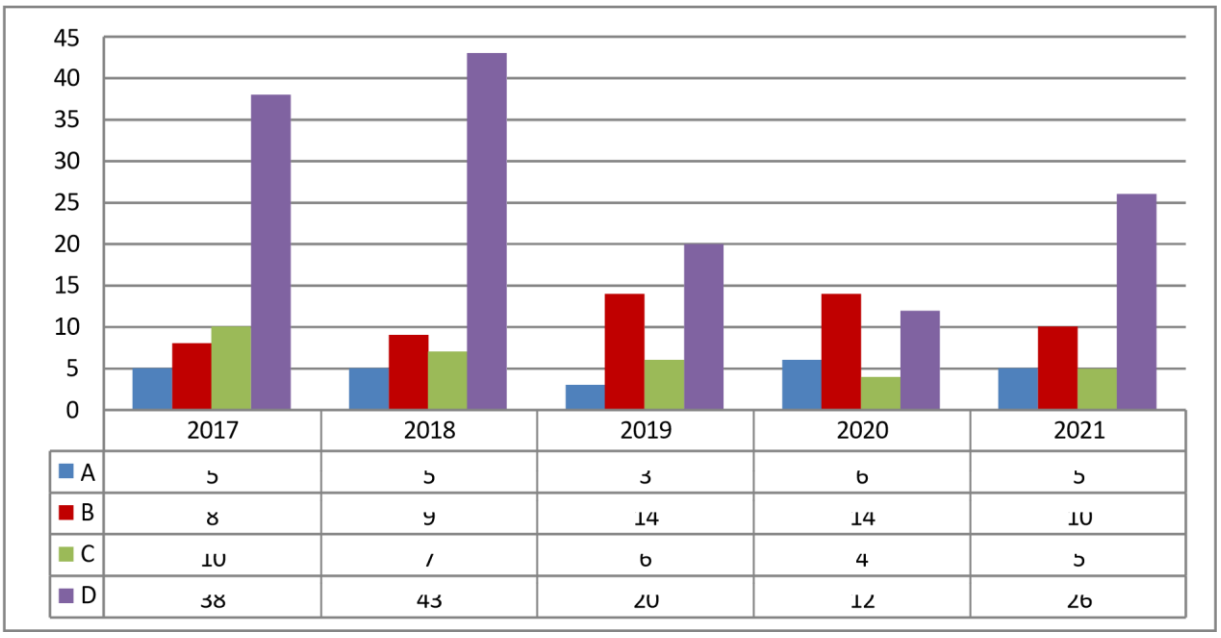


Fig. 12: Evaluation of the development of publishing activity at KPLZI in 2017-2021 from data Libraries



	2017	2018	2019	2020	2021
A	7	4	0	1	2
B	17	14	14	24	18
C	5	6	9	2	3
D	38	17	25	5	12

Fig. 13: Evaluation of the development of publication activity at the KLŤLM in 2017-2021 from the data Libraries



	2017	2018	2019	2020	2021
A	5	5	3	6	5
B	8	9	14	14	10
C	10	7	6	4	5
D	38	43	20	12	26

Fig. 14: Evaluation of the development of publication activity at KPL in 2017-2021 from the data Libraries

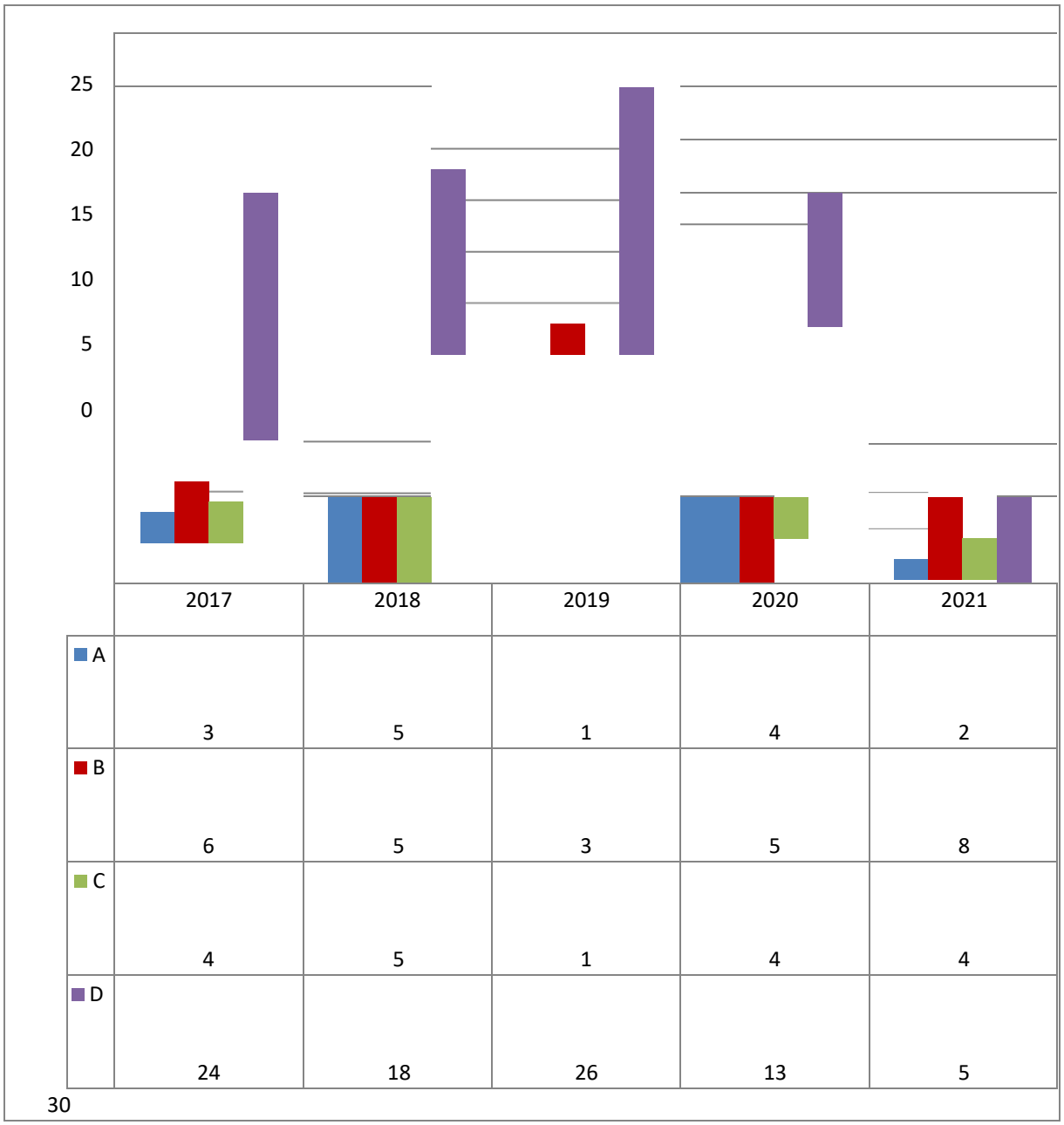
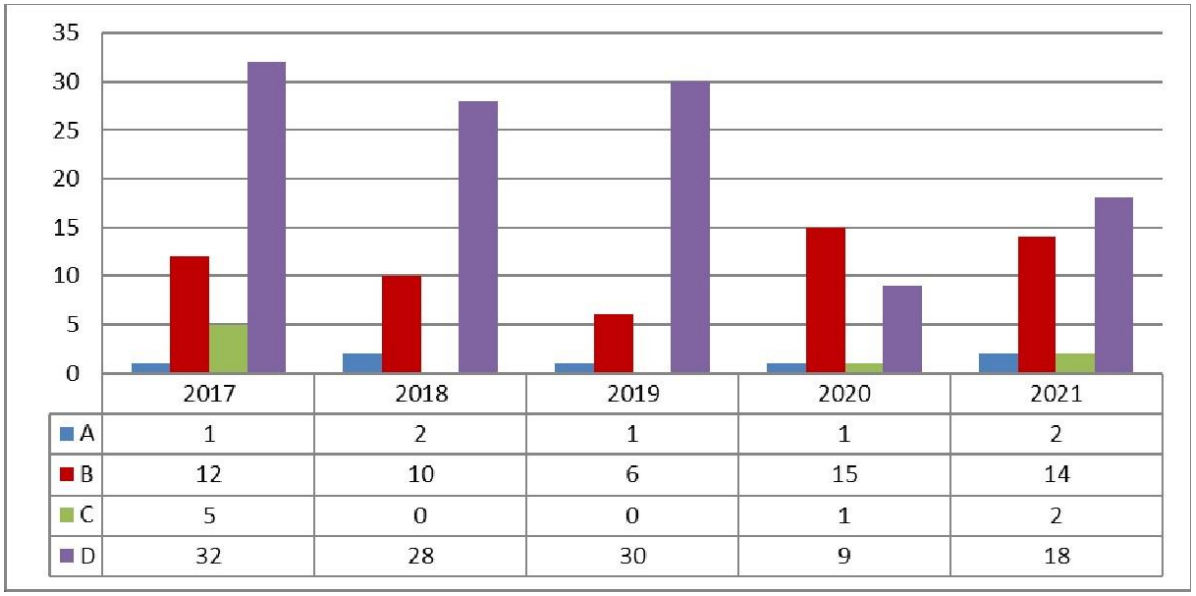


Fig. 15: Assessment of the development of publication activity at KPP in 2017-2021 from the data Libraries



	2017	2018	2019	2020	2021
A	1	2	1	1	2
B	12	10	6	15	14
C	5	0	0	1	2
D	32	28	30	9	18

Fig. 16: Evaluation of the development of publishing activity at KAZMZ in 2017-2021 from data Libraries

	2017	2018	2019	2020	2021
A	4	5	0	4	1
B	3	6	5	4	6
C					

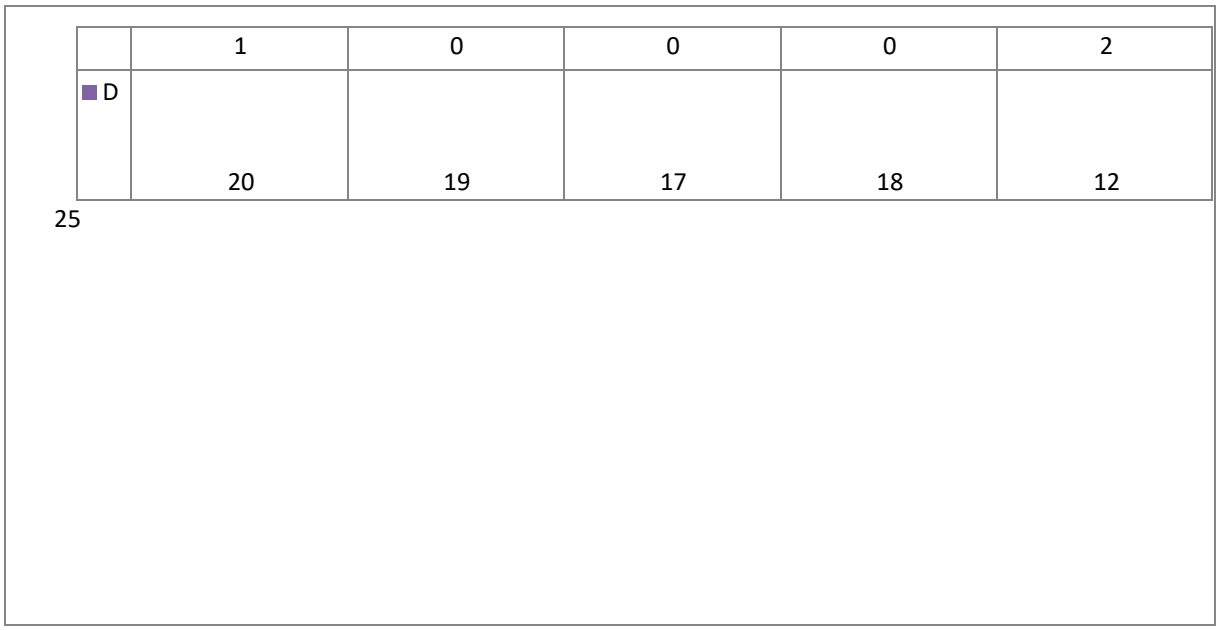


Fig. 17: Evaluation of the development of publication activity at KIOLK in 2017-2021 from the data Libraries

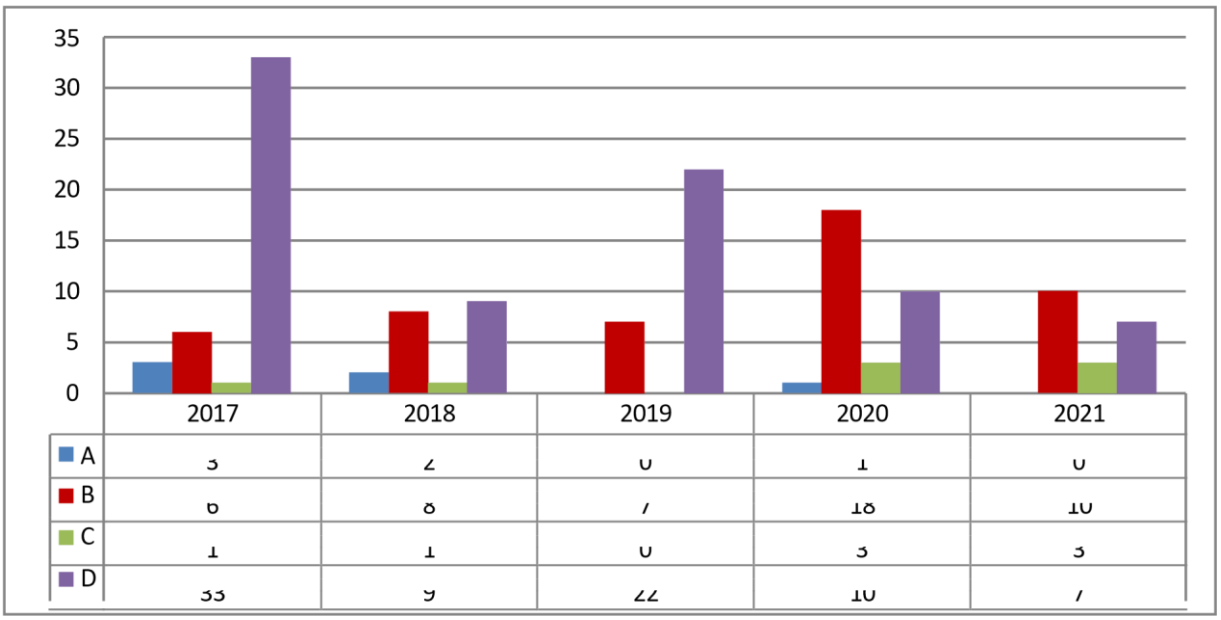
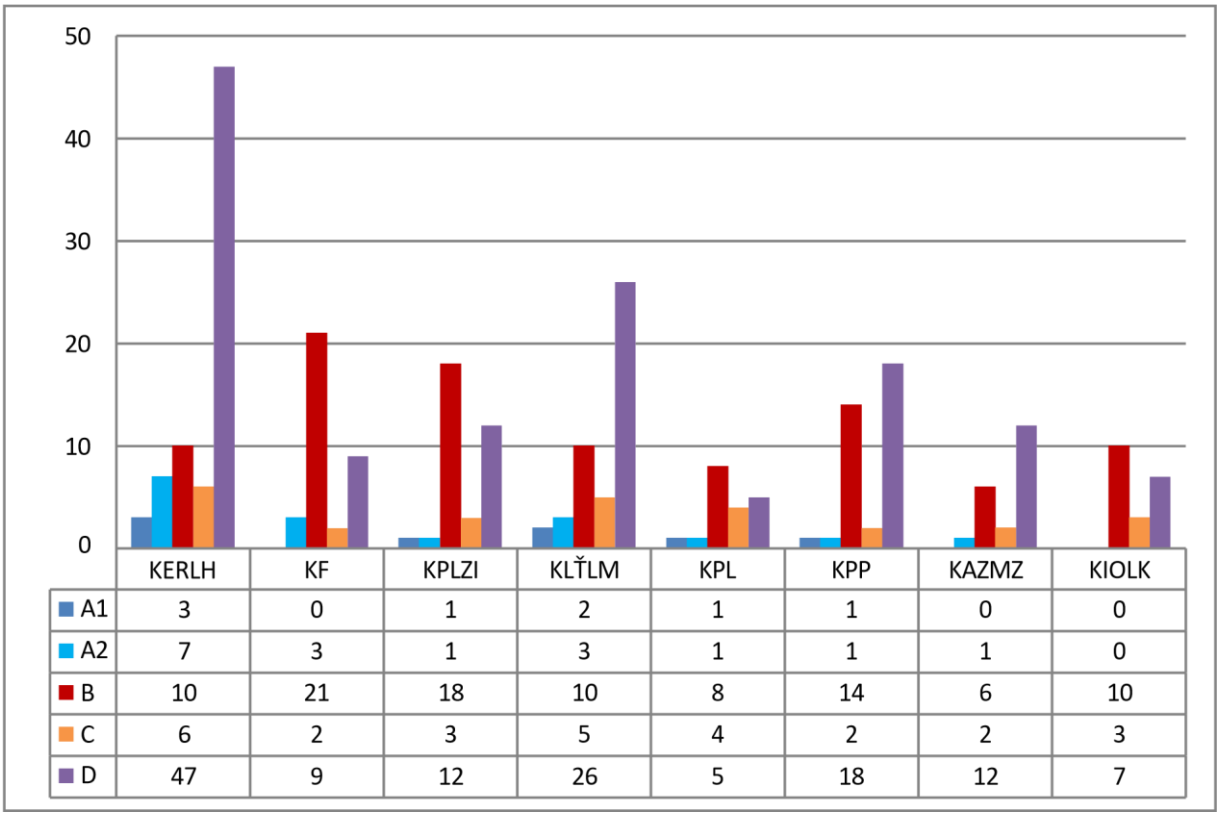
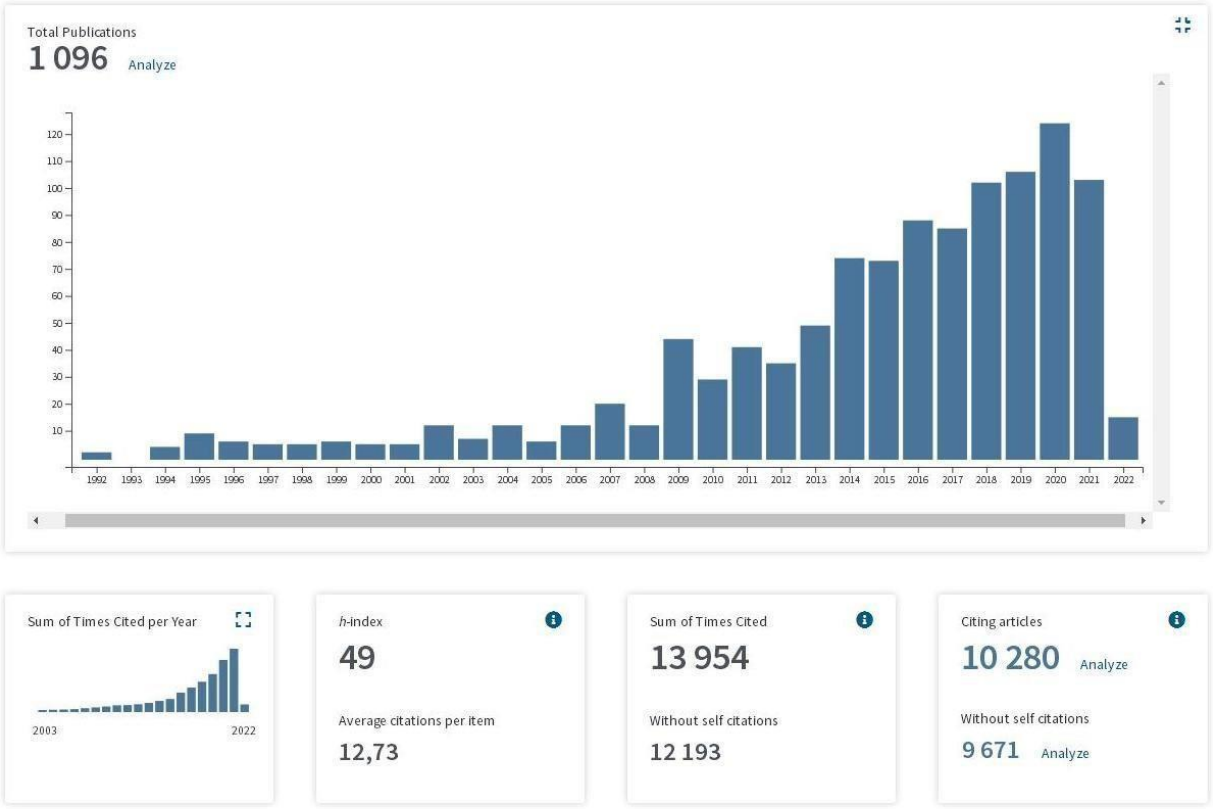


Fig. 18: Comparison of the publication activity of individual LF departments in 2021



	KERLH	KF	KPLZI	KLŤLM	KPL	KPP	KAZMZ	KIOLK
A1	3	0	1	2	1	1	0	0
A2	7	3	1	3	1	1	1	0
B	10	21	18	10	8	14	6	10
C	6	2	3	5	4	2	2	3
D	47	9	12	26	5	18	12	7

Fig. 19: Dynamics of the development of publication outputs and citations of LF staff registered in the Web of Science Core Collection database as of 01.03.2022



As can be seen in Figure 19, the year 2020 was historically exceptional in terms of publication activity and indexing of outputs in the Web of Science Core Collection database. Thus, there must have been a decrease in the number of outputs compared to the record year, while in quantitative terms the level of 2018 was reached. However, it should be noted that the database registers some publication outputs with a considerable delay, so it is possible to expect the registration of even those delayed outputs for 2021, which have not yet appeared in the database on the date of creation of the graphical output (i.e. 01.03.2022).

It is also pleasing to see a further increase in the number of SCI citations in the database compared to previous years. The Hirsch index for the Faculty of Forestry has also increased and reaches a value of 49, whereas in the previous two years it was 42 and 37 respectively.

Table 4 presents an overview of the publication activity of creative staff of individual departments for the years 2020 and 2021 in 4 selected categories, which, in addition to citation response, are among the most important in terms of scientometric potential of our faculty staff to obtain scientific projects or to guarantee study programmes for the accreditation process. These are the number of carentered articles (codenames ADC and ADD), the number of patent applications, utility model applications and design applications (codename AGJ), the number of scientific papers in journals registered in the Web of Science or Scopus databases (codenames ADM and ADN) and the number of scientific monographs (codenames AAA, AAB, ABA, ABB, ABC and ABD). In addition to the number of papers, the table also shows the cumulative percentage of the author's contribution to the papers. The results in these 4

selected key categories indicate a fairly significant disparity in the publication activity of creative workers within departments as well as between departments.

Table 4: Overview of the publication activity of LF staff in 2020 and 2021 in selected categories

Department	Number of CC papers[1] and % author share 2021	Number of CC papers[1] and % author share 2020	Number of patents and designs[2] and % author's share 2021	Number of patents and designs[2] and % share by the author 2020	Number of WOS and SCOPUS papers[3] and % author share 2021	Number of WOS and SCOPUS papers[3] and % author share 2020	Number of scientific monographs[4] and % author's share 2021	Number of scientific monographs[4] and % author share 2020
KERLH								
Šálka Jaroslav prof. Dr. Ing.	1 (0,25)	4 (0,35)			3 (0,80)	1 (0,07)	1 (0,10)	1 (0,25)
Šulek Rastislav doc. Ing. Mgr. PhD.					1 (0,70)			
Báliková Klára Ing. PhD.	2 (0,44)				2 (0,60)		1 (0,60)	
Brodrechtová Yvonne Dr. Ing.	1 (0,04)	1 (0,04)				1 (0,10)	1 (1,00)	
Giertliová Blanka Ing. PhD.	1 (0,08)	2 (0,19)			1 (0,10)	1 (0,30)		
Halaj Daniel doc. Ing. PhD.								
Trenčiansky Marek Ing. PhD.	2 (0,55)	1 (0,30)						
Hajdúchová Iveta prof. Ing. PhD.	3 (0,69)	1 (0,15)				2 (0,40)		
Holécy Ján prof. Ing. CSc.					1 (0,15)	1 (0,10)		
Dobšinská Zuzana JUDr. PhD.		4 (0,73)			2 (0,60)		1 (0,05)	
Navrátilová Lenka Ing. PhD.					1 (0,50)			
Štěrbová Martina Ing. PhD.	2 (0,76)	2 (0,55)				1 (0,33)	1 (0,05)	1 (0,25)
Výbošťok Jozef Ing. PhD.	3 (0,84)	4 (0,56)			1 (0,30)	2 (0,55)	2 (0,06)	
KF								

Ďurkovič Jaroslav prof. Dr. Mgr.	4 (0,50)	3 (0,61)						
Ujházy Karol prof. Ing. PhD.	4 (0,44)	3 (0,26)			1 (0,30)			
Gömöry Dušan prof. Ing. DrSc.	2 (0,65)	7 (1,61)			1 (0,25)	3 (0,95)		
Klinga Peter Ing. PhD.		2 (0,75)						
Krajmerová Diana Ing. PhD.	2 (0,25)					2 (0,30)		
Máliš František doc. Ing. PhD.	7 (1,17)	11 (0,42)				1 (0,03)		
Kochjarová Judita doc. RNDr. CSc.	2 (0,25)	2 (0,09)						

Kováč Ján Mgr. PhD.	3 (0,50)							
Hrivnák Matúš Ing. PhD.	1 (0,15)	1 (0,40)				4 (0,45)		
Širka Pavel Mgr. PhD.	1 (0,25)	2 (0,32)				1 (0,10)		

Department	Number of CC papers[1] and % author share 2021	Number of CC papers[1] and % author share 2020	Number of patents and designs[2] and % author's share 2021	Number of patents and designs[2] and % share of the author 2020	Number of WOS and SCOPUS papers[3] and % author share 2021	Number of WOS and SCOPUS papers[3] and % author share 2020	Number of scientific monographs[4] and % author's share 2021	Number of scientific monographs[4] and % author share 2020
KPLZI								
Fabrika Marek prof. Ing. PhD.		1 (0,02)						
Chudý František doc. Ing. CSc.	1 (0,05)	1 (0,10)				1 (0,20)		

Kardoš Miroslav doc. Ing. Bc. PhD.	1 (0,05)						1 (0,03)	
Bahýľ Ján Ing. PhD.		2 (0,04)					1 (0,03)	
Bošeľa Michal Ing. PhD.	9 (1,59)	7 (0,76)				1 (0,10)		
Root Milan Mgr. PhD.	2 (0,75)	3 (0,70)						
Sedmák Róbert doc. Ing. PhD.	3 (0,38)	7 (1,54)			1 (0,15)			
Sitko Roman Ing. PhD.	4 (0,21)	2 (0,06)					1 (0,09)	
Tomaštík Julián Ing. PhD.	3 (1,55)	2 (0,12)					1 (0,03)	
Scheer Ľubomír prof. Ing. CSc.								
Tuček Ján prof. Ing. CSc.		3 (0,11)						
Valent Peter Ing. PhD.		1 (0,03)			1 (0,05)		1 (0,06)	

Čerňava Juraj Ing. PhD.						1 (0,45)		
Korená Hillayová Michaela Ing. PhD.		2 (0,15)			1 (0,35)	1 (0,50)		
Depart ment	**Number of CC works[1] and %**	**Number of CC works[1] and %**	**Number of Patents**	**Number of Patents**	**Number of WOS and SCOPUS papers[3]**	**Number of WOS and SCOPUS papers[3]**	**Number of Scientific**	**Number of Scientific**
	autho r's share 2021	**autho r's share 2020**	**and designs[2] and % author share 2021**	**and designs[2] and % author share 2020**	**a % author's share 2021**	**a % author's share 2020**	**monographs[4] and % author's share 2021**	**monograph s[4] and % author share 2020**
KLŤLM								
Štollmann Vladimír doc. Ing. CSc. PhD.				2 (1,25)	2 (0,53)	1 (0,25)		

Ferenčík Michal Ing. PhD.							1 (0,03)	
Gejdoš Miloš doc. Ing. PhD.	4 (2,18)	3 (0,94)						1 (0,60)
Juško Vladimír Ing. PhD.		1 (0,03)					1 (0,01)	
Lieskovský Martin doc. Ing. PhD.	3 (0,68)	1 (0,08)						3 (0,95)
Jakubis Matúš prof. Ing. PhD.					1 (0,70)	1 (0,80)	1 (0,01)	2 (0,90)
Messingerová Valéria prof. Ing. CSc.		1 (0,10)			1 (0,50)	1 (0,40)		
Merganič Ján doc. Ing. PhD.	2 (0,63)	5 (0,72)			1 (0,05)	1 (0,05)	1 (0,30)	
Allman Michal Ing. PhD.	1 (0,70)	1 (0,35)			1 (0,05)		1 (0,03)	
Dudáková Zuzana Ing. PhD.	1 (0,20)	1 (0,50)			1 (0,50)		1 (0,12)	
Vlčková Mária Ing. PhD.					1 (0,20)		2 (0,51)	
Mokroš Martin Ing. PhD.	2 (0,45)	2 (0,12)				1 (0,40)	1 (0,06)	
Chudá Juliána Ing. PhD.	2 (0,15)							
KIOLK								

Fleischer Peter doc. Ing. PhD.	3 (0,15)	6 (0,95)				1 (0,05)		
Kodrík Milan doc. Ing. CSc.								
Hlaváč Pavol Ing. PhD.								
Pavlík Martin doc. Ing. PhD.	1 (0,27)	2 (0,80)			1 (0,20)			
Kmet'a Jaroslav prof. Ing. PhD.		2 (0,13)			2 (0,25)	1 (0,05)		
Kurjak Daniel doc. Ing. PhD.	3 (0,39)	8 (0,98)				1 (0,05)		
Fleischer Peter Ing. PhD.	3 (0,36)	7 (1,30)				1 (0,15)		
Kubov Martin Ing. et Ing. PhD.		2 (0,50)						
Konôpková Alena Mgr. PhD.		5 (0,90)				3 (0,60)		
Dzurenko Marek Ing. PhD.	2 (0,55)	3 (0,45)						
Mezei Pavel Ing. PhD.	2 (0,17)	1 (0,25)						

Department	Number of CC papers[1] and % author share 2021	Number of CC papers[1] and % author share 2020	Number of patents and designs[2] and % share by the author 2021	Number of Patents and designs[2] and % author's share 2020	Number of WOS and SCOPUS papers[3] and % author's share 2021	Number of WOS and SCOPUS papers[3] and % author's share 2020	Number of scientific monographs[4] and % share by the author 2021	Number of scientific monographs[4] and % author share 2020
KAZMZ								
Kropil Rudolf Dr. h. c.. prof. Ing. PhD.	2 (0,25)	1 (0,10)						
Rajský Dušan doc. MVDr. PhD.	1 (0,10)				2 (0,18)			
Bútora Ľubomír Ing. PhD.								
Lešo Peter doc. Ing. PhD.								1 (0,10)
Stanovský Miroslav Ing. CSc.								
Garaj Peter prof. Ing. CSc.								
Korňan Martin RNDr. PhD.		1 (1,00)						
Kubala Jakub Mgr. PhD.	1 (0,12)	2 (0,45)						
Pataky Tibor Ing. CSc.		1 (0,07)						
Smolko Peter Ing. PhD.	4 (1,52)	2 (0,25)						
Veselovská Alexandra Ing. PhD.	1 (0,45)							
KPL								
Jaloviar Peter doc. Ing. PhD.	1 (0,09)	2 (0,32)			2 (0,70)	2 (0,40)	1 (0,20)	
Kucbel Stanislav doc. Ing. PhD.	1 (0,09)	2 (0,33)			2 (0,25)	2 (0,40)	1 (0,30)	
Lukáčik Ivan doc. Ing. CSc.	4 (0,23)				1 (0,07)			1 (0,10)

Repáč Ivan doc. Ing. PhD.	1 (0,60)					2 (1,00)		
Vencurik Jaroslav doc. Ing. PhD.	1 (0,09)	2 (0,35)			2 (0,30)	2 (0,20)		1 (0,15)
Saniga Milan prof. Ing. DrSc.		3 (0,36)			3 (0,47)	1 (0,25)	1 (0,50)	1 (0,50)
Parobeková Zuzana Ing. PhD.		1 (0,05)			2 (0,77)	1 (0,10)		
Pittner Ján Ing. PhD.		4 (0,25)			2 (0,20)	2 (0,35)		1 (0,35)
Sedmáková Denisa Ing. PhD.	3 (0,38)	4 (0,98)			3 (0,65)	2 (0,40)		
Department	**Number of CC papers[1] and % author share 2021**	**Number of CC papers[1] and % author share 2020**	**Number of patents and designs[2] and % author's share 2021**	**Number of patents and designs[2] and % share by the author 2020**	**Number of WOS and SCOPUS papers[3] and % author share 2021**	**Number of WOS and SCOPUS papers[3] and % author share 2020**	**Number of scientific monographs [4] and % author's share 2021**	**Number of scientific monographs[4] and % author share 2020**
KPP								
Gömöryová Erika doc. Ing. CSc.	6 (0,86)	4 (1,15)				1 (0,09)		
Střelcová Katarína doc. Ing. PhD.	4 (0,25)	3 (0,25)						
Vido Jaroslav doc. Ing. PhD.	1 (0,50)	3 (1,00)			1 (0,02)		1 (0,70)	1 (0,45)

[1] Scientific papers in peer-reviewed scientific journals (code ADC, ADD)
[2] Copyright certificates, patents, utility models, discoveries (code designation AGJ)
[3] Scientific papers that are not peer-reviewed but are registered in WoS or Scopus databases (code designation ADM, ADN)
[4] Book publications in the character of scientific monographs (code AAA, AAB, ABA, ABB, ABC, ABD)

Pichler Viliam prof. h. c. prof. Dr. Ing.	3 (0,54)	2 (0,35)						
Škvarenina Jaroslav prof. Ing. CSc.	3 (0,37)	6 (0,80)						
Homolák Marián Ing. PhD.	2 (0,25)	1 (0,50)						
Leštianska Adriana Ing. PhD.		2 (0,60)						
Nalevanková Paulína Ing. PhD.	1 (0,50)	2 (1,10)						

As of 15.01.2022, the h-index values of the LF creative staff were updated as they were listed in the Web of Science Core Collection database. The results of the h-index values (Table 5) show the existing significant disproportions not only between departments but also within departments. While it is pleasing to see an increase in the h-index value with a significant number of creative faculty members compared to previous years, increasing the h-index value by way of international acclaim (rather than intra-university acclaim) remains one of the key tasks of the LF Long-Term Plan 20172023. As well as differences in the h-index, differences in the number of citations recorded in the Web of Science Core Collection database for 2021 reflect differences not only between staff within departments, but also between departments (Table 5).

Tab. 5: Comparison of the Hirsch index and the number of citations of LF staff in the Web of Science Core database
Collection (as of 15.01.2022) for the years 2020 and 2021

Depart ment	H-index 2021 (WOS Core Collection)	H-index 2020 (WOS Core Collection)	Citations 2021 (WOS Core Collection)	Citations 2020 (WOS Core Collection)
KERLH				
Šálka Jaroslav prof. Dr. Ing.	10	9	38	43
Šulek Rastislav doc. Ing. Mgr. PhD.	3	3	15	15
Báliková Klára Ing. PhD.	2	-	7	-
Brodrechtová Yvonne Dr. Ing.	6	4	22	16
Giertliová Blanka Ing. PhD.	4	3	14	9
Halaj Daniel doc. Ing. PhD.	3	3	4	8
Trenčiansky Marek Ing. PhD.	3	2	10	5
Hajdúchová Iveta prof. Ing. PhD.	7	5	23	13
Holécy Ján prof. Ing. CSc.	2	2	11	9
Dobšinská Zuzana JUDr. Mgr. PhD.	12	10	65	51
Štěrbová Martina, Ing. PhD.	4	3	11	14
Výbošťok Jozef Ing. PhD.	4	2	16	18
Navrátilová Lenka Ing. PhD.	1	-	0	-
KF				
Ďurkovič Jaroslav prof. Dr. Mgr.	12	11	69	48
Ujházy Karol prof. Ing. PhD.	13	12	83	50
Gömöry Dušan prof. Ing. DrSc.	24	23	228	217
Klinga Peter Ing. PhD.	3	3	8	4
Krajmerová Diana Ing. PhD.	9	8	40	46
Máliš František doc. Ing. PhD.	17	13	168	120
Kochjarová Judita doc. RNDr. CSc.	10	9	32	22
Hrivnák Matúš Ing. PhD.	4	4	23	17
Širka Pavel Mgr. PhD.	3	2	5	2
Kováč Ján Mgr. PhD.	4	3	22	20
KPLZI				
Fabrika Marek prof. Ing. PhD.	11	9	340	275
Chudý František doc. Ing. CSc.	6	6	42	39

Kardoš Miroslav doc. Ing. Bc. PhD.	5	4	16	18
Bahýľ Ján Ing. PhD.	4	2	6	4
Bošeľa Michal Ing. PhD.	16	13	91	87
Root Milan doc. Mgr. PhD.	8	7	52	43
Sedmák Róbert doc. Ing. PhD.	12	10	85	63
Sitko Roman Ing. PhD.	6	5	27	10
Tomaštík Julián Ing. PhD.	9	7	97	86
Scheer Ľubomír prof. Ing. CSc.	4	4	9	5

Tuček Ján prof. Ing. CSc.	8	6	42	41
Valent Peter Ing. PhD.	5	4	37	38
Čerňava Juraj Ing. PhD.	3	3	23	25
Korená Hillayová Michaela Ing. PhD.	1	1	2	1
KLŤLM				
Štollmann Vladimír doc. Ing. CSc. PhD.	3	2	9	2
Ferenčík Michal Ing. PhD.	5	5	21	17
Gejdoš Miloš doc. Ing. PhD.	9	7	56	57
Juško Vladimír Ing. PhD.	1	0	1	0
Lieskovský Martin doc. Ing. PhD.	5	4	23	21
Jakubis Matúš prof. Ing. PhD.	3	3	1	0
Messingerová Valéria prof. Ing. CSc.	5	4	19	18
Merganič Ján doc. Ing. PhD.	12	11	153	108
Allman Michal Ing. PhD.	5	4	20	13
Dudáková Zuzana Ing. PhD.	5	3	18	11
Vlčková Mária Ing. PhD.	4	3	8	6
Mokroš Martin Ing. PhD.	11	9	165	120
Chudá Juliána Ing. PhD.	3	-	11	-
KIOLK				
Fleischer Peter doc. Ing. PhD.	9	8	56	77
Kodrík Milan doc. Ing. CSc.	4	4	2	5
Hlaváč Pavol Ing. PhD.	3	3	6	11
Pavlík Martin doc. Ing. PhD.	2	1	6	4
Kmeťa Jaroslav prof. Ing. PhD.	8	6	36	20
Kurjak Daniel doc. Ing. PhD.	9	8	68	37

Fleischer Peter Ing. PhD.	4	4	26	15
Kubov Martin Ing. et Ing. PhD.	2	1	4	3
Konôpková Alena Mgr. PhD.	4	3	23	6
Dzurenko Marek Ing. PhD.	3	2	9	4
Mezei Pavel Ing. PhD.	8	5	46	23
KAZMZ				
Kropil Rudolf Dr. h. c. prof. Ing. PhD.	9	7	30	28
Rajský Dušan doc. MVDr. PhD.	9	9	35	27
Bútora Ľubomír Ing. PhD.	1	0	1	0
Lešo Peter doc. Ing. PhD.	3	2	11	3
Garaj Peter prof. Ing. CSc.	3	3	9	9
Korňan Martin RNDr. PhD.	7	7	14	14
Kubala Jakub Mgr. PhD.	3	2	110	96
Pataky Tibor Ing. CSc.	1	1	1	2
Smolko Peter Ing. PhD.	5	4	14	16
Veselovská Alexandra Ing. PhD.	2	2	5	5

Depart ment	H-index 2021 (WOS All Databases)	H-index 2020 (WOS Core Collection)	Number of SCI citations 2021	Number of SCI citations 2020
KPL				
Jaloviar Peter doc. Ing. PhD.	9	8	62	42
Kucbel Stanislav doc. Ing. PhD.	11	9	85	60
Lukáčik Ivan doc. Ing. CSc.	5	4	10	10
Repáč Ivan doc. Ing. PhD.	4	4	8	9
Vencurik Jaroslav doc. Ing. PhD.	6	5	43	26
Saniga Milan prof. Ing. DrSc.	11	10	96	67
Parobeková Zuzana Ing. PhD.	2	2	16	7
Pittner Ján Ing. PhD.	5	5	36	14
Sedmáková Denisa Ing. PhD.	7	5	48	17
KPP				
Gömöryová Erika doc. Ing. CSc.	11	10	60	45
Střelcová Katarína doc. Ing. PhD.	13	13	65	51
Vido Jaroslav doc. Ing. PhD.	9	7	40	42
Pichler Viliam prof. h. c. prof. Dr. Ing.	12	11	51	42

Škvarenina Jaroslav prof. Ing. CSc.	17	15	111	103
Homolák Marián Ing. PhD.	7	6	20	23
Leštianska Adriana Ing. PhD.	4	3	9	5
Nalevanková Paulína Ing. PhD.	4	4	17	14

3. Editorial activity

Tables 6 and 7 show the evaluation of the editorial activity at the Faculty of Forestry for the year 2021. The process of developing the editorial plan very often encounters non-compliance with the Principles of Editorial Activity. In 2021, the fulfilment of the plan reached 50 %. The editorial activity is carried out on the basis of the Organisational Directive No. 3/2015 for the Editorial Activity Principles with effect from 1.7.2015.

In connection with the publication of the periodical Acta Facultatis Forestalis, it is necessary to mention the problems of previous years with the filling of the two obligatory issues with articles and thus with its periodicity. Of course, this is also related to the evaluation of the category of these outputs on the basis of the endowment (ADF category). As a result of the situation, we have come to a solution where the special issue of Acta Facultatis Forestalis with selected papers from the SVOČ becomes a regular issue supplemented by several contributions from the creative staff of the faculty.

Table 6: Evaluation of editorial activities at the Faculty of Forestry in 2021

Type of publication	Planned number	Number submitted	Implementation (%)
Textbooks	3	1	33,33%
Scripts	9	3	33,33%
Handbooks			
Scientific monographs	7	4	57,14%
Professional book publications		1	
Proceedings of the approved GTC	2		
Proceedings of scientific works	2	2	100%
Other special-purpose publications	1	1	100%
Total	**24**	**12**	**50%**

Table 7: Evaluation of editorial activities by departments at the Faculty of Forestry in 2021

Department	Status	Textbooks	Scripts	Handbooks	Monographs	Dept. of Books. public.	Proceedings, special publications.	Total
KERLH	planned	1	2		2		2	7
	uploaded by	1	0		2		0	3
	implementation (%)	100	0		100		0	42,86
KF	planned		3					3
	uploaded by		1					1
	implementation (%)		33,33					33,33
	planned	1			1			2

KPLZI	uploaded by	0			0			0
	implementation (%)	0			0			0
KLŤLM	planned		1		1	0		2
	uploaded by		1		1	1		3
	implementation (%)		100		100	0		150
KIOLK	planned	1	1		1			3
	uploaded by	0	0		0			0
	implementation (%)	0	0		0			0
KAZMZ	planned							
	uploaded by							
	implementation (%)							
KPL	planned		1		1			2
	uploaded by		1		1			2
	implementation (%)		100		100			100
KPP	planned		1		1			2
	uploaded by		0		0			0
	implementation (%)		0		0			0
LF	planned						3	3
	uploaded by						3	3
	implementation (%)						100	100

4. Organisation of scientific and professional events

Conferences, symposia, seminars and workshops are among the most important forms of publication and confrontation of scientific knowledge. Unfortunately, in the past year 2021, due to the pandemic caused by the coronavirus, few scientific events were scheduled, of which 1 event and 1 conference were held online at the EKOMA Sports Center (Table 8). However, with the current unflattering epidemiological situation, 2022 cannot be expected to be any more conducive to holding scientific and professional events outside of the online environment.

Table 8: Scientific and professional events organised in 2021

Name of the event	Venue	Deadline proceedings	Type of event	Number of participants home/abroad	Event sponsor
Meeting of economically oriented foresters and woodworking departments from the Czech Republic and Slovakia	Zvolen	23.09.-24.09.2021	Conference	51/13	Prof. Dr. Ing. Jaroslav Šálka
Funding 2021 Forests - Timber	Zvolen	25.11.2021	online conference with interzin. By visiting	85/17	prof. Ing. I. Hajdúchová, PhD.

5. Doctoral studies

III. Doctoral studies, student scientific and professional activities

1. Doctoral studies

Doctoral studies (PhD) at the Faculty of Forestry, TU in Zvolen are carried out in full-time form for 3 years and in external form for 4 years. It is organized in accordance with the Act on Higher Education No. 131/2002 Coll. as amended, internal guidelines and study regulations in 7 doctoral study programmes accredited in 2015. At the end of 2017, a new study programme Forest Ecology was accredited in the field of study Forest Protection.

The admission procedure for doctoral studies was held well in advance. The study programmes, conditions and admission procedure were published. The admission procedure consisted of an assessment of the applicant's level of knowledge of foreign languages and a verbal interview with the applicant, at which the applicant's theoretical and methodological knowledge related to the topic was examined. The proposal and the conditions for the admission procedure were approved by the Academic Senate of the Faculty of Forestry. Out of 14 applicants, 8 students were admitted to the full-time form of study, no applicant was admitted to the part-time form of study.

In 2021, the following students successfully completed their doctoral studies in the field of forestry (Table 9):

Ing. Pavel Ďurica defended his dissertation thesis in the study programme Forest Cultivation and Protection on the topic: dynamics of structure and disturbance regime of spruce natural forest in NPR Zadná Poľana and NPR Babia hora, supervisor doc. Jaloviar

Ing. Juliána Chudá
defended her doctoral thesis in the study programme forest management on the topic: transmission defining the position under the forest cover, supervisor prof. Tuček

Ing. Martina Krahulcová defended her dissertation thesis in the study programme ecosystem services of forests on the topic: evaluation of forest certification as a tool to support ecosystem services in Slovakia, supervisor doc. Paluš

Ing. Andrej Kvas
defended his dissertation thesis in the study programme Forest Ecology on the topic Analysis of the influence of climatic extremes on the quality of the habitats of the field hare in the planar and colline type of landscape, supervisor doc. Vido

Ing. Christian Mikler
defended his doctoral thesis in the study programme of forest management on the topic: performance of forest management in Slovakia in the context of globalisation, supervisor prof. Hajdúchová

Ing. Lenka Navrátilová defended her dissertation thesis in the study programme forest ecosystem services on the topic: perception and acceptance of the concept of bioeconomy and forest ecosystem services in Slovakia, supervisor prof. Šálka

Mag. biol Anja Petek Petrík defended her dissertation thesis in the study programme of forest phytology on the topic The morphological and physiological stomatal response of tree species under drought stress, supervisor doc. Kurjak

Ing. Peter Petrík defended his dissertation thesis in the study programme Forest Phytology on the topic: Variability sources of photosynthetic related traits of European coniferous tree species under changing environmental conditions, supervisor doc. Kurjak

Ing. Matej Priatka defended his dissertation thesis in the study programme forestry technologies on the topic: technological deployment of forest technology adapters for forest fire fighting, supervisor prof. Prof. Messingerová

Ing. Jozef Rozkošný defended his dissertation thesis in the study programme Forest Ecology on the influence of biotic factors on the current state of oak stands in Považský Inovec, supervisor doc. Professor Fleischer

Table 9 gives an overview of the number of PhD students by study programme and year. The number of doctoral candidates who have completed their studies without submitting their dissertation has fallen significantly because the exclusion from studies is consistently applied on the basis of the relevant legislation and proposals from supervisors.

Tab. 9.
and forms of study at the Faculty of Forestry in 2021 (as of 31.12.2021)

Study programme	Total	of which daily	Number of students					Exceeding the standard length of studies DF/EF
			1. r.	2. r.	3. r.	4. r.	5. r.	
cultivation and protection forests	1	1			1			
economic adjustment forests	4	4		2	2			
forestry phytology	7	6	3	3	1			
applied zoology and hunting	0							
forestry technologies	3	3	2	1				
ecosystem services forests	11	9	4	4	3			
forest ecology	5	4	3		2			
Total	**31**	**27**	**12**	**10**	**9**			

Table 10: Doctoral graduates by field of study as of 2017 (as of 31.12.2021)

Study programme doctoral studies	Number of graduates				
	2017	2018	2019	2020	2021
	ES/HS	ES/HS	ES/HS	ES/HS	ES/HS
forest cultivation and protection	1/1	1/1	1/0	2/0	1/0
forest management		4/0	2/0	2/0	2/0
forestry phytology	5/0	1/1	3/0		2/0
applied zoology and hunting	1/0				
forest ecology					2/0
forestry technologies			1/1	1/0	0/1
forest ecosystem services			2/0	3/0	2/0
S p o l u	**7/1**	**6/2**	**9/1**	**8/0**	**9/1**

Table 10 documents the number of students between 2016 and 2020 who successfully completed their doctoral studies by defending their dissertation. Figure 20 highlights an important indicator in terms of accreditation, namely the number of completed PhD students per associate professor and professor post. This indicator has been unflattering for many years and no extreme increase in the value can be expected in the future. Figure 21 shows the trend in the number of doctoral graduates between 2017 and 2021. Table 10 documents this situation in terms of study programmes.

Fig. 20: Number of completed PhD students per associate professor and professor position (2017-2021)

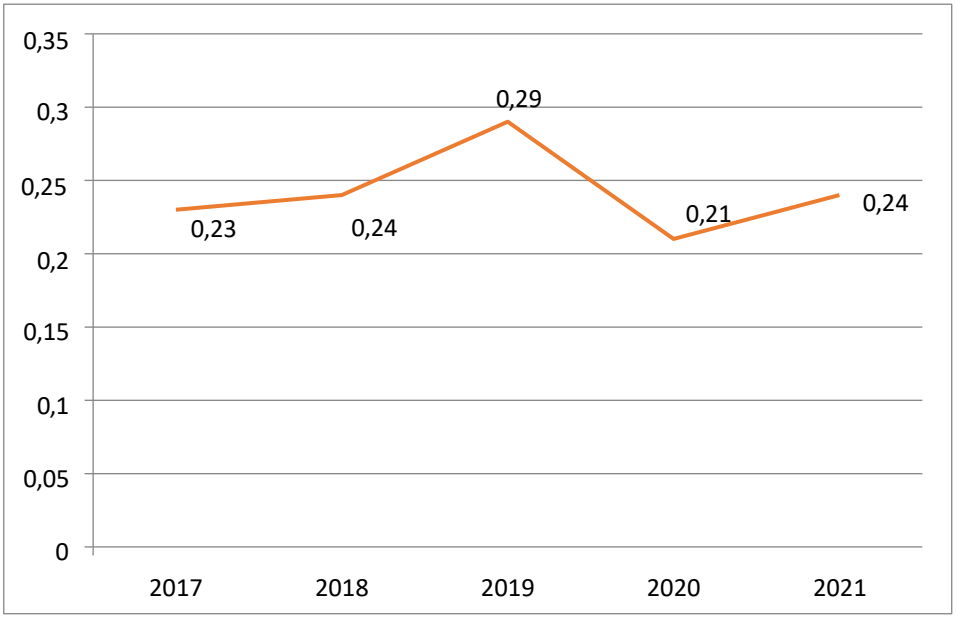


Fig. 21: Number of completed PhD students (2017-2021)

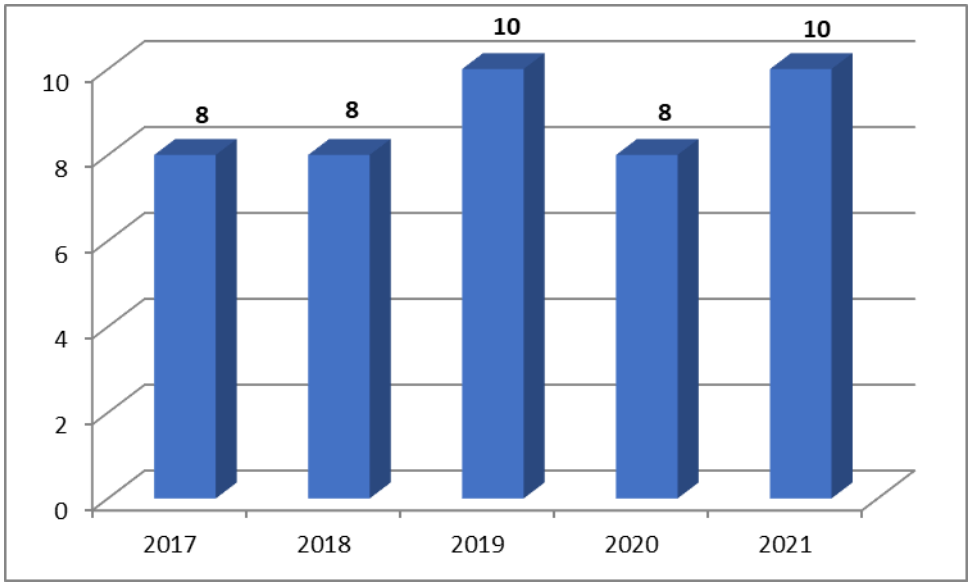


Table 11: Number of successfully completed PhD students in 2017-2021

Doctoral study programme	Number of PhD students	Name of supervisor and number PhD students
forest cultivation and protection	8	doc. Jaloviar - 2 doc. Kodrík - 1 doc. Kucbel - 1 doc. Repáč - 3 prof. Saniga -1
forest management	10	Prof. Fabrika - 1 prof. Hajdúchová - 1 doc. Chudý - 1 doc. Kardoš - 1 doc. Root - 2 doc. Merganič - 1 prof. Tucek - 3
forestry phytology	12	prof. Ďurkovič - 2 prof. Gömöry - 2 doc. Gömöryová - 1 Ing. Hrivnák, PhD. - 1 prof. Kmet - 1 doc. Kurjak - 2 prof. Škvarenina - 1 prof. Ujházy - 2
forest ecology	2	doc. Fleischer - 1 doc. Vido - 1
applied zoology and hunting	1	prof. Kropil - 1
forestry technologies	4	prof. Messinger - 3 doc. Stollmann - 1
forest ecosystem services	7	prof. Holécy - 1 doc. Paluš - 1 prof. Šálka - 2 prof. Škvarenina - 1 doc. Šulek - 1 prof. Tucek - 1

Between 2017 and 2021, 44 PhD students (Tables 10 and 11) have successfully completed their studies, mostly in the full-time form of study. In recent years, the faculty has been more rigorous in assessing the publication activity of doctoral students. Between 2017 and 2021, the following PhD students have been excluded or prematurely

9 PhD students were graduated (Tab.12), while external PhD students predominated. Their number has increased in recent years due to a more consistent application of one of the criteria for comprehensive accreditation. These are outputs of doctoral students mainly in category A (i.e. scientific papers registered in WOS, CC and SCOPUS databases with adequate impact factor). The number of PhD students recruited is also significantly influenced by the change in the Ministry's funding of PhD studies (this is funding from the wage chapter). In view of these facts, the management of the Faculty of Forestry has decided that only those supervisors who are researchers of current scientific projects and have recently published in impacted journals together with doctoral students are allowed to write topics for doctoral studies.

Table 12: Number of PhD students proposed by their supervisor at the Faculty of Forestry in 2017-2021 expelled from doctoral studies or dropped out at their own request

Doctoral study programme	Number of PhD students	Name of supervisor and number PhD students
Before taking the dissertation examination		
forest cultivation and protection	**1**	**doc. Repac - 1**
forestry phytology	**2**	**prof. Škvarenina - 1** **prof. Ujházy - 1**
forest ecology	**1**	**Ing. Barna - 1**
applied zoology and hunting	**1**	**prof. Garaj - 1**
forest ecosystem services	**2**	**doc. Fleischer - 1** **prof. Škvarenina - 1**
After passing the dissertation examination		
forestry phytology	**1**	**prof. Škvarenina - 1**
applied zoology and hunting	**1**	**prof. Šálka - 1**

In the past, the Achilles heel of doctoral studies at the Faculty of Forestry has been the quality of our doctoral students' outputs for the purposes of doctoral accreditation. After incorporating the requirement of acceptance of scientific publications for print in scientific journals of the CC or WOS or SCOPUS databases with an adequate impact factor, or an accepted industrial property right application, into Article 31 of the Study Regulations for Doctoral Studies at the Faculty of Forestry, the situation has changed for the better. In AR 2020/2021, 10 PhD students defended their dissertations, eight of whom have at least one category A output as of 01.03.2022 in terms of the criteria from the last accreditation (CC database, with the lowest achieved IF of 2.512, or a utility model application at the Industrial Property Office of the Slovak Republic). According to the departments, the representation of completed PhD students with category A outputs is as follows: KPLZI - 1, KERLH - 2, KPP - 1, KIOLK - 3, KLŤLM - 1. In terms of the evaluation of doctoral studies according to the rules from the last comprehensive accreditation, the result from AR 2020/2021 would correspond to a final grade A (Table 13).

In the case of the evaluation of the 8 PhD students who are currently post-dissertation (i.e. not yet graduates), one of them has two accepted category A outputs as of 01.03.2022 in peerreviewed journals (Table 14) and two have category B outputs in journals registered in the WOS database. The preliminary assessment of the PhD students' outputs after the dissertation examination is unflattering and corresponds to a grade of C-, which is entirely due to the

pandemic situation. From the point of view of the quality of outputs, we consider it a priority to have constant communication between doctoral students and their supervisors or faculty management so that at the time of the dissertation defence an article accepted by the editorial board for publication in a journal registered in the CC or WOS or SCOPUS database with an adequate IF is available, as required by the approved change in the study regulations for doctoral studies at TUZVO.

Table 13: Publication activity of PhD graduates for the years 2015-2021

Year	OV	A	B	C	D	Result	Mark
2020/2021	OV 19	8	2	0	0	3,80	A
2019/2020	OV 19	5	2	1	1	3,22	B
2018/2019	OV 19	5	3	1	1	3,20	B
2017/2018	OV 19	6	0	0	2	3,25	A-
2016/2017	OV 19	7	0	1	0	3,75	A-
2015/2016	OV 19	7	2	0	0	3,78	A
2014/2015	OV 5	0	1	1	2	1,75	C
2014/2015	OV 14	0	0	1	0	2,00	C
2014/2015	OV 19	1	0	4	0	2,40	C+

Table 14: Publication activity of PhD students after the dissertation examination for the year 2021

Year	OV	A	B	C	D	Result	Mark
2021	OV 19	1	2	0	5	1,50	C-

2. Student Scientific and Professional Activity (SSPA)

Student scientific professional activity provides students with the opportunity to develop their professional knowledge. Students have the opportunity to present the results of their work to a panel of experts to test the level of content of their work, to test their written expression, to showcase their presentation talents and to test their argumentative skills in the defence of a professional issue. ŠVOČ itself leads students to scientific thinking, creative scientific work and invention. It can equally be a good basis for a successful thesis defence and can also be an initial step towards a prospective employment in the labour market after graduation. The aim of this competition is to bring new impulses to routine educational coursework and thus create a space for active students to present their own ideas.

On 14 April 2021, the Faculty of Forestry of the Technical University in Zvolen
61st forestry conference of student scientific and professional activities by distance learning. LF students had the opportunity to present their work via MS Teams or to submit them in the form of scientific papers. The evaluation and announcement of the results took place on 21 April 2021. The conference was officially opened with a speech by the Dean of the Faculty of Forestry, prof. Ing. Marek Fabrika, PhD. In this year's edition of the ŠVOČ competition, 2 expert sections were created. Following the good experience from previous years of ŠVOČ, larger sections were created, bringing together papers from several departments.

Table 15: Number of submitted and presented papers in individual sections, expert committees at 61. 61st Forestry Conference

SECTION Expert Committee (the first is the chairman)	number of entries/presentations works

ENGINEERING SECTION *Ing. Michal Ferenčík, PhD., (chairman), Mgr. Pavel Širka, PhD., Ing. Ján Pittner, PhD., Ing. Peter Marčiš,*	13/8
DOCTORAL SECTION *prof. Ing. Iveta Hajdúchová, PhD. (Chairwoman), doc. Ing. Róbert Sedmák, PhD.,* *Ing. doc. Ing. Katarína Střelcová, PhD., doc. Ing. Peter Fleischer, PhD. ,* *PhDr. Andrej Timko, PhD*	12/6

Table 16: Rewarded students in each committee at 61. 61st Forestry Conference

Section	Winners (1st to 3rd place)
ENGINEERING SECTION	1. Bc. Kristína Pulišová 2. Bc. Marek Štefanec 3. Bc. Miroslav Bača
DOCTORAL SECTION	1. Ing. Peter Petrík 2. Mag. Biol. Anja Petek 3. PhDr. Lenka Halušková

The committees evaluated the difficulty of the chosen topic, the theoretical and practical contribution of the work, the formal level of the work, the presentation of the work and the answers during the discussion. In total, 25 papers were submitted to the 61st edition of the competition at the Faculty of Forestry, of which 12 papers were in the sections of PhD students. The course of the 61st Forestry Conference was evaluated by the Vice Dean of the Faculty of Forestry for External Relations, Assoc. Ing. Daniel Halaj, PhD. He highlighted the level of the conference and the positive attitude of students and teachers who participated in the student scientific and professional activities.

CONCLUSION

The submitted report on the scientific research activities of the Faculty of Forestry of the TU was prepared according to the requirements of the management of the TU in Zvolen and the Ministry of Education and Science of the Czech Republic. It presents basic information on scientific research and publishing activities, personnel and financial support of research, doctoral studies and student scientific and professional activities. The information was compiled on the basis of records from the level of the LF Dean's Office, SLDK as well as from individual departments.

Based on the participation and results, it can be stated that the involvement of the departments and staff in research projects of various nature was high. The outputs of scientific results are numerous but with significant differences both between departments and between individual staff members. There are currently 30 students in doctoral studies, 26 of whom are

full-time. Participation and quality in Student Scientific and Professional Activities can be considered acceptable in this pandemic period.

V. IMPLEMENTATION OF THE 2021 TARGETS AND 2022 ACTIONS

Implementation of tasks and measures from the College of the Dean of the Faculty of Forestry on 11. 03. 2021

1. Prepare an evaluation of research activities and doctoral studies for the year 2021
T : February 2022
From : Vice-Dean for VVČ

2. Prepare a draft science and research plan for 2021.
T : February 2021
From : Vice-Dean for VVČ

3. Prepare a proposal of scientific events for the Faculty of Forestry for the year 2021.
T : February 2022
From : Vice-Dean for VVČ

4. Continue to streamline the evaluation of scientific and publishing activities at the TU level in Zvolen through SLDK and the need to compare the results of all workplaces.
T : permanent task
From : Vice-Dean for VVČ

5. Encourage involvement in all forms of scientific research, whether basic or applied research, both nationally and internationally, to increase the proportion of funding received from international programmes in a number of departments. Cooperate with other faculties in the preparation of Structural Fund projects.
T : permanent task
From : LF management

6. Seek financial incentives for staff with excellent results in terms of involvement in major scientific projects and for staff with outstanding results in terms of publications. Increase the proportion of WOS and CC publications based on successful scientific research projects (reduction of outputs in category C).
T : permanent task
From : LF management

7. Evaluate the success rate of completion of doctoral studies, the extent of publishing activities of doctoral students, especially in publications included in WOS, or SCOPUS, and take the analysis into account in the admission continuation of doctoral students.
T : permanent task
From : Vice-Dean for VVČ

8. Ensure the holding of the faculty round of ŠVOČ in 2021.
T : April 2021
From : Vice-Dean for VVČ

The tasks were carried out as follows:

1. The evaluation of scientific research activities and doctoral studies for the year 2021 was prepared and approved.
2. A science and research plan for 2022 has been developed and approved.
3. A proposal of scientific and professional events for the Faculty of Forestry for the year was elaborated and approved 2022.

4. The evaluation of the VVČ is carried out through the departments, with the heads of the departments being responsible for fulfillment and compliance. The evaluation of publishing activities was also carried out through the SLDK, which sends documents to the Ministry of Education and Science. Accordingly, the guidelines for the departments have been modified. However, non-compliance with the deadline for submission of the documents to the Faculty of Forestry persists,

and especially incorrectly prepared documents for the departments, which complicates their processing.

5. LF has been involved in all forms of scientific research in the past year, whether it is basic or applied, national and international research.
6. The first and partly also the second part of the task has been fulfilled, motivation for involvement in major international scientific projects will have to be carried out.
7. The evaluation has been carried out, the task will continue.
8. The faculty round of ŠVOČ was secured, the abstract book was published and the best papers were subsequently published in the periodical Acta Facultatis Forestalis Zvolen 2021.

Tasks and actions for 2022

1. Prepare an evaluation of research activities and doctoral studies for the year 2022
T : February 2023
From : Vice-Dean for VVČ

2. Prepare a draft science and research plan for 2022.
T : February 2022
From : Vice-Dean for VVČ

3. Prepare a proposal of scientific events for the Faculty of Forestry of TU for 2022.
T : February 2022
From : Vice-Dean for VVČ

4. Continue to streamline the evaluation of scientific and publishing activities at the TU level in Zvolen through SLDK and the need to compare the results of all workplaces.
T : permanent task
From : Vice-Dean for VVČ

5. Encourage involvement in all forms of scientific research, whether basic or applied research, both nationally and internationally, to increase the proportion of funding received from international programmes in a number of departments. Cooperate with other faculties in the preparation of Structural Fund projects.
T : permanent task
From : LF management

6. Seek financial incentives for staff with excellent results in terms of involvement in major scientific projects and for staff with outstanding results in terms of publications. Increase the proportion of WOS and CC publications based on successful scientific research projects (reduction of C outputs).
T : permanent task
From : LF management

7. Evaluate the success rate of completion of doctoral studies, the extent of publishing activities of doctoral students, especially in publications included in WOS, or SCOPUS, and take the analysis into account in the admission continuation of doctoral students.
T : permanent task
From : Vice-Dean for VVČ

8. Ensure the holding of the faculty round of ŠVOČ in 2022.
T : April 2022
From : Vice-Dean for VVČ

6. External relations

1. INTRODUCTION

Within the framework of the approved Long-term plan of the Technical University of Zvolen for 2017 - 2023 in the area 3 "Public Relations, National and International Cooperation", the Faculty of Forestry implemented in 2021 steps with the aim of improving the image of the faculty, strengthening national and international cooperation and thus creating a "goodwill" of this educational and scientific research institution.

The individual tasks focused on:

- popularization of the results of scientific research, pedagogical and other activities of the faculty towards the general professional and lay public,
- Promotion of the Faculty through press and scientific conferences, television programmes, special editions of newspapers and professional journals,
- cooperation with economic and social practice, the region and the city of Zvolen,
- promotion of sustainable forest management in Slovakia,
- support for student and faculty staff mobility,
- cooperation s professionally a professionally close universities countries V4, EU and international organisations.

These are activities with a long-term strategic intent. The Faculty of Forestry (FF) approaches their implementation purposefully and responsibly. The Faculty of Forestry has continued to popularise its scientific research activities through its own updated websites: www.lesnickyvyskum.sk and www.lesnickekruzky.sk, as well as through social networking channels. The Faculty continued to amplify its outreach through increased participation in television and print media. It promoted nature-based forest management and ecosystem services through participation in major international research outputs as well as research studies for economic practice. Communicated continuously with economic practice regarding the employment of our graduates in the labour market, mainly in the forestry sector.
The faculty also emphasizes the mobility of its student teachers in order to support their personal progression. However, due to the ongoing global pandemic of COVID-19 throughout 2021, the participation of students and teachers in Erasmus+ academic mobility has been significantly reduced.
In the field of marketing strategy, the activities within the "Social Media Strategy of the Faculty of Forestry, TU Zvolen" continued in 2021 despite the pandemics. In the evaluation year 2021, the process improved again in the area of relations in the external environment towards the professional and lay public, the effect of which is in the creation of a positive image and goodwill of the Faculty of Forestry. The Faculty has thus continuously successfully implemented its branding strategy under the motto: *"Together for a sustainable future"*, which it carries in its logo.

2. IMPLEMENTATION OF THE TASKS APPROVED BY THE SCIENTIFIC COUNCIL OF THE LF FOR EXTERNAL RELATIONS IN 2021

In 2021, the strategy of promoting and motivating the personal growth of students in order to increase their employability on the labour market, as well as the scientific and pedagogical staff

of the faculty in order to achieve quality in their teaching and research activities, was continued. *In view of the year-round pandemic due to COVID-19, it was necessary to continuously adapt marketing activities towards secondary school students, students of the Faculty of Forestry, their potential employers, as well as the scientific and pedagogical staff of the Faculty.* Efforts were made to encourage, motivate students in their distance learning, promote the quality of the offered online/commented lectures and tutorials, promote scientific and other important outputs of the faculty's eminent students and scientists in TV and print media, as well as on social networks in the form of paid advertising.

Task 1

Promoting the quality of online education and motivating students in distance learning
Continue to promote and motivate the personal growth of LF students in order to increase their employability in the labour market with tailored marketing tools in the light of the global pandemic:

- telephone or online communication with potential employers in the LH sector,
- meeting with students in the form of online meetings,
- Implementation and promotion of quality online education,
- Motivating lectures for mastering distance learning in the form of online couching,
- Active online networking for clubs, project activities, mobility and social marketing.

Similarly, for the scientific and pedagogical staff of the Faculty of Forestry, online couching, active online networking for online mobility and social marketing were used to achieve quality in teaching and research activities.

Rating:
During the distance learning parts of each semester, we supported students as well as staff through online mental couching, i.e. an on-demand workshop by Mgr. Petr Bielik and also for coping with the pitfalls of distance learning in the form of a lecture by Dr. Tomas Eichler. The students met with the faculty management through regular online meetings with the requested feedback from the students towards improving the pedagogical process during the distance form of education. We maintained an active online networking for circular, scientific research activities of the faculty members and supported international mobility.

Task 2

Promotion of interdepartmental as well as interfaculty scientific teams and their outputs
Based on the strong support of the new category of the LF SVOČ focused on theses containing elements of innovation, students will be guided for teamwork under the responsibility of their supervisors between departments or faculties and subsequently selected for the formation of spin-off project teams. We will adapt the implementation for an electronic environment within available software solutions with promotion
outputs through multiple faculty communication channels (print and television media). In the same way, these students will be able to participate in other projects, e.g. with the city of Zvolen in the framework of building green infrastructure in the city's intravilas, as well as in the international projects of the faculty. Similarly, the aim is to develop this activity among the scientific and teaching staff towards achieving a higher competitiveness of the submitted research projects.

Rating:

Due to the predominantly distance learning format in 2021 as well as the online form of the faculty FTES itself, it has proven not to be a conducive environment for the implementation of interdepartmental and interfaculty research projects of our students. However, the faculty has not abandoned the organization of the SVOČ itself with proper student outputs for their further personal growth and the necessary input for doctoral studies.

Task 3

Building relationships with secondary schools and international education and research institutions with emphasis on the electronic environment

Promotion of the faculty at the international level in two basic areas: scientific activities (electronic and personal promotion of scientific teams at professional forums) and study opportunities, faculty environment (modern and creative interior of TUZVO, online brochures, online fairs, international student activities, Erasmus+, CEEPUS) in conjunction with the city of Zvolen (green infrastructure and biotechnological innovations). Cooperation with secondary schools and involvement of their students in the faculty's SVOČ and research projects with emphasis on the online environment (www.lesnickyvyskum.sk). Efforts to establish individual top faculty researchers and their teams within international structures of institutions such as EFI and IUFRO.

Rating:

Relationship building with secondary schools has been limited due to the global pandemic and the anti-pandemic measures taken. It was largely conducted online through MS Teams or Zoom software products. Similarly, participation of secondary schools in the faculty SHSC was discontinued. Despite all the obstacles, we managed to keep the attention of the students in the individual LF circles, e.g. through shared circle activities in the students' home environment, the creation of new video promotional materials for secondary schools placed on the LF website as well as on the LF YouTube channel, and the online presentation of study opportunities at selected secondary schools.

3. FOREIGN COOPERATION AGREEMENTS

Cooperation between the Faculty of Forestry and foreign partners is implemented on the basis of bilateral and multilateral treaties, agreements, memoranda and programmes. On the basis of these agreements, various types of academic mobility of the Faculty's staff and students take place. Table 1 gives an overview of the bilateral agreements of the ERASMUS+ programme, which is an ongoing project to implement various types of mobility in the European Higher Education Area.

Tab.1 Bilateral ERASMUS+ contracts

See	Institution	State	Area of cooperation
1.	Lesotechnitcheski Universitet University of Forestry Sofia	Bulgaria	Forestry, Environmental science, Engineering, Materials - wood
2.	Mendel University in Brno Mendel University in Brno	Czech Republic	Forestry, Environment, Materials - wood

3.	Jan Evangelista Purkyně University in Ústí nad Labem	Czech Republic	Environmental sciences, Ecology,
4.	Czech Agricultural University in Prague Czech University of Life Science Prague	Czech Republic	Forestry, Environment, Forestry Business and Administration, Engineering
5.	Masaryk University Brno	Czech Republic	Earth Sciences
6.	University of Ostrava - University of Ostrava	Czech Republic	Earth Sciences
7.	University of Zagreb - Faculty of Forestry	Croatia	Forestry, Materials - wood
8.	Karelia University of Applied Sciences	Finland	Forestry, Engineering
9.	University of Helsinki	Finland	Forestry
10.	University of Eastern Finland	Finland	Forestry, Environmental sciences
11.	Seinajoki University of Applied Sciences	Finland	Forestry
12.	Agroparistech - Institut des sciences et industries du vivant et de l´environnemen	France	Forestry
13.	Université de Lorraine ENSTIB	France	Forestry
14.	Aristotle University of Thessaloniki	Greece	Forestry
15.	Latvia University of Life Sciences and Technologies	Latvia	Forestry, Environmental sciences, Natural environments and wildlife
16.	University of West Hungary	Hungary	Forestry, Earth Science
17.	Eötvös Loránd University	Hungary	Earth Science
18.	Szent István University	Hungary	Environment
19.	Georg-August-Universität Göttingen	Germany	Forestry
20.	Technische Universität Dresden	Germany	Forestry, Materials (Wood)
21.	Technical University of Műnchen	Germany	Forestry
22.	Hochschule Ostwestralen-Lippe	Germany	Materials - wood
23.	Inland Norway University of Applied Sciences	Norway	Forestry, Environment
24.	Norwegian University of Science and Technology	Norway	Environmental Sciences, Engineering, Technology
25.	Poznan University of Life Sciences	Poland	Forestry, Environmental sciences, Engineering
26.	University of Agriculture in Krakow	Poland	Forestry, Environment
27.	Universidade de Lisboa	Portugal	Forestry, Agriculture, fisheries
28.	Universidade de Évora	Portugal	Forestry, Geodesy, Cartography, Remote sensing
29.	Instituto Politécnico de Portalegre	Portugal	Forestry
30.	BOKU-Universität fur Bodenkultur Wien	Austria	Forestry, Environmental science
31.	Universitatea Transylvania Transilvania University of Brasov	Romania	Forestry, Materials (Wood)
32.	University of Ljubljana	Slovenia	Forestry, Material Science (Wood)
33.	Universidad Politécnica de Madrid	Spain	Forestry, Earth Science
34.	Universitat Politècnica De València	Spain	Forestry
35.	Universita Degli Studi Di Sassari	Italy	Biology and Genetics, Environmental Sciences, Ecology
36.	Kastamonu University	Turkey	Forestry
37.	Karadeniz Technical University	Turkey	Forestry

Table 2 lists other international agreements that have been concluded mainly for scientific and technical cooperation, but their focus also allows for student and staff mobility. Most of these agreements are of a framework nature; specific activities are subsequently provided for in the form of separate projects and amendments to these agreements.

Traditionally, our cooperation with partner forestry faculties in the Czech Republic - Faculty of Forestry and Wood Technology MU in Brno, Faculty of Forestry and Wood Technology ČZU in Prague - is already rich. It is necessary to mention the mutual memberships and visits to the

SC of the faculties, defences, etc. These activities are covered by institutional funds as well as faculty projects, which is an expression of support and willingness for mutual cooperation.

It should be noted that there are foreign activities that may not be merely contractual. Many faculty members meet and collaborate with foreign counterparts at the departmental level, based on personal contacts and friendships.

Table 2 Other international treaties and cooperation agreements

See	Institution	State	Area of interest
1.	University of Forestry Sofia	Bulgaria	Academic cooperation agreement
2.	Czech University of Agriculture Prague	Czech Republic	Agreement on scientific-pedagogical collaboration
3.	Mendel University of Agriculture and Forestry in Brno	Czech Republic	Cooperation agreement
4.	Global Change Research Centre of the CAS	Czech Republic	Cooperation agreement
4.	Faculty of Forestry, University of Zagreb	Croatia	Cooperation agreement
5.	Sallahadin University, Kurdistan Region of Iraq	Iraq	Scientific cooperation in the field of forestry, natural resources, nature and landscape conservation, exchange of students and teachers
6.	University of West Hungary, Sopron	Hungary	Cooperation Agreement on Education and research
7.	Georg-August University of Göttingen	Germany	Framework agreement on scientific collaboration
8.	Technical University of Dresden	Germany	Cooperation agreement
9.	Agricultural University of Cracow	Poland	Framework cooperation agreement
10.	Universitat für Bodenkultur Vienna	Austria	Cooperation agreement
11.	Izhevsk State Technical University of M. T. Kalashnikov, Izhevsk	Russian Federation	Cooperation agreement
12.	North-Eastern Federal University M. K. Ammosova, Yakutsk	Russian Federation	Cooperation agreement

The Faculty of Forestry has signed several memoranda of cooperation with major international institutions and universities, which focus on academic mobility, mutual exchange of knowledge and scientific publications, work on scientific projects focused on bilateral and multilateral grants.

At the level of the Technical University in Zvolen, an important Memorandum of Cooperation was signed between the TUZVO and the JRS in Ispra (Joint Research Centre of the EC), in which the LF has a leading position both in terms of content and focus. The cooperation between the institutions was divided into the following areas:

- Forest ecosystem services and biodiversity
- Forestry and climate change
- Sustainable use of forests under uncertainties
- Bio-economy in forestry
- Timber as ecosystem service for buildings and bio-energy
- Applied geoinformatics and Decision support systems in Forestry

Table 3 Memoranda of Cooperation

See	Institution	State
1.	University of Agriculture in Kraków, Faculty of Forestry	Poland
2.	Institute of Biosciences and BioResources, Firenze	Italy

3.	Aurora Research Institute of the Aurora College, Inuvik	Canada
4.	Mendel University in Brno	Czech Republic
5.	Institute of International Forestry and Forest Products, Dresden	Germany
6.	ARO Volcani Center, Bet Dagan	Israel
7.	Forest National Corporation, Ministry of Agriculture and Forestry	Sudan
8.	University of Khartoum, Faculty of Forestry, Khartoum	Sudan
9.	College of Forestry and Range Science, Sudan University of Science and Technology, Khartoum	Sudan

4. MEMBERSHIP OF INTERNATIONAL ORGANISATIONS AND GOVERNING BODIES OF INTERNATIONAL SCIENTIFIC PROGRAMMES

The Faculty of Forestry and its staff are members of several international organisations, scientific programmes, scientific and professional societies. An overview of the most important positions is given in Table 4-6. These positions do not change significantly from year to year, although an increase can be observed in the longer term.

Table 4 International NGOs

Name of organisation	Name	Position
European PRO SILVA Committee	prof. Ing. Milan Saniga, DrSc.	Member
IUFRO	doc.Mgr.Ing.Rastislav Šulek,PhD.	coordinator of research group Forest law and environmental legislation, member of International Council
	prof. Dr. Ing. Jaroslav Šálka	Deputy Coordinator of the Forestry Group policies in the Baltic countries and the region Central and Eastern Europe
	doc. Ing. František Máliš, PhD.	member unit 1.03.01- Traditional coppice, ecology, silviculture and socioeconomic aspects
	prof.h.c. prof. Dr. Ing. Viliam Pichler	Member
International Council for Game and Wildlife Conservation (CIC)	Ing. Tibor Lebocký, PhD.	Head of the Slovak delegation, international expert for trophy evaluation
International Association of Vegetation Science	doc. Ing. František Máliš, PhD.	Member of the Historical Vegetation Working Group Ecology
Research Policy Working Group EUA	Dr h.c. prof. Ing. Rudolf Kropil, PhD.	committee member
ForestReplot - a database of forest herb layer resurvey plots	doc. Ing. František Máliš, PhD.	National Platform Coordinator

Tab. 5 Scientific programmes

Programme name	Name	Position
H2020 Critical solutions for elderly wellbeing RISE-WELL	prof.h.c. prof. Dr. Ing. Viliam Pichler	Co-investigator

H2020 Holistic management practices, modelling and monitoring for European forest soils, HoliSoils	Ing. Michal Bošeľa, PhD. doc. Ing. Erika Gömöryová, CSc. prof. Ing. Jaroslav Škvarenina, CSc. Ing. Marián Homolák, PhD. doc. Ing. Jaroslav Vido, PhD. Ing. Pavlína Nalevanková, PhD. doc. Ing. Peter Fleischer, PhD. Ing. Peter Fleischer, PhD. Ing. Peter Marčiš	Co-investigators
H2020 Integrated Technological and Information Platform for wildfire Management (SILVANUS)	Dr. Ing. Yvonne Brodrecht	Principal Investigator
LTER Long-term Ecological Research Europe	doc. Ing. Peter Fleischer, PhD.	member of a national body
LIFE16 NAT/SI/000634 Preventing the extinction of Dinario-SE Alpine lynx population through reinforcement and long-term conservation	Dr. h. c. prof Ing. Rudolf Kropil, PhD. Mgr. Jakub Kubala, PhD.	project manager coordinator of professional activities
COST Action CA 20132 - Urban Tree Guard - Safeguarding European urban trees and forests through improved biosecurity	JUDr. Mgr. Zuzana Dobšinská	Member of the working group
COST Action CA 20132 - Intergovernmental Coordination from Local to European Governance (IGCOORD)	prof. Dr. Ing. Jaroslav Šálka	Member of the working group
COST Action CA15206 Payments for Ecosystem Services - Forests for Water (PESFOR-W)	prof. Dr. Ing. Jaroslav Šálka	Member of the working group
COST Action CA 19128 Pan-European Network for Climate Adaptive Forest Restoration and Reforestation (PEN-CAFoRR)	prof. Ing. Dušan Gömöry, DrSc.	member of the management committee
COST Action CA15226 Climate smart forestry in mountain regions (CLIMO)	doc. Ing. Peter Fleischer, PhD. doc. Ing. Katarína Střelcová, PhD. Ing. Michal Bošeľa, PhD.	Member of the working group
COST Action CA18134 Genomic Biodiversity Knowledge for Resilient Ecosystems (G.BIKE)	Ing. Peter Klinga, PhD.	Member of the working group Monitoring of genetic diversity
COST Action CA16208 Knowledge conversion for enhancing management of European riparian ecosystems and services (CONVERGES)	doc. Ing. František Máliš, PhD.	member of the management committee in the position of substitute member
COST Action CA19139 Process-based models for clmate impact attribution across sectors (PROCLIAS)	doc. Ing. Ján Merganič, PhD.	management representative committee
COST Action CA18237 European Soil-Biology Data Warehouse for Soil Protection (EUdaphobase)	doc. Ing. Erika Gömöryová, CSc.	Member of the working group
EUFORGEN European forest genetic resources programme	prof. Ing. Dušan Gömöry, DrSc.	Member of the working group

Table 6 Scientific and professional societies

Name of organisation	Name	Position
British Ornithologist Union	RNDr. Martin Korňaň, PhD.	Member
Carpathian Convention Working Group on Biodiversity	Mgr. Jakub Kubala, PhD.	Member
Czech Academy of Agricultural Sciences, Faculty of Economics Commission	prof. Ing. Iveta Hajdúchová, PhD.	Member
	prof. Ing. Ján Holécy, CSc.	Member
	prof. Dr. Ing. Jaroslav Šálka	Member

Czech Bioclimatological Society	prof. Ing. Jaroslav Škvarenina, CSc.	Member
Czech Botanical Society	doc. RNDr. Judita Kochjarová, CSc.	Member
	Mgr. Pavel Širka, PhD.	Member
European Economic and Social Committee Brussels	Dr h.c.prof. Ing. Rudolf Kropil, PhD.	Member of the Bureau
NAT Economic and Social Committee	Dr h.c.prof. Ing. Rudolf Kropil, PhD.	Member
ECO Economic and Social Committee	Dr h.c.prof. Ing. Rudolf Kropil, PhD.	Member
REX Economic and Social Committee	Dr h.c.prof. Ing. Rudolf Kropil, PhD.	Member
SOC Economic and Social Committee	Dr h.c.prof. Ing. Rudolf Kropil, PhD.	Member
European Ornithologist Union	RNDr. Martin Korňaň, PhD.	Member
European Forest Institute	prof. Dr. Ing. Jaroslav Šálka	SR representative in the Forest Policy Research Network
ERGA European Reference Genome Atlas	Ing. Peter Klinga, PhD.	Member
European Universities Association	Dr h.c.prof. Ing. Rudolf Kropil, PhD.	committee member
German Ornithologist Union	RNDr. Martin Korňaň, PhD.	Member
FACE European Federation for Hunting and Conservation	Ing. Tibor Lebocký, PhD.	Head of Delegation Slovak Republic
FESPB Federation of European Societes of Plant Biology	prof. Ing. Jaroslav Kmet'j, PhD	Member
IAVS European Vegetation Survey	prof. Ing. Karol Ujházy, PhD.	Member of the working group
IAVS Historical Vegetation Science	prof. Ing. Karol Ujházy, PhD.	Member of the working group
International Association of Bryologists	Mgr. Pavel Širka, PhD.	Member
International Association for Economics and Management in Wood Processing and Furniture Manufacturing - WoodEMA	doc. Ing. Miloš Gejdoš, PhD.	Member
International Association for the Study of the Commons	doc. Mgr. Ing. Rastislav Šulek, PhD.	Member
ICP Forests	doc. Ing. František Máliš, PhD.	Member of the expert panel for biodiversity and ground vegetation
	doc. Ing. Martin Pavlík, PhD.	Member
International Humic Substances Society	doc. Ing. Erika Gömöryová, CSc.	Member
International Society for Mushroom Science	doc. Ing. Martin Pavlík, PhD.	Member
International Society for Medicinal Mushrooms	doc. Ing. Martin Pavlík, PhD.	Member
International Union of Game Biologists	Dr h.c.prof. Ing. Rudolf Kropil, PhD.	steering committee member
International Union of Soil Science	doc. Ing. Erika Gömöryová, CSc.	Member
	Ing. Marián Homolák, PhD.	Member
IPCC - Intergovernmental Panel on Climate Change, Switzerland	prof. Ing. Jaroslav Škvarenina, CSc.	expert reviewer
The Maple Society	prof. Dr. Mgr. Jaroslav Ďurkovič	Member
The European acoustics association EAA	doc. Ing. Miloš Gejdoš, PhD.	Member
Mitteleuropäischen Gesellschaft für Jagdwissenschaft	doc. MVDr. Dušan Rajský, CSc.	Member of the Board of Directors and Vice President
Mitteleuropäischen Instituts für Wildtierökologie	doc. MVDr. Dušan Rajský, CSc.	Member of the Board of Directors and Vice President
OEE Hungarian National Forestry Association	Ing. Tibor Lebocký, PhD.	Member
SINIF Simposio Nacional Sobre Incendios Forestales, Comité Scientifico-profesional,Alicante	prof. Ing. Ján Holécy, CSc.	Member of the Scientific and Expert Council

Central European Institute of Wildlife Ecology	doc. MVDr. Dušan Rajský, CSc.	Member of the Board of Directors
Wildlife Society	Dr h.c.prof. Ing. Rudolf Kropil, PhD.	Member
World Society for Mushroom Biology and Mushroom Products	doc. Ing. Martin Pavlík, PhD.	Member

5. MEMBERSHIP OF NATIONAL AND INTERNATIONAL EDITORIAL BOARDS AND ASSESSMENT ACTIVITIES

Faculty of Forestry staff are members of several national and international journal editorial boards, an overview of which is given in Tables 7-9. In addition to these positions, they are also invited as reviewers to assess manuscripts of articles, projects and various documents.

Tab. 7 Domestic periodicals

Name of periodical	Name	Position
Acta Facultatis Forestalis	prof. Dr. Mgr. Jaroslav Ďurkovič	scientific editor
	prof. Ing. Marek Fabrika, PhD.	Chairman of the Editorial Board
	prof. h.c. prof.Dr. Ing. Viliam Pichler	member of the editorial board
	prof. Ing. Peter Garaj, CSc.	
	prof. Ing. Iveta Hajdúchová, PhD.	
	prof. Ing. Matúš Jakubis, PhD.	
	prof. Ing. Valéria Messingerová, CSc.	
	prof. Ing. Ladislav Paule, PhD.	
	prof. Ing. Milan Saniga, DrSc.	
	prof. Ing. Jaroslav Škvarenina, CSc.	
	doc. Ing. Martin Lieskovský, PhD.	Executive Editor
Economy and society	prof. Ing. Iveta Hajdúchová, PhD.	member of the editorial board
Folia Oecologica	prof. Ing. Dušan Gömöry, DrSc.	member of the editorial board
	doc. Ing. Róbert Sedmák, PhD.	member of the editorial board
Thaiszia - Journal of Botany	Mgr. Pavel Širka, PhD.	member of the editorial board
Meteorological journal	prof. Ing. Jaroslav Škvarenina, CSc.	member of the editorial board

Tab. 8 Foreign and international periodicals

Name of periodical	Name	Position
Biological and Chemical Research (USA)	doc. Ing. Martin Pavlík, PhD.	member of the editorial board
Central European Forestry Journal	ng. Michal Bošeľa, PhD.	member of the editorial board, ecretary and thematic editor
	prof. Ing. Dušan Gömöry, DrSc.	member of the editorial board
	doc. Ing. Erika Gömöryová, CSc.	member of the editorial board
Diversity	RNDr. Martin Korňan, PhD.	reviewer board member
Forests	doc. Mgr. Ing. Rastislav Šulek, PhD.	monkey editor
	prof. Ing. Dušan Gömöry, DrSc.	member of the editorial board
	ng. Michal Bošeľa, PhD.	ematic editor
	doc. Ing. Miloš Gejdoš, PhD.	opical advis member. board
Newsletter for Sumatran experiments	prof. Ing. Milan Saniga, DrSc.	member of the editorial board
ournal of Central European Agriculture	Dr. h. c. prof. Ing. Rudolf Kropil, PhD.	member of the editorial board
ournal of Forest Science	prof. Ing. Marek Fabrika, PhD.	member of the editorial board

ournal of Plant Interactions	prof. Ing. Karol Ujházy, PhD.	member of the editorial board
Pedosphere Research	doc. Ing. Erika Gömöryová, CSc.	member of the editorial board
Plos One	prof. Ing. Dušan Gömöry, DrSc.	member of the editorial board
	ng. Michal Bošeľa, PhD.	member of the editorial board and academic editor
Summarizing	prof. Ing. Dušan Gömöry, DrSc.	member of the editorial board
The Sumatran Journal	prof. Ing. Milan Saniga, DrSc.	member of the editorial board
Forestry Research Reports	prof. Ing. Milan Saniga, DrSc.	member of the editorial board

Tab. 9 Professional periodicals

Name of periodical	**Name**	**Position**
Biology	doc. RNDr. Judita Kochjarová, CSc.	member of the editorial board
Magazine Mobility-machinery-technology-ecology	prof. Ing. Iveta Hajdúchová, PhD.	member of the editorial board
Hunting and fishing	doc. MVDr. Dušan Rajský, CSc.	Chairman of the Editorial Board
Slovak Raptor Journal	Dr h. c. prof. Ing. Rudolf Kropil, PhD.	Vice-President
Tichodroma	doc. Ing. Peter Lešo, PhD.	member of the editorial board
	RNDr. Martin Korňan, PhD.	member of the editorial board

Among other significant activities of the faculty members in this part it is necessary to mention:

- membership in the editorial board of the Bulletin of the Slovak Botanical Society - doc. RNDr. Judita Kochjarová, CSc.
- membership of the scientific board of the journal Manažment podnikov - Management of Companies - doc. Ing. Vladimír Štollmann, CSc., PhD.
- Editor of the special issue Qualitative Features of Wood as a Determinant for Wood Quality Assessment (https://www.mdpi.com/journal/forests/special_issues/wood_assessment), journal Forests - doc. Ing. Miloš Gejdoš, PhD.
- guest editor of the special issue of the journal Forests on the topic "Circular Bioeconomy in ForestBased Sector: Governance and Policy" - JUDr. Mgr. Mgr. Zuzana Dobšinská, PhD.
- guest editor of the special issue of Sustainability magazine on "Forest Policy and Management Practices for the 21st Century" - JUDr. Mgr. Zuzana Dobšinská, PhD.

Trade union memberships Doctoral studies, scientific councils, habilitation and inauguration committees:

- MU Brno, Department of Economics and Management of Renewable Natural Resources - prof. Ing. Iveta Hajdúchová, PhD.
- ČZU Praha - inauguration proceedings doc. Ing. Vilém Jarský, Ph. D. - member of the inauguration commission - prof. Ing. Iveta Hajdúchová, PhD.
- ČZU Praha, Department of Business Management and Economics - prof. Ing. Iveta Hajdúchová, PhD., prof. Ing. Ján Holécy, CSc., prof. Dr. Ing. Jaroslav Šálka
- Centre of Plant Biology and Biodiversity of the Slovak Academy of Sciences - member of the Scientific Board - prof. Ing. Dušan Gömöry, DrSc.
- State Nature Conservation of the Slovak Republic - member of the scientific board - prof. Ing. Karol Ujházy, PhD.
- Institute of Forest Ecology of the Slovak Academy of Sciences - member of the Scientific Board - Ing. Michal Bošeľa, PhD.
- MŠ MT ČR, Mendel Brno - member of the Trade Union Council - prof. Ing. Milan Saniga, DrSc.
- SPU Nitra, Faculty of Horticulture and Landscape Engineering - member of the Scientific Board and member of the Habilitation Committee commissions - doc. Ing. Ivan Lukáčik, CSc.

- **Other memberships:**
  - Saint Petersburg State Forest Technical University - Conference devoted to the sustainable development of the industry in 2021 - member of the program committee - prof. Ing. Iveta Hajdúchová, PhD.
  - Database administrator within the SoilTemp initiative - doc. Ing. František Máliš, PhD.
  - Economic and Social Committee of the Slovak Republic - Chairman - Dr. h. c. prof. Ing. Rudolf Kropil, PhD.
  - Slovak Government Council for Science, Technology and Innovation - Dr. h. c. prof. Ing. Rudolf Kropil, PhD.
  - Government Council for the Recovery and Cohesion Plan - Dr. h. c. prof. Ing. Rudolf Kropil, PhD.
  - Government Council for the European Green Deal - Dr. h. c. prof. Ing. Rudolf Kropil, PhD.
  - Government Council for Cohesion Policy 2021-2027 - Dr. h. c. prof. Ing. Rudolf Kropil, PhD.
  - Government Council for Agenda 2030 - Dr. h. c. prof. Ing. Rudolf Kropil, PhD.
  - Monitoring Committee for OP VI - Dr. h. c. prof. Ing. Rudolf Kropil, PhD.
  - Scientific Council of ČZU Praha, Mendel University Brno, TU Košice, UVLF Košice, SPU Nitra, UKF Nitra, UVR AU Banská Bystrica, UMB Banská Bystrica, NLC Zvolen, CPPV Nitra - Dr. h. c. prof. Ing. Rudolf Kropil, PhD.

- National Platform for Biodiversity - Dr. h. c. prof. Ing. Rudolf Kropil, PhD.
- MDPI Board Member (Reviewer Board Member) - doc. Mgr. Ing. Rastislav Šulek, PhD.
- Scientific Committee of the Conference Managerial, Social and Environmental Aspects of the Forest-based Sector for Sustainable Development: 40th Anniversary Conference - member - JUDr. Mgr. Zuzana Dobšinská, PhD.
- Croatian Academy of Sciences - Honorary Membership - prof. Ing. Milan Saniga, DrSc.
- Section DVFFA Ertragskunde - member of the working group - prof. Ing. Marek Fabrika, PhD.
- SAV commission for assessment of scientific qualification of employees - member - prof. Ing. Dušan Gömöry, DrSc.
- Institute of Forest Ecology of the Slovak Academy of Sciences - member of the attestation committee - prof. Ing. Dušan Gömöry, DrSc.

- National Forestry Centre - member of the attestation committee - prof. Ing. Dušan Gömöry, DrSc.
- Ministry of Agriculture of the Czech Republic - member of the expert board for the research project NAZV QJ1920433
  "Effect of defensive measures on populations of lycopods in relation to population densities" - Ing. Pavol Hlaváč, PhD.
- Slovak Acoustical Society ri SAV - member - doc. Ing. Miloš Gejdoš, PhD.
- Council for the creation of NLF 2022-2030 "Forests and modern technologies" - coordinator of the team - doc. Ing.
  Ján Merganič, PhD.
- Department of Forestry SAPV - member - doc. Ing. Ján Merganič, PhD.
- OÚ Banská Štiavnica, Department of Environmental Care - member of the review committee (CHA Banská Štiavnica Botanical Garden) - doc. Ing. Ivan Lukáčik, CSc.
- Slovak Botanical Society - chairman of the dendrological section - Ing. Ivana Sarvašová, PhD.
- Slovak Bioclimatological Society - membership in the committee - doc. Ing. Katarína Střelcová, PhD.
- Slovak Meteorological Society - membership - doc. Ing. Katarína Střelcová, PhD.
- Slovak Academy of Agricultural Sciences - member of the Department of Forestry - doc. Ing. Erika Gömöryová, CSc.
- Societas pedologica slovaca - preparation of a new version of the Morphogenetic Classification System of Soils of Slovakia - member of the working group - doc. Ing. Erika Gömöryová, CSc.

Tab. 10 Assessment of scientific publications for foreign and domestic periodicals

Name of foreign periodical	Name of the assessor
Acta Universitatis Agriculturae et Silviculturae Mendelianae Bruensis	doc. Ing. Miloš Gejdoš, PhD.
Agriculture and Forest Meteorology	Ing. Michal Bošeľa, PhD.
Agronomy	doc. Ing. Peter Lešo, PhD.
Atmosphere	Ing. Denisa Sedmáková, PhD.
	prof. Ing. Jaroslav Škvarenina, CSc.
Biology	Mgr. Ján Kováč, PhD.
	doc. Ing. Erika Gömöryová, CSc.
BMC Genomics	prof. Ing. Dušan Gömöry, DrSc.
Botany	prof. Ing. Dušan Gömöry, DrSc.
Central European Forestry Journal	JUDr. Mgr. Zuzana Dobšinská, PhD.
	doc. Ing. Stanislav Kucbel, PhD.
	doc. Ing. Peter Jaloviar, PhD.
	doc. Ing. Erika Gömöryová, CSc.
	Ing. Klára Báliková, PhD.
Croatian Journal of Forest Engineering	doc. Ing. Miloš Gejdoš, PhD.
Dendrobiology	prof. Ing. Dušan Gömöry, DrSc.
	Ing. Denisa Sedmáková, PhD.
Dedrochronology	Ing. Michal Bošeľa, PhD.
Diversity	RNDr. Martin Korňan, PhD.
Earth	prof. Dr. Ing. Jaroslav Šálka
Ecology and Evolution	prof. Ing. Dušan Gömöry, DrSc.
Ecological Indicators	JUDr. Mgr. Zuzana Dobšinská, PhD.
Ecosystems	prof. Ing. Jaroslav Škvarenina, CSc.

Energies	doc. Mgr. Ing. Rastislav Šulek, PhD.
	doc. Ing. Miloš Gejdoš, PhD.
Electronic Journal of Polish Agricultural Universities	prof. Ing. Jaroslav Škvarenina, CSc.
Environmental and Experimental Botany	Ing. Alena Konôpková, PhD.
Environmental Science and Pollution Research	Mgr. Ján Kováč, PhD.
European Journal of Forest Research	RNDr. Martin Korňan, PhD.
	doc. Ing. Peter Lešo, PhD.
Food Technology and Biotechnology journal	doc. Ing. Martin Pavlík, PhD.

Folia Geographica	prof. Ing. Jaroslav Škvarenina, CSc.
Folia Oecologica	doc. Ing. Erika Gömöryová, CSc.
Forest Ecology and Management	prof. Ing. Karol Ujházy, PhD.
	Ing. Michal Bošeľa, PhD.
	doc. Ing. Stanislav Kucbel, PhD.
	doc. Ing. Peter Jaloviar, PhD.
	Ing. Denisa Sedmáková, PhD.
Forest Policy and Economics	prof. Dr. Ing. Jaroslav Šálka
	JUDr. Mgr. Zuzana Dobšinská, PhD.
Forests	JUDr. Mgr. Zuzana Dobšinská, PhD.
	doc. Mgr. Ing. Rastislav Šulek, PhD.
	prof. Ing. Dušan Gömöry, DrSc.
	prof. Ing. Iveta Hajdúchová, PhD.
	Ing. Klára Báliková, PhD.
	prof. Ing. Ľubomír Scheer, CSc.
	doc. Ing. Miloš Gejdoš, PhD.
	RNDr. Martin Korňan, PhD.
	doc. Ing. Martin Lieskovský, PhD.
	Ing. Michal Ferenčík, PhD.
	doc. Ing. Erika Gömöryová, CSc.
Functional Ecology	Ing. Michal Bošeľa, PhD.
Genes	prof. Ing. Dušan Gömöry, DrSc.
Government Information Quarterly	JUDr. Mgr. Zuzana Dobšinská, PhD.
	prof. Ing. Karol Ujházy, PhD.
International Soil and Water Conservation Research	doc. Ing. Erika Gömöryová, CSc.
Journal of Agricultural Science and Technology	doc. Ing. Ivan Repáč, PhD.
Journal of Forest Science	prof. Ing. Dušan Gömöry, DrSc.
	prof. Ing. Karol Ujházy, PhD.
	prof. Ing. Ľubomír Scheer, CSc.
	prof. Ing. Iveta Hajdúchová, PhD.
	doc. Mgr. Ing. Rastislav Šulek, PhD.
	doc. Ing. Stanislav Kucbel, PhD.
	doc. Ing. Ivan Repáč, PhD.
Journal of Hydrology and Hydromechanics	prof. Ing. Jaroslav Škvarenina, CSc.
Journal of Mountain Science	doc. Ing. Erika Gömöryová, CSc.
Journal of Plant Interaction	prof. Ing. Karol Ujházy, PhD.

Journal of Soil Science and Plant Nutrition	doc. Ing. Erika Gömöryová, CSc.
Land	RNDr. Martin Korňan, PhD.
	prof. Dr. Ing. Jaroslav Šálka
	JUDr. Mgr. Zuzana Dobšinská, PhD.
	Ing. Klára Bálikova, PhD.
Landscape Ecology	Ing. Peter Klinga, PhD.
Microorganisms	doc. Ing. Erika Gömöryová, CSc.
Oikos	RNDr. Martin Korňan, PhD.
Pland Biotechnology Reports	prof. Dr. Mgr. Jaroslav Ďurkovič
Plant Root	doc. Ing. Peter Jaloviar, PhD.
PLOS One	doc. Ing. Peter Lešo, PhD.
Processes	Ing. Marián Homolák, PhD.
Remote Sensing	prof. Ing. Ján Tuček, CSc.
Revista Ambiente & Água	Ing. Klára Báliková, PhD.
Scandinavian Journal of Forest Research	prof. Ing. Dušan Gömöry, DrSc.
Science of the Total Environment	Ing. Michal Bošeľa, PhD.
Scientific Reports	prof. Ing. Dušan Gömöry, DrSc.
South African Journal of Botany	Mgr. Ján Kováč, PhD.
	JUDr. Mgr. Zuzana Dobšinská, PhD.
	doc. Mgr. Ing. Rastislav Šulek, PhD.
Sustainability	Ing. Klára Báliková, PhD.
	Ing. Marek Trenčiansky, PhD.
	RNDr. Martin Korňan, PhD.
	doc. Ing. Miloš Gejdoš, PhD.
	prof. Ing. Jaroslav Škvarenina, CSc.
	Ing. Marián Homolák, PhD.
Urban Forestry and Urban Greening	JUDr. Mgr. Zuzana Dobšinská, PhD.
Water	prof. Ing. Jaroslav Škvarenina, CSc.
Forestry Research Reports	Ing. Denisa Sedmáková, PhD.
Name of the domestic periodical	**Name of the assessor**
Ecological studies	prof. Ing. Jaroslav Škvarenina, CSc.
Meteorological Journal	prof. Ing. Jaroslav Škvarenina, CSc.

- Assessment Monographs: J. Konôpka, V. Šebeň, B. Konôpka,
  19 November 2004, Zvolen, Forestry Studies No. 70 - prof. Ing. Jaroslav Škvarenina, CSc.
- Special contributions for forestry practice: forest-forest-circles 10, Nature-friendly forest management - author - prof. Ing. Milan Saniga, DrSc.
- work on the commenting process of the National Forestry Programme for 2020-2030 - prof. Ing. Milan Saniga, DrSc.
- Website Pro Silva Slovakia - annotated lectures focused on the conversion of stands by cultivation practices in the sense of PBHL - prof. Ing. Milan Saniga, DrSc.

Work on joint publications:

- Collaboration with ForestREplot and SoilTemp partners on several publications, e.g. Staude et al. 2021 (Directional turnover towards larger-ranged plants over time and across habitats, Ecology Letters), Haesen et al. 2021 (Forest Temp-Sub-canopy microclimate temperatures of European forests, Global Change Biology 27), Caron et al. 2021 (Thermal differences between juveniles and adults increased over time in European forest trees, Journal of Ecology 201), Perring et al. 2021 ("Lianification" or liana invasion - is there a difference?, Frontiers in Ecology and the Environment 17), Vangasbeke et al. 2021 (ClimPlant: realized climatic niches of vascular plants in European forest understoreys, Global Ecology and Biogeography 30), Depauw et al. 2021 (Evaluating structural and compositional canopy characteristics to predict the light-demand signature of the forest understorey in mixed, semi- natural temperate forests, Appl. Opt. Veg. Sci. 2021) - doc. Ing. František Máliš, PhD.
- Oak Ridge National Laboratory USA - publication Bhagia et al. 2021. Applied Material Today 24: 101078 - prof. Dr. Mgr. Jaroslav Ďurkovič
- Phytophthora Research Centre Brno CR - publication Ďurkovič et al. 2021. Journal of Fungi 7: 969 - prof. Dr. Mgr. Jaroslav Ďurkovič
- College of Resources, Sichuan Agrarian University China - a publication of Tao et al. 2022, HAZMAT, Vol.425 - Mgr. Ján Kováč, PhD.
- Museum of National History and Department of Zoology Palacký University in Olomouc - article for the magazine Živa - RNDr. Martin Korňan, PhD.
- Bureau for Forest Management and Geodesy, Poland - collaboration on the preparation of the original scientific thesis - RNDr. Martin Korňan, PhD.
- Institute for Economic Modification of Forests, Czech Republic - collaboration on the preparation of the original scientific thesis - RNDr. Martin Korňan, PhD.

Reviews of works:

- Teaching support for forestry bioeconomy and forestry bioeconomy - ČZU Praha - review - prof. Ing. Iveta Hajdúchová, PhD.

- opponent's opinion on the doctoral thesis of Ing. Daniel Toth - FLD ČZU Praha - prof. Ing. Iveta Hajdúchová, PhD.
- opponent's opinion for inauguration proceedings doc. Ing. Vilém Jarský, Ph. D. - ČZU Praha - prof. Dr. Ing Jaroslav Šálka
- The use of modern laser scanning techniques for data collection in forest ecosystems - dissertation thesis of ČZU Praha - prof. Ing. Ľubomír Scheer, CSc.
- Conversion of forest stands to a composition closer to nature in the Jablonec nad Nisou Forest Administration - dissertation work ČZU Praha - doc. Ing. Peter Jaloviar, PhD.
- Natural Regeneration within gaps of different sizes - dissertation Mendel University Brno - doc. Ing. Peter Jaloviar, PhD.
- Prerequisites for the regeneration and cultivation of the chestnut tree (*Castanea sativa Mill.*) and its occurrence in the Czech Republic - dissertation thesis ČZU Praha - doc. Ing. Ivan Repáč, PhD.
- Diversification of forest stands and the use of saplings and semi-saplings on mid-elevation sites - dissertation thesis ČZU Praha - doc. Ing. Ivan Repáč, PhD.

Assessments of project proposals and projects under development:

- Nordic Forest Research - opinion on the project - JUDr. Mgr. Zuzana Dobšinská, PhD.
- Research and development to support the competitiveness of Slovak forestry - project report - doc. Ing. Peter Fleischer, PhD.
- Ministry of Education and Science of the Slovak Republic - preparation of reviews for projects in the VEGA commission - Ing. Pavol Hlaváč, PhD.
- Mendel University Brno CR - IGA project report - doc. Ing. Daniel Kurjak, PhD.
- PRO SILVA Slovakia Annual report year 2021 - report prepared for Pro Silva Europe- prof. Ing. Milan Saniga, DrSc.
- Elaboration of the characteristics of selected Pro Silva Slovakia objects in English language for Pro Silva Europe website:
  - Selection Forest and Conversion to Selection Forest -Demonstration Pro silva object
  - Mistresses
  - University Forest Enterprise (UFE) of Technical University in Zvolen plus Pro Silva
  - Example the mosaic beech and oak stands Kremený potok.
  - Exemplary Forests Stará Myjava- Pro Silva Chrastina ○ Exemplary Forests Stará Turá- Pro Silva Dubrava ○ Exemplary Forests Košice (11 Pro silva objects) ○ Exemplary Forests Pro Silva Počuvadlo
- NKFI (Hungaria) - Exploring the effects of environmental factors and forestry treatments on the compositional, functional and interactional dynamics of the forest microbiome - doc. Ing. Erika Gömöryová, PhD.
- British Ornithologists` Union - foreign grant assessment - doc. Ing. Peter Lešo, PhD.
- Narodowe Centrum Nauki Poland - project assessment - prof. Ing. Dušan Gömöry, DrSc.

Other cooperation:

- University of Bologna - preparation of the project COST OC-2021-1-25393 - Joint Effects of Climate Extremes and Atmospheric Deposition on European Forests - prof. Dr. Mgr. Jaroslav Ďurkovič
- Nicolaus Copernicus University in Toruń Poland - cooperation - Mgr. Ján Kováč, PhD.
- University of Belgrade Serbia - preparation of the project APVV "Ex situ conservation of the globally critically endangered species *Ochyraea tatrensis*, a strictly endemic moss of the Low Tatras - Mgr. Pavel Širka, PhD.

- Faculty of Forestry, University of Agriculture Krakow - informal professional cooperation in the field of forest phytopathology and forest protection - Ing. Pavol Hlaváč, PhD., prof. Ing. Jaroslav Kmet'j, PhD.
- HNEE Eberwalde, Landesbetrieb Forst Brandenburg, Germany:
  Professional cooperation within the project KEGA 006TUZ-4/2020 "Use of innovative approaches to increase the quality of education in the fields of Forestry and Hunting through e-learning explanatory dictionary of Slovak and German terminology

used in hunting'. For KIOLK: Ing. Pavol Hlaváč, PhD. (project leader: Mgr. Zuzana Vyhnáliková, PhD., for the German side: Dr. Ľubomír Blaško)

Organisational and professional cooperation in the preparation of the planned professional excursion of German students in Slovakia, during which they will also visit the KIOLK LF TU in Zvolen. For KIOLK: Ing. Pavol Hlaváč,PhD.

Informal professional cooperation in the field of forest protection, forestry phytopathology with a focus on wildlife damage - exchange of current knowledge and literature. For KIOLK: Ing. Pavol Hlaváč, PhD.

- MycoMedica d.o.o. Slovenia - cooperation on the basis of the Cooperation Agreement -Ing. Martin Pavlík, PhD.
- Shanghai Academy of Agricultural Sciences China - cooperation within the Cooperation Agreement between TUZVO and SAAS; cooperation on research on Ganoderma lucidum species, financed partly from APVV 17-0644; guarantor : doc.Ing.Martin Pavlík,PhD.
- Czech University of Agriculture Prague - informal professional cooperation in the field of forest protection with a focus on forest fires and the impact of protective and defensive measures on the population of lycophorid insects - Ing. Pavol Hlaváč, PhD. and prof. Ing. Jaroslav Kmet'j, PhD.
- Institute of Forest Protection and Hunting, Faculty of Forestry and Wood Technology, Mendel University in Brno - Expert cooperation in the field of forest phytopathology and forest protection - consultations, determination of fungal pathogens, opinions - Ing. Pavol Hlaváč, PhD., prof. Ing. Jaroslav Kmet'j, PhD.
- ČZU Praha - cooperation within the COST 3DForEcoTech project - Ing. Martin Mokroš, PhD.
- Involvement in the consortium, preparation of documents and submission of the application for the H2020 project Resilient Forested Landscapes under Climate Change (REFORCE) - prof. Ing. Ján Tuček, CSc., doc. Ing. Róbert Sedmák, PhD.
- Belarusian State Technological University Minsk - cooperation on the basis of the Cooperation Agreement - doc. Ing. Vladimír Štollmann, CSc., PhD.
- Saint-Petersburg State Forestry University S. M. Kirov Saint Petersburg - cooperation on the basis of the Cooperation Agreement - Assoc. Ing. Vladimír Štollmann, CSc., PhD.
- Arctic State Agrotechnological University of Yakutsk - cooperation on the basis of the Agreement with cooperation - doc. Ing. Vladimír Štollmann, CSc., PhD.
- North-Eastern Federal University M. K. Ammosova - - cooperation on the basis of the Agreement on cooperation - doc. Ing. Vladimír Štollmann, CSc., PhD.
- Izhevsk State Technical University of M. T. Kalashnikov - cooperation on the basis of the Agreement on cooperation - doc. Ing. Vladimír Štollmann, CSc., PhD.
- ZETOR Tractors Brno - non-contractual cooperation - doc. Ing. Vladimír Štollmann, CSc., PhD.
- Institute of Systematics and Evolution of Animals, Polish Academy of Sciences Krakow - research on the impact of ivy (*Hedera helix*) on bird diversity in the Western Carpathians - doc. Ing. Peter Lešo, PhD.

6. PARTICIPATION OF CREATIVE STAFF AT SCIENTIFIC AND PROFESSIONAL EVENTS ABROAD

Fig. 1 shows the evolution of the number of faculty members posted abroad. The number of staff travelling abroad has increased each year during the 2017-2021 reporting period, with the exception of 2020 and 2021, which were significantly affected by the global pandemic (down 84% from 2019). The objectives of the mobility were participation in scientific conferences, seminars, exhibitions, working meetings and coordination activities within international projects, qualification improvement events, study and research stays, etc.

The structure of these destinations has been stable over the long term, in most cases they are EU countries or other European countries, with occasional destinations outside the European continent.

Table 11 gives an overview of the mobility of LF staff within the Erasmus+ programme and Table 12 is only of a conclusive nature, where mainly due to the pandemic no mobility within the National Scholarship Programme took place.

In 2021, there was a significant decline in faculty staff participation in events and research tasks abroad in view of the global pandemic situation with COVID-19. Most of the events were conducted online.

Table 11 Erasmus+ staff mobility for the academic year 2020/2021

Surname and first name	Foreign institution	Landscape	From	to
Teaching				
Ing. Mokroš Martin, PhD.	Finish Geospatial Research Institute - virtual mobility	Finland	31.03.2021	31.03.2021
Ing. Výbošťok Jozef, PhD.	Czech University of Life Sciences - virtual mobility	Prague	26.05.2021	26.05.2021
Training				
no mobility				

Table 12 NSP mobility of LF staff for the academic year 2020/2021

Surname and first name	Foreign institution	Landscape	From	to
no mobility				

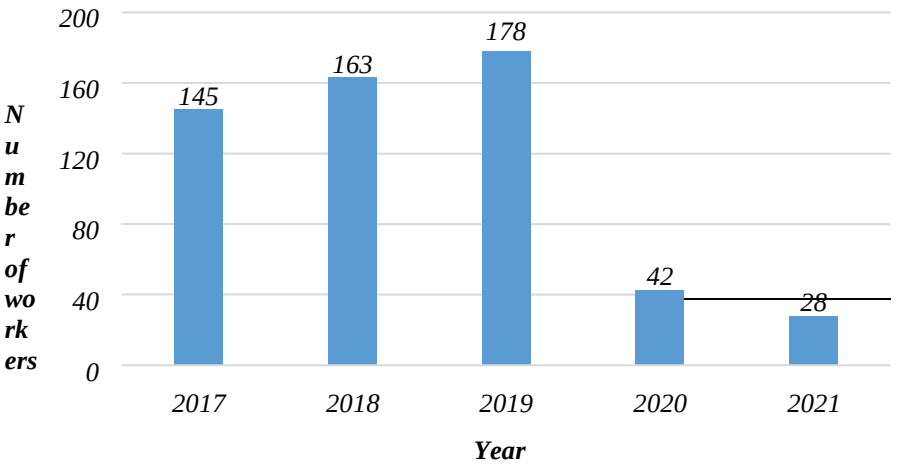


Fig.1 Development of the number of LF expatriate employees in the period 2017-2021

7. RECRUITMENT OF FOREIGN WORKERS

The development of the number of foreign staff recruited at the Faculty of Forestry is shown in Fig. 2. Similarly as in the previous case, this number is predominantly determined by

scientific and professional events at the level of departments, faculties, joint meetings and cooperation of various kinds with foreign partners.

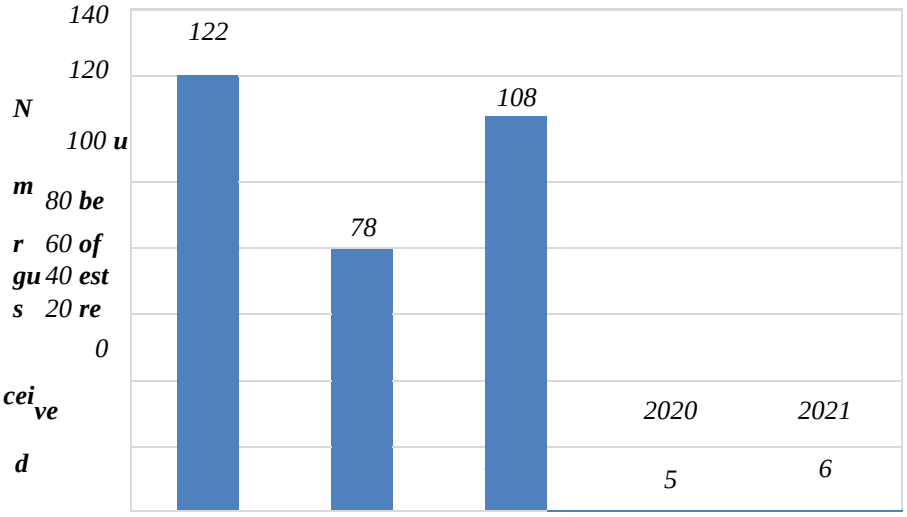


Fig.2 Development of the number of admitted guests in the period 2017-2021

Within the share of foreign workers, visitors from European countries predominated. However, the Faculty of Forestry was also visited by guests from non-European countries. However, their number was significantly reduced due to the global pandemic (Fig. 2, a decrease of 95% compared to 2019).

Tab. 13 Erasmus+ mobility of foreign teaching staff and employees per academic year 2020/2021

Surname and first name	Foreign university	Countries and	From	to
Jitka Menhazova	Mendel University in Brno	Czech Republic	23.08.2021	02.09.2021

Among other activities of the LF departments in 2021, which are examples of bilateral foreign mobility of creative workers, it is necessary to mention :

- online MVK Lesnaya inženeria materialoscience and design, Belarusian State Technological University
  University of Minsk, 01.02. - 13. 02. 2021 - doc. Ing. V. V. Štollmann, CSc. PhD.
- Lecture at the AGATU 2021 Summer School - online, Arctic State University of Agri-Technology University of Yakutsk, 26. - 31. 08. 2021 - doc. Ing. V. V. Stollmann, CSc. PhD.
- Meeting of economically oriented forestry and timber departments from the Czech Republic and Slovakia, conference with the participation of 13 foreign participants, 23.9.-24.9.2021 - prof. Dr. Ing. Jaroslav Šálka
- International online scientific conference "Financing Forests-Tree 2021", 25.11.2021, KERLH, 17 foreign participants - prof. Ing. Iveta Hajdúchová, PhD.
- Online RJ course organized in the framework of the Winter School 2021 in cooperation with Izhevsk State Technical University M. T. Kalashnikov. Funded by KEGA project, course participants: students of LF, 01.10.2021 - 30.12.2021
- Expert excursion in selected objects of LS Duchonka on PBHL issues - 09. 06. 2021 - prof. Ing. Milan Saniga, DrSc.

- Expert lecture on the topic: close to nature forest management in oak and beech stands, Municipal forests Krupina, 09. 09. 2021 - prof. Ing. Milan Saniga, DrSc.
- The use of genetics in artificial breeding of the sage grouse, international seminar in Ostrava, September 2, 2021 with the participation of 14 foreign and 30 domestic participants, event guarantor - prof. Ing. Ladislav Paule, PhD. and Petr Smutný - Ing. Diana Krajmerová, PhD. and Ing. Peter Klinga, PhD.

- Forest typology - 70 years in the service of forestry and nature conservation, international conference on-line, 18 November - 19 November 2021 with the participation of 8 foreign and 70 domestic participants - Assoc. Ing. František Máliš, PhD. and prof. Ing. Karol Ujházy, PhD.
- Ecosystem services and decision support in forest management - final seminar of the H2020 Alterfor project, Hottel Kráľová, 9 September 2021 with the participation of 41 participants (1 Czech Republic) - prof. Ing. Ján Tuček, CSc., doc. Ing. Róbert Sedmák, PhD., Ing. Juraj Čerňava, PhD.
- Final seminar of the FORCLIMEX project APVV-16-0325: "Extreme climate change manifestations and their impacts on the growth and production of forest stands", organized by:NLC, TU in Zvolen, online seminar, 30 November 2021 - doc. Ing. Katarína Střelcová, PhD.
- "Urban climate and heat island", conference, 10.11.2021 with the participation of 30 participants (29 Czech Republic), event guarantor: Dr. Jaroslav Rožnovský, Czech Hydrometeorological Institute MU Brno - prof. Ing. Jaroslav Škvarenina, CSc.

8. ACADEMIC MOBILITY OF STUDENTS

Fig. 3 shows the development of the number of students admitted from abroad and the number of LF students sent to foreign universities and faculties in the period 2017-2021. These mobilities were mainly carried out within the Erasmus+ programme (LF as a partner) and COST STSM[1] , CEEPUS, respectively within the National Scholarship Programme, also participation in international conferences (PhD students, post-doctoral fellows). Their posting abroad mainly serves the purpose of acquiring professional knowledge, establishing contacts and friendships, which in many cases can be the basis for successful international cooperation in the future. Some students have also represented the Faculty of Physics at international scientific conferences and conferences of the School of Science and Technology with their theses. Again, it should be noted that a global pandemic is behind the significant decline in the number of students admitted (down 75% in 2019/2020) and seconded (down 77% in 2020/2021) in 2021. The enrolment status of students between 2020 and 2021 has not changed.

Tables 14 and 15 give an overview of Erasmus+ student mobility. Table 16 presents the mobility of students from abroad admitted to the Faculty of Forestry under the NRP and other mobility schemes.

[1] STSM short term scientific mission

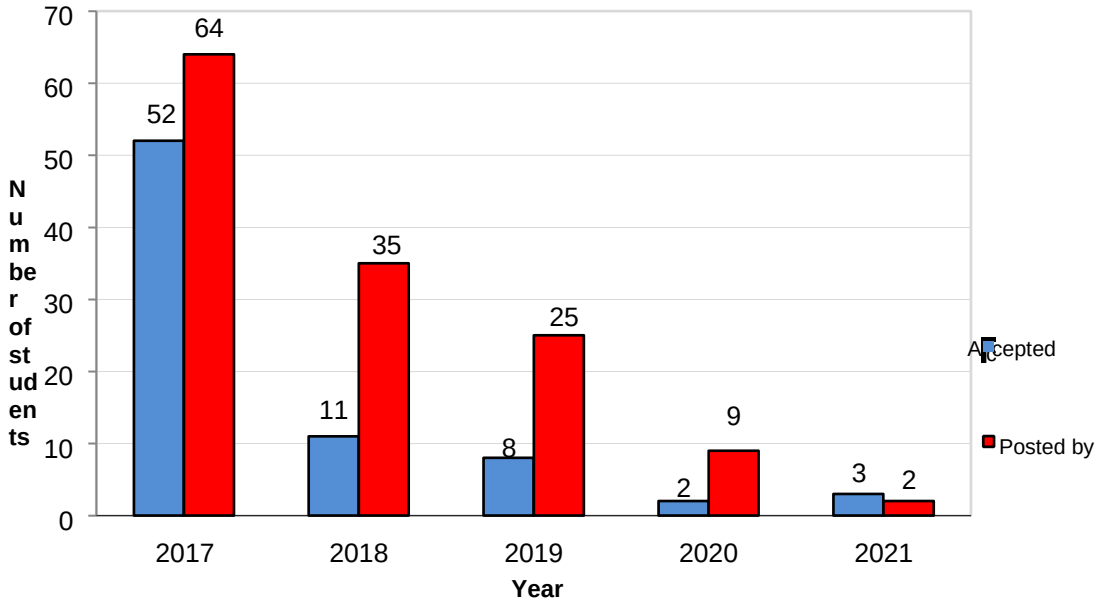


Fig. 3 Development of the number of admitted and seconded LF students from/to abroad in the period 2017 - 2021

Table 14 Erasmus+ Mobility of LF students in the academic year 2020/2021

Surname and first name Student	Foreign university	Landscape	From	to
Study				
no mobility				
Internship				
Mag.biol Petek Petrík Anja	Josip Juraj Strossmayer University of Osljek	Croatia	01.03.2021	01.05.2021
Ing. Petrík Peter	Josip Juraj Strossmayer University of Osljek	Croatia	01.03.2021	01.05.2021

Tab. 15 Erasmus+ mobility of foreign students admitted to the Faculty of Forestry in the academic year 2020/2021

Surname and first name Student	Foreign university	Landscape	From	to
Study				
Jozef Kaděrka	Mendel University Brno	Czech Republic	22.05.2021	25.05.2021
Internship				
no mobility				

Table 26 NSP and other mobility schemes for international students for the academic year 2020/2021

Surname and first name	Foreign institution	Landscape	From	to
Study				

no mobility				
Internship				
Mohammad Mukarram	Aligarh Muslim University	India	15.02.2021	15.12.2021
Xiaoling Wang	East China Normal University, Shanghai	China	22.02.2021	26.06.2021

Thanks are due to all the departments that provided teaching and professional programme for the foreign students and also to the institutions that contributed to the successful completion of their stays.

9. PARTICIPATION OF THE LF IN INTERNATIONAL PROGRAMMES AND PROJECTS SUPPORT FOR TEACHING, SCIENCE AND RESEARCH

Projects of this type have the potential to support mobility, the preparation and submission of major international projects, as well as publication in international scientific journals.

9.1 Projects to support teaching

There were no projects with this theme in 2020.

9.2 Projects to support science and research

COST, H2020 and LIFE Lynx - annotations are given in the Research Activity Assessment and doctoral studies for the year 2021.

9.3 Mixed projects

DAAD "Ostpartnerschaften" solved in cooperation with Georg August Universität Göttingen and TU in Zvolen guarantor: prof. Ľ. Scheer, prof. Dr., W. Kurth

Annotation of results for 2021:
Long-term topics of mutual cooperation are applied informatics, spatial information systems, geoinformatics, forest modelling and growth simulators. The planned mobilities for 2021 have been postponed to 2022 due to the unfavourable pandemic situation.

10. COOPERATION WITH DOMESTIC PARTNERS

Cooperation with domestic partners is an important part of the educational and scientific research activities of the LF at the national level. In 2021, several meetings were held between representatives of the Faculty of Forestry and representatives of organisations of the Ministries of the Ministry of Agriculture and Rural Development of the Slovak Republic and the Ministry of the Environment of the Slovak Republic, as well as with representatives of the State Enterprise Forests of the Slovak Republic at the level of the DG and the management of the plants, as well as with representatives of organisations of forest owners and users. The meetings

were held online due to the pandemic situation of COVID-19. The institutions with which the Faculty of Forestry has long-term cooperation are listed in Table 16.

Table 16 List of long-term cooperation institutions

Institution	NameType of cooperation	
Ministry of Environment of the Slovak Republic	prof. Ing. Dušan Gömöry, DrSc.	member of the Biosafety Commission
	KAZMZ	collaboration
	Ing. Pavol Hlaváč, PhD.	presentation of forest protection methods - preparation of the amendment on national parks
Ministry Agriculture and rural development	KAZMZ	collaboration
	prof. Dr. Ing. Jaroslav Šálka	lectures in the field of forestry legislation
	prof. Ing. Milan Saniga, DrSc.	drafting comments on the Decree amending Decree No. 453/2006 Coll. on forest management as amended by Decree No. 15/2015 Coll.
	doc. Ing. Miloš Gejdoš, PhD.	evaluation of content themes
Municipal Office Sasa	Ing. Pavol Hlaváč, PhD. prof. Ing. Jaroslav Kmet'a, PhD. Pavol Gibas	professional cooperation in the field of arboriculture when assessing the health of trees
Saint Anton Museum	Ing. Pavol Hlaváč, PhD. prof. Ing. Jaroslav Kmet'a, PhD. Pavol Gibas	elaboration of a professional expertise to assess the health status of the trees
Forests SR, š.p. Banská Bystrica	Ing. Blanka Giertliová, PhD.	organising a professional colloquium for students in the field of forest economics
	doc.Ing.Vladimír Štollmann,CSc.PhD.	collaboration
	KAZMZ	collaboration
Bratislava selfgoverning region	KERLH	cooperation in applied research projects
Forests SR, š.p. OZ Semenoles	doc. Ing. Ivan Repáč, PhD.	experiments in nursery centres, Jochy and Orava dam, technical and material support for scientific research activities, exchange of acquired knowledge
LS Poltár	doc. Ing. Miloš Gejdoš, PhD.	drawing up an expert opinion
ML Banská Bystrica	KERLH	cooperation in APVV projects
ML Kremnica	prof. Ing. Iveta Hajdúchová, PhD.	financial management consultancy
TANAP State Forests	doc. Ing. František Máliš, PhD. Ing. Peter Klinga, PhD.	collaboration
	Ing. Pavol Hlaváč, PhD.	professional work in the field of forest protection and entomology, professional consultations
	doc. Ing. Peter Fleischer, PhD.	Implementation of the APVV project for carbon balance assessment using the eddy covariance method
	Ing. Peter Fleischer, PhD.	evaluation of growth changes in trees, measurement of photosynthesis rate and air conductivity in spruce trees
	KERLH	cooperation in APVV projects

	Bachledka Ski & Sun prof. Ing. Jaroslav Kmet'a, **Trail through the** PhD. **treetops Bachledka**	
	prof. Ing. Karol Ujházy, PhD. **SOP SR Banská Bystrica** Slovak Republic Mgr. Pavel Širka, PhD.	
LOS Banská Štiavnica	Ing. Pavol Hlaváč, PhD.	cooperationin the field of forest protection, phytopathology and entomology, provision of HC, consultations, determinations
	Ing. Peter Klinga, PhD.	cooperation
		cooperation in the protection of forest stands growing in the vicinity of the Bachledka treetop trail from the aspect of their protection against bark beetles
	Ing. Pavol Hlaváč, PhD.	preparation of the Catalogue of Biotopes of the monitoring ofspecies of European i eration on the preparation of the APVV m project

KERLH	p o r t a n c e , c o o p	collaboration

	KAZMZ	collaboration
Institute of Forest Ecology of the Slovak Academy of Sciences Zvolen	Ing. Peter Klinga, PhD.	cooperation on research projects (APVV, VEGA)
	Mgr. Pavel Širka, PhD.	project VEGA 2/0132/21
	Ing. Michal Bošeľa, PhD.	collaboration
	doc. Ing. Daniel Kurjak, PhD.	solving a joint VEGA project
	Ing. Peter Fleischer, PhD.	implementation of the joint project APVV- 16-0306
	doc. Ing. Martin Pavlík, PhD.	cooperation on mycological research, publication of a scientific article
Botanical Institute of the Slovak Academy of Sciences	prof. Ing. Karol Ujházy, PhD.	work on monograph Plant communities of Slovakia 6 - forests and shrubs
	doc. RNDr. Judita Kochjarová, CSc.	3 scientific publishing projects of national importance, VEGA project
	doc. Ing. František Máliš, PhD.	collaboration
	Mgr. Ján Kováč, PhD.	collaboration on the publication Vaculík et al. 2021, HAZMAT Vol. 415
	Mgr. Pavel Širka, PhD.	cooperation on the VEGA 2/0132/21 project, APVV-19-0134
PÚ SAV Košice	doc. Ing. Erika Gömöryová, CSc.	cooperation on the project APVV-19-0142, preparation of joint publications
Research Institute Animal Production Nitra	KAZMZ	Opposition, membership in committees, reviewing publications, teaching
National Forestry centre Zvolen	prof. Dr. Ing. Jaroslav Šálka doc. Mgr. Ing. Rastislav Šulek, PhD. JUDr. Mgr. Zuzana Dobšinská, PhD. Ing. Jozef Výbošťok, PhD. Ing. Klára Báliková, PhD.	solving research tasks
	doc. Ing. František Máliš, PhD. prof. Ing. Karol Ujházy, PhD.	renewal and database of TRP areas
	Ing. Michal Bošeľa, PhD.	collaboration
	KAZMZ	collaboration
	doc. Ing. Erika Gömöryová, CSc.	cooperation on the project APVV-19-0142
	doc. Ing. Martin Pavlík, PhD.	cooperation on research on *Ganoderma lucidum* fungi, joint publications, identification and creation of a database of forest pests
	Ing. Peter Fleischer, PhD.	assessment of the dynamics of the leaf index areas in the Bienska research facility valley
	doc. Ing. Daniel Kurjak, PhD.	submission of a joint APVV project
VÚPOP Prešov	doc. Ing. Erika Gömöryová, CSc.	preparation of joint publications
PLATAN	Ing. Pavol Hlaváč, PhD. prof. Ing. Jaroslav Kmeťa, PhD.	professional cooperation in the field of arboriculture
Slovak Environmental Inspectorate	prof. Dr. Ing. Jaroslav Šálka	expert lectures in the field of forestry legislation

OÚ B. Bystrica, Banskobystrica regional road administration	Ing. Pavol Hlaváč, PhD. prof. Ing. Jaroslav Kmet'a, PhD. Pavol Gibas	elaboration of professional expertise before the municipality of Králiky
OÚ Turčianske Teplice T. Teplice	Ing. Pavol Hlaváč, PhD. prof. Ing. Jaroslav Kmet'a, PhD.	advisory and consultancy services **and Golden Spa** in the field of arboriculture
State Veterinary and Food Administration of the Slovak Republic	KAZMZ	collaboration
Slovak Hunting chamber	prof. Dr. Ing. Jaroslav Šálka	expert lectures in the field of forestry legislation
	KAZMZ	collaboration
Institute of Parasitology of the Slovak Academy of Sciences Košice	KAZMZ	collaboration

Central European Institute of Animal	KAZMZ	collaboration
Faculty of Natural Sciences		Mgr.Pavel Širka, PhD. cooperation project VEGA 2/0132/21
UK Bratislava Faculty of Science	prof. Dr. Mgr. Jaroslav Ďurkovič Mgr. Ján Kováč, PhD. Mgr. Pavel Širka, PhD.	collaboration work on publication Yadav et al. 2021 collaboration on publication
UK Bratislava Department of Ecology	KAZMZ	collaboration
UPJŠ Košice	prof. Ing. Ján Tuček, PhD.	cooperation on the oppositions of the PoA
UK Bratislava Botanical garden Mudroom	prof. Ing. Karol Ujházy, PhD.	work on monograph Plant communities of Slovakia 6 - forests and scrubs
STU Bratislava	prof. Ing. Jaroslav Škvarenina,CSc.	opponent's opinion on the PhD thesis
University of Veterinary inof Forestry and Košice Pharmacy	doc. Ing. Martin Pavlík, PhD. KAZMRecommendations	multi-year cooperation with the Department of Chemistry, Biochemistry and Biophysics, Institute of Pharmaceutical Chemistry on scientific Publicatiresearch on fungi of the genus Cordyceps outputs, including an arti le in and common , membership in committees,
Slovak Agricultural University of Nitra	doc. Ing. Erika Gömöryová, CSc. KAZMZoponentures	assessment of publications preparation of joint publications , memberships in union commissions, assessment of publications, APVV solutions
University of Žilina Research Institute of High Mountain	doc. Ing. Daniel Kurjak, PhD. Mgr. Pavel Širka, PhD.	scientific cooperation author's cooperation on the publication
Biology Zvolenská teplárenská, a.s.	doc. Ing. Martin Lieskovský, PhD.	elaboration of expert opinion
HS Hrinova	doc.Ing.Vladimír Štollmann,CSc.PhD.	Cooperation
ZETOR Enginering Slovakia Bytča	doc.Ing.Vladimír Štollmann,CSc.PhD.	cooperation
Ecology Nitra National Zoological garden Bojnica **UMB Banská Bystrica**	KAZMZ Ing. Pavol Hlaváč, PhD.	collaboration cooperation in the field of phytopathology and mycology, preparation of the symposium Wood-destroying fungi 2022

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11. LF MARKETING COMMUNICATION

As part of the communication strategy, the LF applied the following marketing tools in 2021, the scope of which was significantly limited due to the impact of the anti-pandemic measures:

a. *public relations, which* prevailed among the various means. We include: professional seminars, press conferences, lectures, publications for professional and lay public, articles in newspapers and magazines, matriculation, ring activities for professional and lay public, creation of faculty image through social networks, giving interviews for professional, TV talk shows, forest pedagogy, faculty events, etc.).
b. *personal promotion of the* possibility of studying at LF in the framework of trips to high schools and fairs,
c. *Paid advertising* on social networks aimed at promoting studies at the Faculty of Forestry,
d. *direct marketing*, where the faculty reaches out directly to its existing students for various educational and extra-curricular activities via SMS gateway; and
e. *corporate identity*, which included the production of promotional items in accordance with the LF TUZVO design manual (T-shirts, bracelets, pens, notebooks, gift items, etc.)

11.1 Marketing activities of LF

At the beginning of this part of the report, it is necessary to state again that the continuing impact of the global pandemic of COVID-19 had a significant negative impact on the use of marketing activities of the faculty in the analyzed year 2021. The transition to distance learning, the ban on meetings, the restriction to online form of contacts only, has contributed to a very weakened form of use of communication tools, as in this segment naturally prevail "public relations" and personal communication. For this reason, most marketing activities have been carried out only in the electronic environment or in the television and print media. This unfavourable situation was also reflected in the decrease in the number of enrolled first year Bachelor students compared to the previous year 2020, from 159 to 132, i.e. a decrease of 17% (Fig. 4).

As part of the promotion of the Faculty of Forestry and its study programmes as well as scientific research activities, the brochures "Guide to studying at the Faculty of Forestry" in Slovak and English, as well as the Faculty of Forestry websites www.lesnickekruzky.sk and www.lesnickyvyskum.sk were updated for the year 2021. All these brochures are also available online in a browsable form on the forestry website of the main portal https://lf.tuzvo.sk/sk.

Most of the Faculty's activities were presented in short text-image information and videos on the Faculty's website (https://lf.tuzvo.sk/), many of them are shared on Facebook, Instagram as well as on the Faculty's YouTube channel.

We have also paid adequate attention to the promotion of the Faculty of Forestry and communication with the public on social networks (FB and Twitter, LinkedIn, YouTube channel, Instagram), where many information for students and other target groups (prospective students, professional and professional organizations, alumni community, supporters of the Faculty of Forestry, job offers for graduates, etc.) are disseminated and shared. The most relevant information was also promoted through paid advertising. We created promotional videos as a form of online DOD of the various major components of the LF such as the upgraded laboratories, the Komatsu harvester, the new LMP laboratory, the CAVE virtual classroom, and scientific and popular science lectures.

The main marketing activities in 2021, which the faculty organized mainly under its own responsibility, are in chronological order within the calendar year 2021 as shown in Table 17.

Table 17 Overview of LF marketing activities for 2021

Date	Marketing activity
20 January	Promotion of the development of a forest development simulation and visualisation tool called SIBYLA Lex Eterna on social networks
18 February	Lecture by Dr. František Mális as a guest in the scientific confectionery within the Centre Scientific and Technical Information of the Slovak Republic on "Biodiversity in times of global change"
20 February	Online meeting of LF students with the dean of LF
12 March	Online meeting of LF students with the dean of LF
19 March	Mental Coaching with Mgr. Peter Bielik for LF students and staff
24 - 26 March	Promotion of forestry rings on social networks and websites www.lesnickekruzky.sk
29 March	Interview with the Dean of the Faculty of Forestry for lesmedium.sk and the magazine Les & Letokruhy
20 April	Promotion of Dr. Michal Bošela and his participation in international projects COST Action CA15226 CLIMO

23 April	Online lecture by neurogeneticist Dr. Tomas Eichler for students and staff of the Faculty of Medicine entitled "How sleep affects your decision-making" to promote personal growth
27 April	Promotion of the newly launched university incubation programme - "Start up competition TUZVO"
May 5	Public relations in the field of forest pedagogy with the participation of student Bc. Martin Danilák
May 7	Presentation of the award to prof. Korpel for nature-friendly forest management according to the principles of the PRO SILVA movement to the grower LS Paráč, OZ Námestovo Ing. Pavel Dendys in the presence of RTVS and former Minister of Agriculture Jan Mičovský.
16 May	Discussion with Ing. Tibor Pataky, CSc. for the magazine Les & Letokruhy on the topic of management in the habitats of the mountain red deer
1 June	Participation of LF at the opening of the first forest school for children in Slovakia (Levice)
15 June	The Department of Economics and Management of Forestry organised the workshop together with NLC within the project TestPESLes promoted in the magazine Les & Letokruhy
30 August	Participation of LF on the new trail of the Forestry Arboretum Kysihýbel near Banská Stiavnica
10 September	LF workshop within the ALTERFOR project on Ecosystem Services and Decision Support in Forest Management
13 September	Inauguration of the new LMP Laboratory built with financial assistance MŠVVaŠ SR within the project KEGA No. 007TU Z-4/2019 under the leadership of doc. Ing. Vladimír Štollmann, CSc., PhD.
13 September	Working visit to the friendly Faculty of Forestry in Brasov (Romania) with the participation of Prof. Viliam Pichler, LF Secretary and LF External Relations Officer.
27 September	Opening of the Academic Year 2021/2022 for first year students of the Faculty of Forestry
23 - 24 September	Meeting of economically oriented forestry and timber departments from the Czech Republic and Slovakia organised by KERLH LF
27 September	Lecture doc. Stollman for pupils of the seventh and ninth grade of the elementary school P. Jilemnického 1813/1 in Zvolen with illustrative demonstrations
4 October	Ascent to the Deserted Castle 2021 for first year students of the Faculty of Forestry
4 October	Virtual Open Day SAIA, n. o.
4 October	Promotion of the LF fishing club in the framework of its activities on the Kováčov Pond
25 October	Guest of RTVS Experiment Dr. Peter Klinga from the Department of Phytology on the topic Bears
25 October	Opening of the Children's Forestry University in the school year 2021/2022
10 November	Filming for RTVS VAT programme on the application of the Sibyl forest growth simulator using game-engine
10 November	Forest pedagogy for pupils of 1st - 4th year of primary school Porúbka 20 on the theme "Winter in the bird kingdom"
18 November	Meeting of LF management with foreign PhD students and master from India and Indonesia.
19 November	Meeting of the LF management with successful students, awarded by the Literary Fund for the best work of the Student Scientific Conference 2020/2021 - Ing. Kristína Pulišová and Ing. Peter Petrík, PhD.
23 November	Meeting of the leaders of the rings at the LF with the management of the LF

1 December	Online St. Nicholas quiz for LF students via Kahoot platform
6 December	Online recruitment and membership meeting of the beekeeping club at the Faculty of Forestry
11 December	RTVS 2 aired an article with the continuation of the development of the Sibyl growth simulator at the Faculty of Forestry in the Science and Technology magazine with Gregor Mares (VAT). In the programme, the Dean of the Faculty of Forestry, prof. Ing. Marek Fabrika, PhD.

11.2 LF Student Portfolio

Within the 2016-2021 reporting period, the portfolio of first-year students at LF continues to be clearly dominated by three main groups (clusters) of students (Figure 4), namely: *forestry secondary schools (*average share of 44% of the total number of students), *grammar schools (*25%) and *technical secondary schools* (this includes electrical, civil, industrial, mechanical and vocational - 11.3%). Despite the fact that the number of enrolled students reached the highest level achieved in recent years (229 students, including repeating students), the number of students enrolled in the first year of the Bachelor's degree in 2021 decreased by 17% compared to 2020.

Figure 5 documents the distribution of the number of the largest group of students from forestry SHSs. For the period 2019-2021, we can conclude that on average they have the largest representation

students from Banská Štiavnica (about 42% of the number of all students from forestry secondary schools), Liptovský Hrádok (about 31.6%) and Prešov (25%), a minority of students from the forestry secondary school from Tvrdošín and from the secondary vocational school of services and forestry from Banská Štiavnica. In 2021, the most numerous forestry school was Liptovský Hrádok (38.89%).

In contrast, the representation of grammar school students as the second largest group of students at the LF with a 25% share (Figure 6) shows the following over the period under study:

a. *the high variability of the representation of individual cities within the Slovak Republic between years,*
b. *a low number of students per grammar school in the range of 1-3 students and*
c. *the overwhelming concentration of grammar schools from the Central Slovak region (Banskobystrický and Žilinský). In the last two years 2020-2021 there is a trend of increasing number of students from the West Slovak region (Bratislava, Malacky, Nitra)* The cities that had the highest representation of grammar school students during the entire period under study include Brezno, Zvolen, Banská Bystrica, Krupina, Bardejov, Rožňava and Košice.

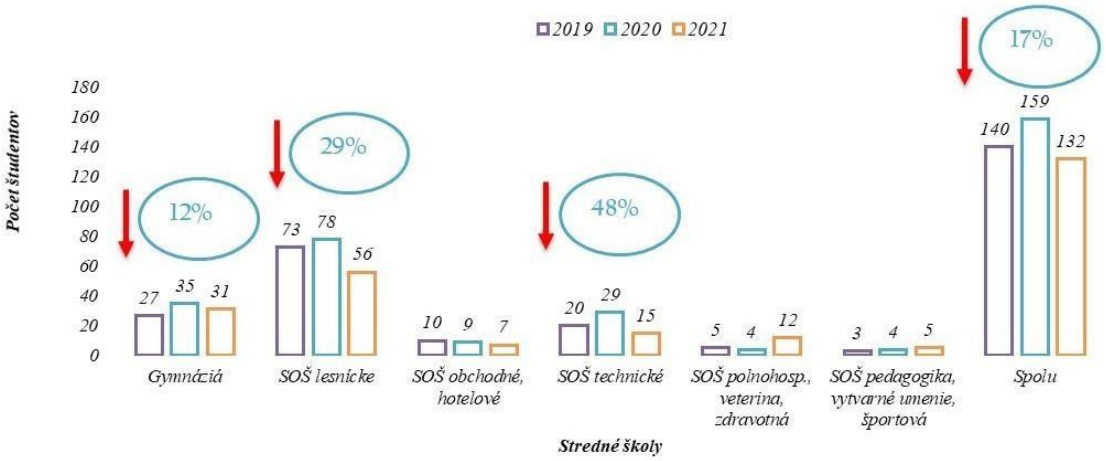


Fig. 4 Evolution of the number of secondary school students enrolled in the first year 20192021

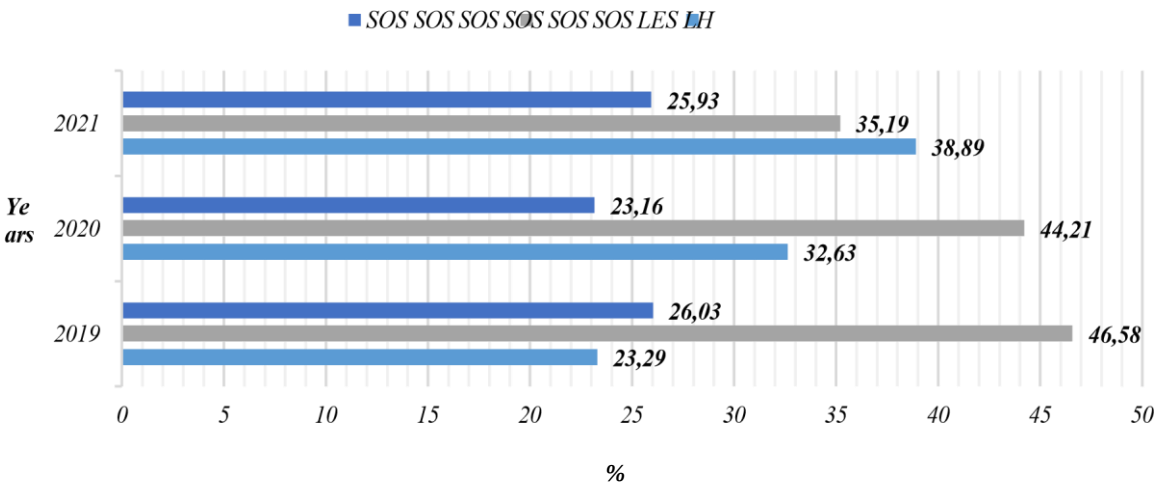


Fig. 5 Evolution of the percentage of students in the total number of students from forestry secondary schools in 2019-2021

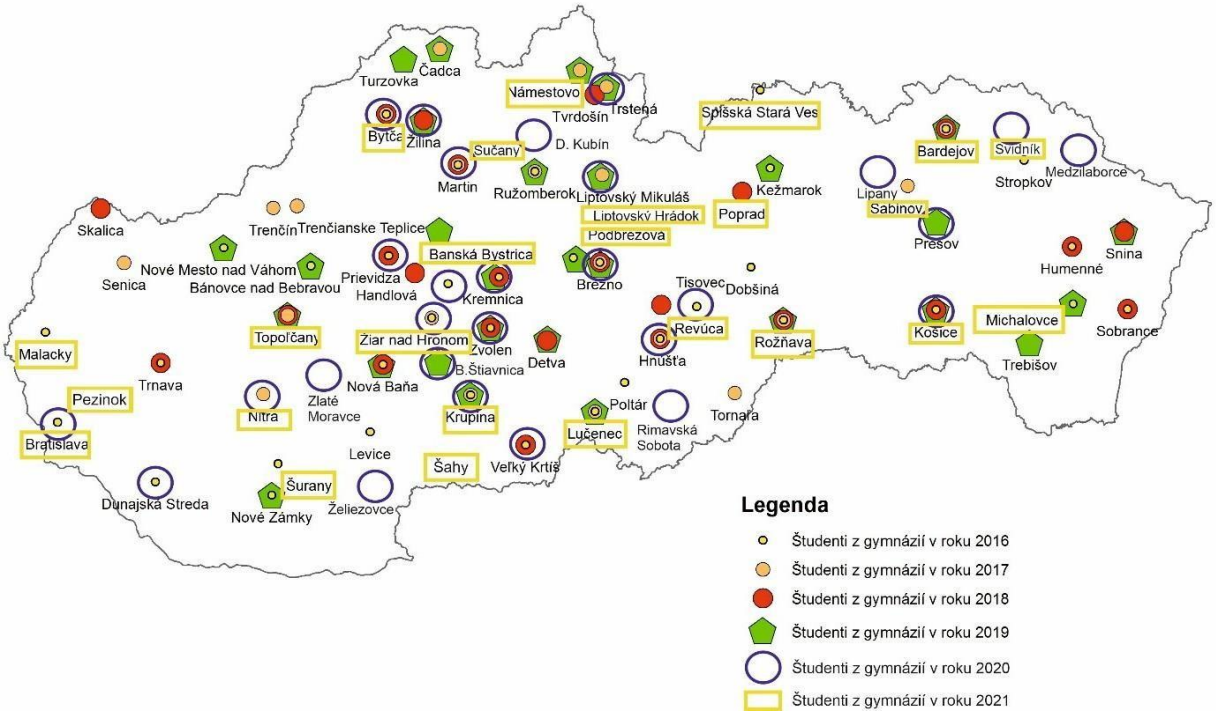


Fig. 6 Evolution of the representation of grammar school students in the first year of LF within the cities of Slovakia 2016-2021

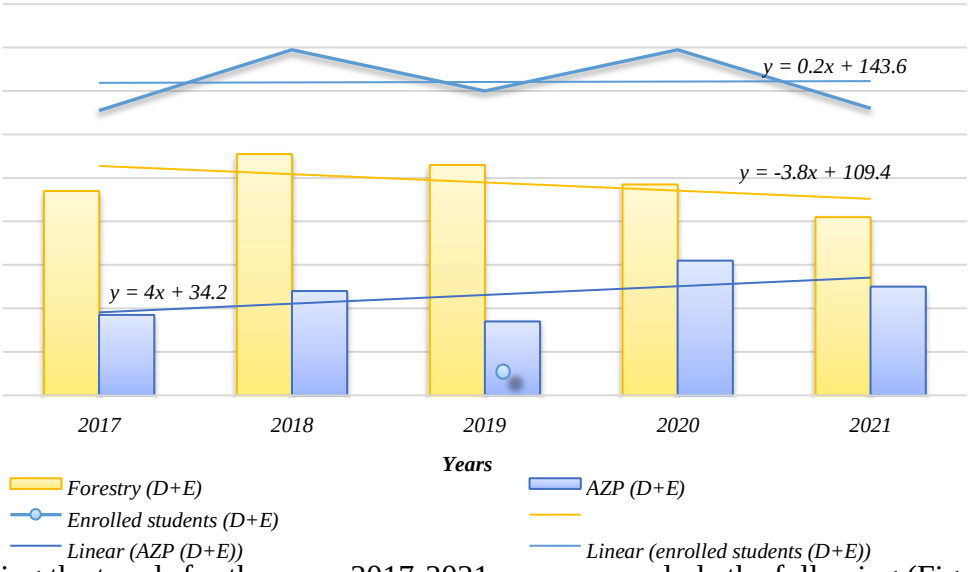


Fig.7 Comparison of enrolment trends (2017 - 2021)

Comparing the trends for the years 2017-2021, we can conclude the following (Figure 7):

- The total number of students enrolled (full-time and part-time) in the first year of the Bachelor's degree fell in the last year 2021 by 17%,
- *The AZP* study programme has shown an increasing trend over the last 5 years and the study programme
  Forestry slightly downward trend,
- The total enrolment of students in the 2017-2021 reporting period has, despite its variability ($_{vr}$ = 8.6%) balanced trend.

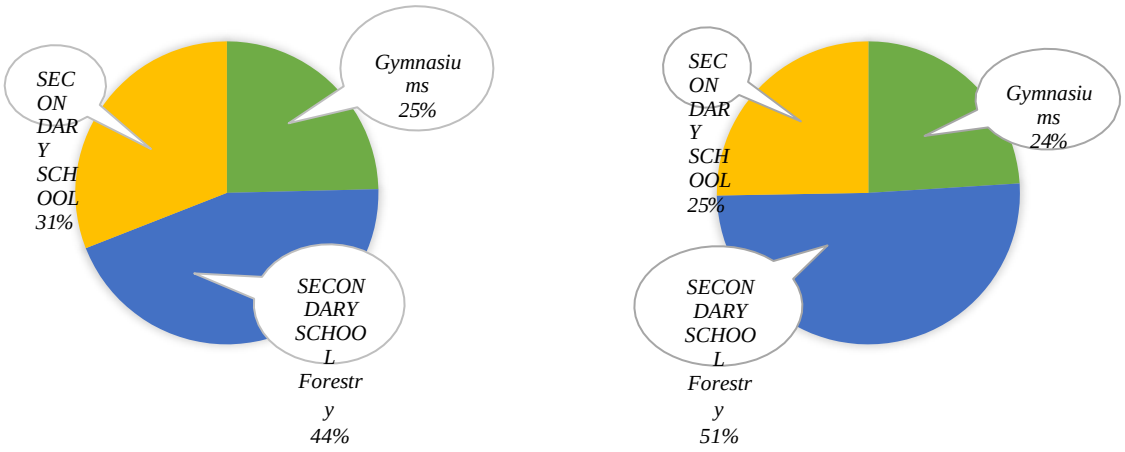


Fig. 8a Proportion Secondary schools in the LF portfolio 2021Figure 8b Share of secondary schools in the LF portfolio 2016 - 2021

Figures 8a and 8b detail the three main groups of students in the LF portfolio. It can be noted that on average over the last 5 years, forestry high school students make up 51%, high school students 24% and other high school students 25%. From the last surveyed year 2021, even non-forestry high school students are predominant (Figure 8a).

12. DRAFT EXTERNAL RELATIONS TASKS FOR 2022

In 2022, the strategy of promoting and motivating the personal growth of students for the purpose of their employability on the labour market, as well as the motivation of scientific and pedagogical staff of the faculty for the purpose of achieving quality in their teaching and research activities will be continued. *In view of the very uncertain outlook of the situation regarding the pandemic disease COVID-19, it will be necessary to continuously adapt marketing activities towards secondary school students, students of the Faculty of Forestry, their potential employers, as well as the scientific and pedagogical staff of the Faculty.* Efforts will be made to encourage, motivate students in their full-time as well as distance learning, promote the quality of the offered online/commented lectures and tutorials, promote scientific and other important outputs of the faculty's distinguished students and scientists in TV and print media as well as on social networks in the form of paid advertising, promote interdepartmental as well as interfaculty scientific teams with a tendency to form project teams (also on an online platform) on a spin-off basis.

Task 1

Promotion and support of the quality of education and scientific activities of the Faculty of Forestry Continue to promote and motivate the personal growth of LF students in order to make them employable in the labour market with tailored marketing tools:

- face-to-face, telephone or online communication with potential employers in the LH sector,
- meeting with students in both face-to-face and online meetings,
- implementation and promotion of combined forms of education (face-to-face and distance learning),
- Motivating lectures for mastering distance learning in the form of online couching,
- Active networking for ring, project activities, mobility and social marketing.

Similarly, for the scientific and pedagogical staff of the Faculty of Science, online couching, active networking for mobility and social marketing will be used to achieve quality in teaching and research activities.

Task 2

Promotion and support of interdepartmental as well as interfaculty research teams

Support of interdepartmental and interfaculty student scientific teams within the framework of the LF SVOČ with an orientation towards innovative projects with the aim of forming spin-off-based project teams. Similarly, the aim is to develop this activity among scientific and teaching staff towards achieving higher competitiveness of submitted research projects.

Task 3

Improving relations with secondary schools and international educational and research institutions

Promotion of the faculty at national and international level in two main areas: scientific activities (electronic and personal promotion of scientific teams at professional forums) and study opportunities, faculty environment (modern and creative interior of TUZVO, online brochures, online fairs, international student activities, Erasmus+, CEEPUS) in conjunction with the city of Zvolen (green infrastructure and biotechnological innovations). Cooperation with secondary schools and involvement of their students in the faculty's SVOČ and research projects (www.lesnickyvyskum.sk).

Efforts to establish individual top scientists of the faculty and their teams within national and international structures of institutions such as EFI and IUFRO.

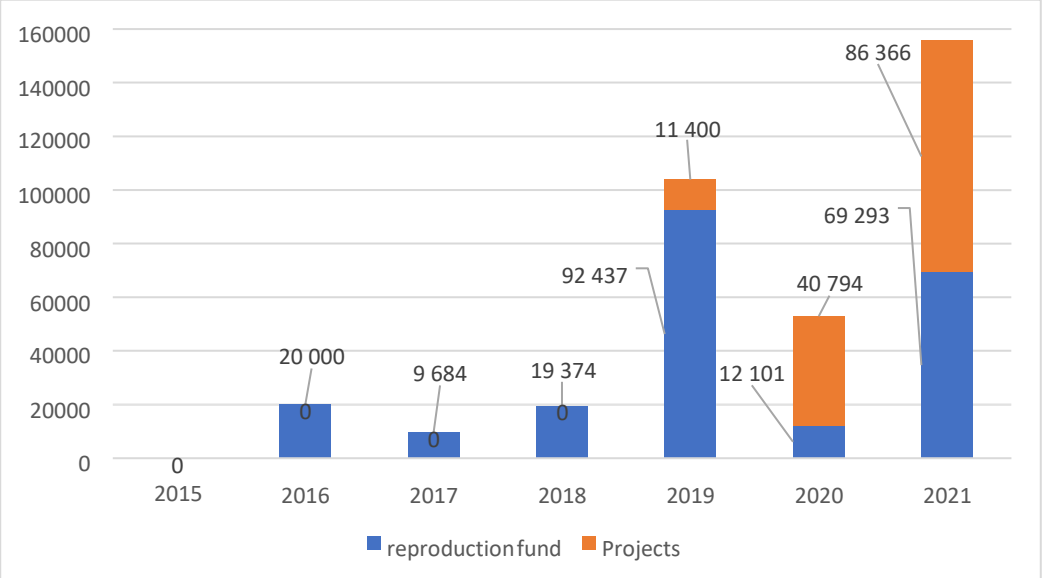
7. Management faculty

The draft methodology for the distribution of the TU in Zvolen subsidy for the year 2021 and the procedure of budgeting was discussed at the meeting of the Rector's College of the TU in Zvolen on 18 February 2021. Subsequently, the Academic Senate of the Technical University of Zvolen at its meeting on 25 February 2021 approved the proposal for the distribution of the subsidy of TU Zvolen and the budgeting process for 2021.

I. Funds for capital expenditure - subsidy

Funds for capital expenditures from the endowment have not been allocated to faculty in 2021. In the long term, the faculty provides capital development only from faculty-driven projects and the faculty reproduction fund. An overview of investments through capital expenditures since 2015 is shown in the chart below (Figure 1).

Fig. 1: Evolution of LF capital expenditure in Euros per year 2015-2021 by source funding



Capital expenditure has increased by €102 764 compared to 2020. The highest share of capital expenditure was drawn from the reproduction fund in the amount of € 69 923. The detailed implementation is described in point IV. From the Fomon project, €66,187 was drawn down for capital funds and this was for the purchase of a laser and ultrasonic rangefinder with GPS, a combined spectrometer and fluorometer, a drone and a nanoscope. From structural changes, € 20 179 was used for capital expenditure for the purchase of fume cupboards and furniture for laboratories.

II. Funds for current expenditure - goods and other services - subsidy

a) Faculty education and operation - programme 0771100

The faculty was allocated current expenditure of **€ 4 137** for goods and other services for the provision of education and operation. The saving from 2020 was 2 851,90 € carried over as a balance to the following year. An overview by department is given in the table below (Table 1).

Table 1: Utilization of current endowment funds in individual departments in 2021

Department	Subsidy r.2021	Balance from 2020	Drawdown 2021	Balance 2021
KPP	450 €	418 €	765,37 €	102,63 €
KPL	354,00 €	379,09 €	379,09 €	354,00 €
KERLH	391,00 €	14,09 €	159,73 €	245,36 €
KF	407,00 €	354,54 €	623,68 €	137,86 €
KLŤLM	417,00 €	303,36 €	540,60 €	179,76 €
KAZMZ	309,00 €	22,60 €	341,70 €	0 €
KIOLK	388,00 €	341,51 €	473,40 €	256,11 €
KPLZI	521,00 €	511,43 €	646,79 €	385,64 €
DLF	900,00 €	507,28 €	724,11 €	673,07 €
Total	**4 137,00 €**	**2 851,90 €**	**4 654,47 €**	**2 334,43 €**

b) Research and development activities - subsidy for the operation and development of infrastructure for research and development - programme 0771201

The faculty was allocated **€26,690** for research and development activities for 2021 (similar to last year). The saving from 2020 of €17,504.11 was carried forward as a balance to the following year. An overview by department is given in the table below (Table 2).

Table 2: Implementation of appropriations for research and development activities (science and technology chapter) for individual workplaces in 2021

Department	Subsidy r.2021	Balance from 2020	Drawdown 2021	Balance 2021
KPP	2 008,00 €	670,03 €	1 812,57 €	865,46 €
KPL	1 790,00 €	1 887,05 €	1 925,89 €	1 751,16 €
KPLZI	3 475,00 €	1 749,63 €	3 010,58 €	2 214,05 €
KERLH	2 267,00 €	982,85 €	3 088,52 €	161,33 €

KF	2 908,00 €	2 669,81 €	2 669,81 €	2 908,00 €
KLŤLM	2 349,00 €	1 944,01 €	1 899,07 €	2 393,94 €
KAZMZ	2 031,00 €	662,10 €	691,50 €	2 001,60 €
KIOLK	1 861,00 €	1 142,06 €	1 905,37 €	1 097,69 €
DLF	8 001,00 €	5 796,57 €	9 460,58 €	4 336,99 €
Total	**26 690,00 €**	**17 504,11 €**	**26 463,89 €**	**17 730,22 €**

c) Structural changes

For the structural changes of the faculty, a subsidy of **€ 93 750** has been allocated to the faculty for the year 2019-2021. The balances from 2020 in the amount of € **29 367,74** were transferred to 2021. The funds were invested in the development of infrastructure within the framework of the forthcoming virtual science park TUZVO (laboratory equipment - furniture and fume cupboards). The amount of the investments is shown in Table 3.

Table 3: Allocations and uptake of structural change funding in 2021

Name	SPP element	Subsidy r.2021	Balance from 2020	Drawdown r.2021	Balance 2021
Structural changes	**77116105**	0,00 €	29 367,74 €	29 367,74 €	0,00 €

III. Funds allocated to scientific projects

a) **KEGA projects**

In 2021, the KEGA grant agency allocated current funds totalling **€34,436** for research and development tasks for the development of education in specified areas. A list by project and responsible investigator is given in Table 4.

Table 4: Allocations and spending in KEGA projects in 2021

SPP element	Principal investigator	Subsidy r.2021	Balance from 2020	Drawdown r.2021	Balance 2021
K-18-002-00	prof. Jakubis	0,00 €	2 088,95 €	2 088,95 €	0,00 €
K-19-001-00	Prof. Fabrika	7 342,00 €	0,00 €	7 206,82 €	135,18 €
K-19-002-00	prof. Šálka	4 437,00 €	5 850,22 €	5 111,24 €	5 175,98 €
K-19-003-00	doc. Stollmann	8 262,00 €	-622,44 €	7 266,72 €	372,84 €
K-21-001-00	doc. Vido	14 395,00 €	0,00 €	8 508,00 €	5 887,00 €

Total		34 436 €	7 317 €	30 182 €	11 571 €

b) VEGA projects

The grant agencyVEGA has allocatedfunds of 234,187 in **2021 for current expenses to individual project leaders for basic research**

€. The list by project and responsible researchers is given in Table 5.

Table 5: Allocations and spending in VEGA projects in 2021

SPP element	Hl. Principal Investigator	Subsidy r.2021	Balance of 2020	Drawdown r.2021	Balance 2021
V-17-001-00	prof. Gömöry	0,00 €	1 794,07 €	1 794,07 €	0,00 €
V-17-005-00	Ing. Klinga	0,00 €	38,00 €	38,00 €	0,00 €
V-17-006-00	prof. Ujházy	0,00 €	1 758,61 €	1 758,61 €	0,00 €
V-18-001-00	prof. Pichler	0,00 €	2 329,64 €	2 329,64 €	0,00 €
V-18-002-00	doc. Vido	11 411,00 €	5 411,26 €	16 822,26 €	0,00 €
V-18-003-00	doc. Chudý	9 383,00 €	6 853,42 €	13 858,87 €	2 377,55 €
V-18-004-00	prof. Saniga	0,00 €	438,12 €	438,12 €	0,00 €
V-19-001-00	prof. Škvarenina	20 978,00 €	6 706,73 €	15 152,41 €	12 532,32 €
V-19-002-00	doc. Lukáčik	4 788,00 €	3 300,25 €	8 088,25 €	0,00 €
V-19-003-00	prof. Ďurkovič	14 626,00 €	2 901,62 €	7 220,99 €	10 306,63 €
V-19-004-00	prof. Kropil	6 549,00 €	6 485,14 €	13 034,14 €	0,00 €
V-20-001-00	prof. Jaloviar	6 185,00 €	5 431,74 €	10 321,08 €	1 295,66 €
V-20-002-00	doc. Šulek	7 097,00 €	4 484,98 €	7 459,57 €	4 122,41 €
V-20-003-00	Ing. Giertliová	7 367,00 €	3 592,66 €	6 261,67 €	4 697,99 €
V-20-004-00	Ing. Šterbová	4 261,00 €	3 044,19 €	5 709,34 €	1 595,85 €
V-20-005-00	prof. Gömöry	17 780,00 €	7 934,17 €	23 742,93 €	1 971,24 €
V-20-006-00	doc. Merganič	16 644,00 €	3 201,50 €	11 144,45 €	8 701,05 €
V-20-007-00	Ing. Mokros	14 336,00 €	551,37 €	13 242,88 €	1 644,49 €
V-20-008-00	doc. Kurjak	12 013,00 €	4 635,43 €	11 716,42 €	4 932,01 €
V-21-001-00	prof. Gömöry	15 159,00 €	0,00 €	7 998,64 €	7 160,36 €
V-21-002-00	prof. Pichler	13 680,00 €	0,00 €	12 376,65 €	1 303,35 €
V-21-003-00	doc. Repáč	11 230,00 €	0,00 €	7 967,25 €	3 262,75 €
V-21-004-00	prof. Ujházy	19 548,00 €	0,00 €	9 897,62 €	9 650,38 €
V-21-005-00	doc. Lesho	13 753,00 €	0,00 €	5 884,68 €	7 868,32 €

V-21-006-00	doc. Sedmák	4 749,00 €	0,00 €	1 701,13 €	3 047,87 €
O-11-110/0003-00	prof. Ujházy	2 650,00 €	0,00 €	1 661,32 €	988,68 €
Total		**234 187 €**	**70 892,90 €**	**217 621 €**	**87 458,91 €**

c) **APVV projects**: the Agency has allocated a total of **€711 890** in current funding for APVV projects in 2021. A list by project and responsible investigator is given in Table 6. *Note: The balance column also includes salary expenses for the month of December 2021 paid in January 2022. According to the Agency's rules, these expenses are included in the budget for 2021. However, they are booked in 2022 in the accounts of the HEREFA. Therefore, these are not funds to be returned to the Agency*.

Table 6: Allocations and uptake of AAL projects in 2021

SPP element	Principal Investigator	Subsidy r.2021	of which coinvestigator	Balance of 2020	Returned in r.2020	Drawdown 2021	Balance 2021
06K1158	**prof. Gömöry**	0,00 €	0,00 €	**708,42 €**	708,42	0,00 €	**0,00 €**
06K1170	**prof. Pichler**	0,00 €	0,00 €	**0,00 €**	0,00 €	0,00 €	**0,00 €**
06K1172	**doc. Fleischer**	37 856,00 €	4 227,00 €	**51,72 €**	0,00 €	33 680,72 €	**0,00 €**
06K1177	**doc. Merganič**	64 764,00 €	0,00 €	**2 793,25 €**	0,00 €	65 738,43 €	**1 818,82 €**
06K1178	**prof. Škvarenina**	83 252,00 €	37 507,00 €	**1 422,64 €**	0,00 €	47 167,64 €	**0,00 €**
06K1180	**doc. Střelcová**	49 398,00 €	21 088,00 €	**0,00 €**	0,00 €	26 871,29 €	**1 438,71 €**
06K1181	**prof. Hajdúchová**	48 366,00 €	0,00 €	**12 429,25 €**	3 352,59 €	50 973,66 €	**6 469,00 €**
06K1185	**prof. Gömöry**	28 724,00 €	12 098,00 €	**0,00 €**	0,00 €	16 626,00 €	**0,00 €**
06K1186	**prof. Holécy**	59 991,00 €	0,00 €	**2 325,06 €**	1 465,84 €	56 782,93 €	**4 067,29 €**
06K1187	**doc. Máliš**	72 456,00 €	0,00 €	**2 557,75 €**	0,00 €	74 314,75 €	**699,00 €**
06K1188	**Ing. Bošeľa**	55 415,00 €	0,00 €	**3 219,81 €**	3 219,81 €	52 418,71 €	**2 996,29 €**
06K1189	**Prof. Fabrika**	51 846,00 €	0,00 €	**3 127,58 €**	0,00 €	51 180,73 €	**3 792,85 €**
06K1193	**Ing. Mokros**	36 389,00 €	0,00 €	**0,00 €**	0,00 €	28 187,10 €	**8 201,90 €**
06K1196	**doc. Sedmák**	14 289,00 €	5 222,00 €	**0,00 €**	0,00 €	6 880,03 €	**2 186,97 €**
06K1197	**Ing. Dobšinská**	21 009,00 €	13 485,00 €	**0,00 €**	0,00 €	7 524,00 €	**0,00 €**

O-17-110/0001-00	**doc. Střelcová**	9 281,00 €	0,00 €	**0,00 €**	0,00 €	9 281,00 €	**0,00 €**
O-17-110/0002-00	**prof. Gömöry**	15 011,00 €	0,00 €	**694,95 €**	0,00 €	15 705,95 €	**0,00 €**
O-18-110/0002-00	**prof. Šálka**	34 412,00 €	0,00 €	**112,43 €**	23,29 €	32 527,11 €	**1 974,03 €**
S-19-110/0001-00	**prof. Saniga**	18 370,00 €	0,00 €	**2 027,20 €**	2 608,94 €	17 788,26 €	**0,00 €**
S-20-110/0001-00	**prof. Škvarenina**	11 061,00 €	0,00 €	**0,00 €**	0,00 €	9 341,26 €	**1 719,74 €**
Total		**711 890,00 €**	**93 627,00 €**	**31 470,06 €**	**11 378,89 €**	**602 989,57 €**	**35 364,60 €**

d) **Top team**

The top team has been allocated **€15,065** from the endowment in 2021**,** so as shown in Table 7.

Table 7: Allocations and uptake in 2021 for the Top Team

SPP element	Name	Subsidy r.2021	Balance of 2020	Drawdown 2021	Balance 2021
I-16-110-00	Sylvibio	15 065,00 €	16,23 €	15 081,23 €	0,00 €

e) **Foreign projects**

The Faculty of Forestry received funding in 2021 under four international projects. An overview of the allocated funds and their use by individual projects and their responsible researchers is presented in Table 8.

Table 8: Allocations and uptake of funds under foreign projects in 2021

SPP element	Project	Subsidy r.2021	Balance from 2020	Drawdown r.2021	Balance 2021
Z-16-110/0001-00	Alterfor prof. Tuček	47 164,00 €	-14 979,99 €	21 379,73 €	10 804,28 €
Z-17-110/0002-00	LIFE Lynx prof. Kropil (EC)	0,00 €	87 550,04 €	79 859,58 €	7 690,46 €
Z-17-110/0002-00	LIFE Lynx prof. Kropil (MOE)	56 385,04 €	10 231,81 €	66 616,85 €	0,00 €
Z-21-110/0001-00	HoliSoils	39 195,32 €	0,00 €	14732.25	24 463,07 €
Total		**142 744,36 €**	**82 801,86 €**	**167 856,16 €**	**42 957,81 €**

f) **European funds**

The Faculty of Forestry had funds from two projects financed by European funds. An overview is given in Table 9.

Table 9: Allocations and uptake of European funds in 2021

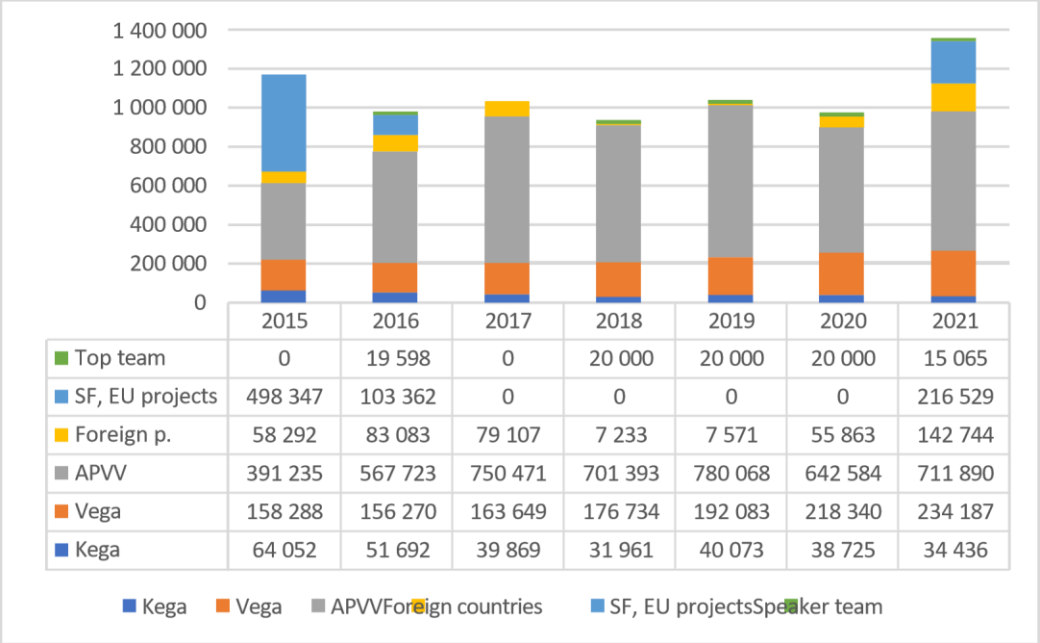
SPP element	Project	Subsidy r.2021	Balance from 2020	Drawdown r.2021	Balance 2021
E-20-110/0001-00	FOMON	140 397,17 €	0,00 €	140 134,42 €	262,75 €

E-20-190/0002-00	FORRES	76 131,62 €	1 479 407,19 €	274 338,80 €	1 281 200,01 €
Total		**216 528,79 €**	**1 479 407,19 €**	**414 473,22 €**	**1 281 462,76 €**

g) **Overview of projects for the previous period**

Figure 2 shows the overall overview and evolution of funding received for research projects by individual grant agencies since 2015.

Fig. 2: Evolution of funding for research projects 2015-2021



	2015	2016	2017	2018	2019	2020	2021
Top team	0	19 598	0	20 000	20 000	20 000	15 065
SF, EU projects	498 347	103 362	0	0	0	0	216 529
Foreign p.	58 292	83 083	79 107	7 233	7 571	55 863	142 744
APVV	391 235	567 723	750 471	701 393	780 068	642 584	711 890
Vega	158 288	156 270	163 649	176 734	192 083	218 340	234 187
Kega	64 052	51 692	39 869	31 961	40 073	38 725	34 436

IV. LF Reproduction Fund

Table 10 shows the status of the faculty reproduction fund for 2021.

Table 10: Status of the faculty reproduction fund in 2021

SPP element	Balance from previous years	Retrieved from in 2021	Drawdown 2021	Balance 2021
O-07-110/0027-00	154 116,48 €	37 504,80 €	69 171,00 €	122 450,28 €

The Reproduction Fund purchased a comprehensive measurement and collection system in 2021 data, a portable laser gas analyser, an ultrasound tomograph and a multifunctional device.

Table 11 shows the 2021 depreciation prescription and the 2021 depreciation allowance by faculty department.

Table 11: Faculty depreciation provision and depreciation allowances in 2021 by individual Departments

Workplace	Depreciation 2021	Rebilling for depreciation 2021	The Difference
KPP	6 392 €	1 110 €	5 283 €
KPL	3 631 €	2 339 €	1 292 €
KAZMZ	1 082 €	0 €	1 082 €
KIOLK	8 509 €	4 963 €	3 546 €
KPLZI	12 596 €	19 491 €	-6 895 €
KERLH	18 €	0 €	18 €
KF	6 431 €	4 143 €	2 289 €
KLŤLM	6 610 €	5 460 €	1 150 €
DLF	0 €	0 €	0 €
Total	**45 269 €**	**37 505 €**	**7 764 €**

Departmental depreciation was covered by 83% of **project funds.**

Figure 3 below shows the evolution of the total depreciation provisions for each department as well as the departments' contributions to depreciation since 2015.

Fig. 3: Depreciation recovery 2015-2021

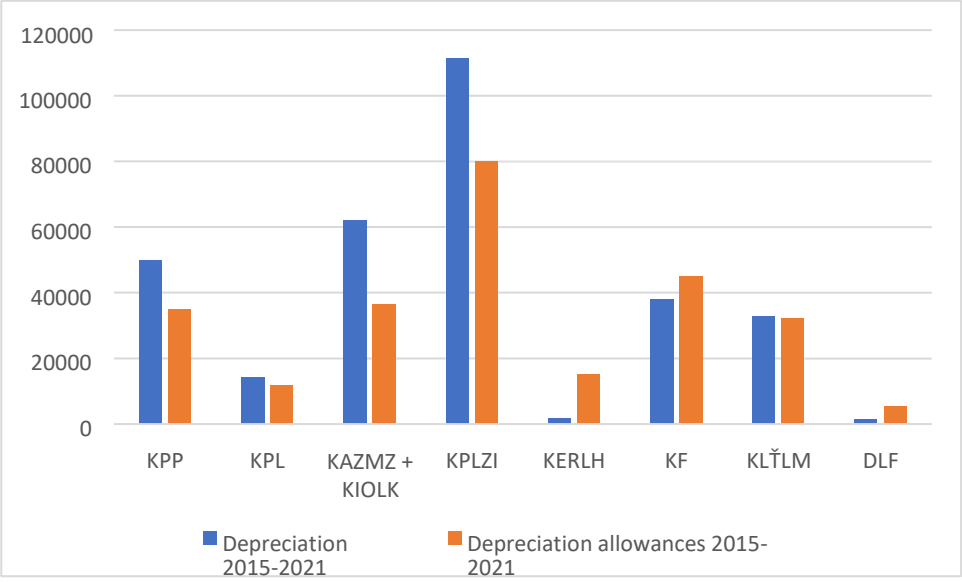
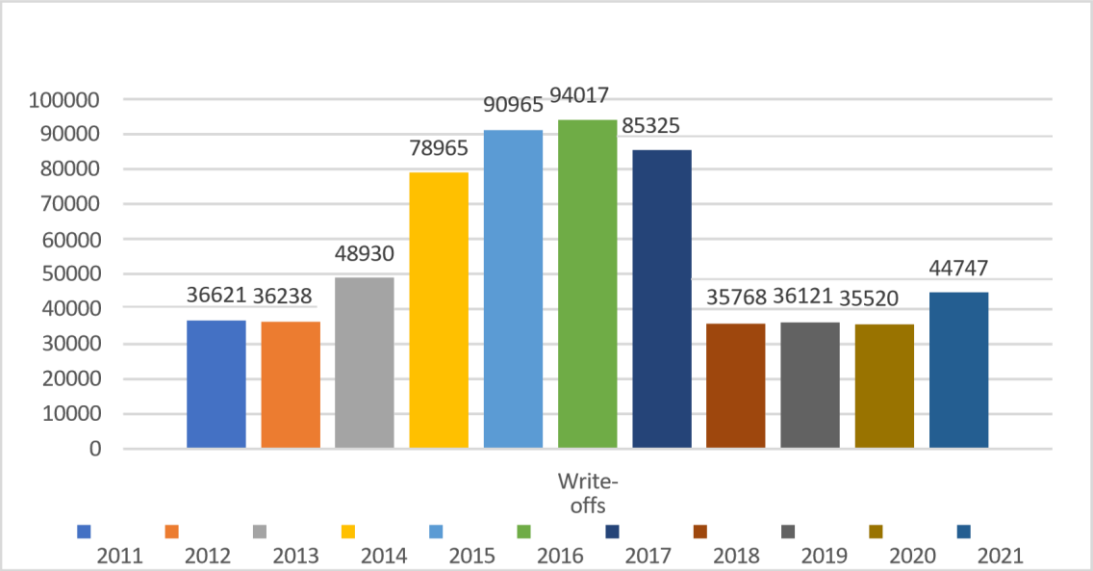


Figure 4 then shows the development of the depreciation rate of the Faculty of Forestry between 2011 and 2021. Fig. 4: Development of the depreciation rate of the Faculty of Forestry between 2011 and 2021



Wage appropriations

The faculty's salary allocation in 2021 was **€1,748,565** for salaries and €615,495 for deductions, a decrease of €213,136 in salaries compared to 2020. The actual use of salary appropriations in 2021 was €1 780 110 (€2 260 409 less than in 2020), including personal allowances and bonuses. During the year, the wage bill was replenished with the balance from the previous year, funds from the current account and refunds from business activities. Personal allowances and bonuses for 2021 were paid in the total amount of **€ 312 069** (€ 171 370 less than in 2020) on the basis of the 'Criteria for granting personal allowances to teaching and research staff of the Faculty of Forestry' discussed by the LF AS. The amount of personal allowances was higher by €19 592 than in the previous year. There was a significant decrease in remuneration.

Figure 5 shows the evolution of staff salaries since 2015, divided into the eligible component (tariff salaries and functional allowances) and the incentive component (personal allowances and special bonuses). Figure 6 then shows the evolution of salaries calculated on average per employee.

Fig. 5: Evolution of salaries (eligible and incentive salary components) of the Faculty of Forestry in 2015-2021

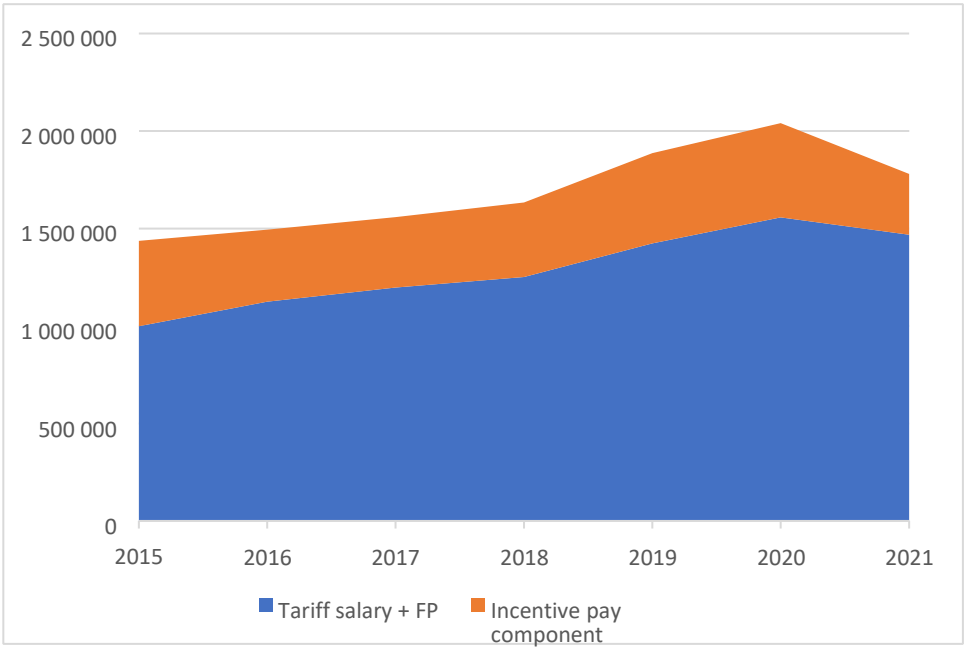


Fig. 6: Evolution of salaries (eligible and incentive pay) of LF on average per per employee in 2015-2021

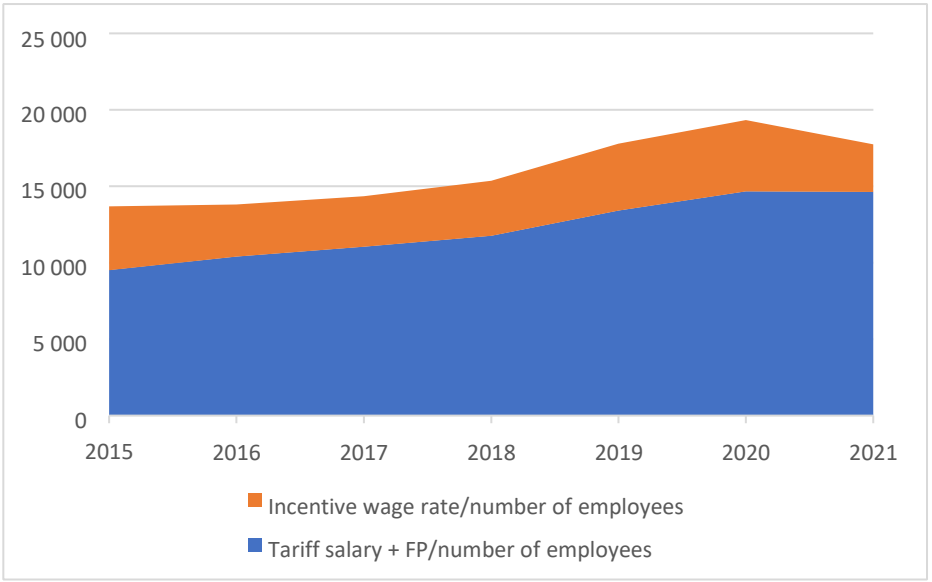


Table 12 shows the total use of LF salary resources in 2021 based on the report received from the HR department of the TUZVO.

Table 12: Use of LF salary funds in 2021

Workplace	2021 budget (excluding levies)	the levy budget for 2021	Retrieved from 1-12/2021	compensation for sickness absence	Para.
	1	2	3	4	5
L F	1 748 565	615 495	1 851 750	3 268	4 626

off.	annive rsaries	Legal	MP reimbursed from other sources	Salary procedures	drawing on the departme nt's budget	drawing levies from the departme nt's budget
6	7	8	9	10	11	12
15 595			91 988	3 141	1 780 110	642 530

Retrieved from 1-12/2021	+ savings/ - MP overrun 2021	+ savings/ - MP overrun for 2020	Balance 2021 (with levies)
13	14	15	16
2 442 641	-58 581	63 051	4 470

V. Business activity

a) **Overview of the Faculty's business activities in 2021**

Table 13 shows the revenues and expenses in 2021 from faculty business activities by department.

Table 13: Revenues and costs in 2021 from the Faculty's business activities

Workplace	SPP element	Revenue 2021	Cost 2021	Retrieved from
KF	**P-110-0002/16**	13 038,84 €	12 911,04 €	**127,80 €**
KERLH	**P-110-0001/20**	0,00 €	18 115,02 €	**-18 115,02 €**
KIOLK	**P-110-0002/20**	1 857,18 €	1 840,99 €	**16,19 €**
KPLZI	**P-110-0001/21**	2 500,00 €	2 028,37 €	**471,63 €**
KPLZI	**P-110-0002/21**	46 466,67 €	44 535,38 €	**1 931,29 €**
KERLH	**P-110-0003/21**	4 968,00 €	4 928,75 €	**39,25 €**
Total		**68 830,69 €**	**84 359,55 €**	**-15 528,86 €**

b) **Overview of profitable accounts of departments and faculty**

Table 14 shows the drawdown from the profit and loss accounts in 2021 by individual departments and for the faculty.

Table 14: Disbursement of funds from the profit accounts in 2021

Department	SPP element	Balance before. years	Obtained in 2021	Pumping in 2021	Balance 2021
KPP	R-07-110/0001-00	391,18 €	0,00 €	0,00 €	391,18 €
KPL	R-07-110/0002-00	70,96 €	0,00 €	0,00 €	70,96 €
KAZMZ	R-07-110/0003-00	51 532,20 €	0,00 €	0,00 €	51 532,20 €
KHULG	R-07-110/0006-00	825,50 €	0,00 €	0,00 €	825,50 €
KERLH	R-07-110/0007-00	780,21 €	11 064,57 €	8 057,21 €	3 787,57 €
KLŤLM	R-13-110/0001-00	1 902,92 €	0,00 €	0,00 €	1 902,92 €
KF	R-09-110/0001-00	15 040,54 €	70,15 €	33,10 €	15 077,59 €
LF	R-07-110/0008-00	15 302,56 €	15 233,16 €	10 637,10 €	19 898,62 €
KPLZI	R-21-110/0001-00	0,00 €	875,67 €	811,58 €	64,09 €

Total	**70 905,53 €**	**27 243,55 €**	**18 727,41 €**	**93 486,54 €**

VI. Faculty management result year 2021 - non-subsidy activity

The economic result generated by the LF for the year 2021 is **€ 15 563,63** (by 29 842 € less than in the previous year, but this is due to a correction in the 2020 accounting). The economic result from non-grant activities is **€ 31 092,49** (€ 5 703 more than in the previous year). The higher use of the funds received was not possible due to the fact that, in accordance with the methodology

distribution of the subsidy and budgeting of TU Zvolen for 2021, it is necessary to generate a positive economic result in the amount of at least 20% of the income from the main nonsubsidy activity (i.e. at least 20 807 €). 40% of the economic result will be used to create a reserve fund. The remaining percentages are the profit of the departments and faculty.

Table 15 shows the economic result of the Faculty in 2021. The table was prepared by the Economics Department.

Table 15: Faculty economic result in 2021 in €

Organisational components	Main activity - non-subsidy				EU projects			VH main activity not subsidised Together
	Revenue (V)	Cost (N)	Income tax	VH=V-N	Revenue (V)	Cost (N)	VH=V-N	
LF	131 315,17	110 222,63		31 092,54		0,05	-0,05	31 092,49

Business activity					Total VH	Revenue-HC Faculty	VH within the meaning of Method. of creating a schedule.
Revenue (V)	Cost (N)	VH=V-N Before by taxation	Income tax	VH after Taxation			
68 830,69	88 487,48	-19 656,79	-4 127,93	-15 528,86	**15 563,63**	104 035,25	20 807,05

Table 16 provides a detailed breakdown of the faculty's non-subsidy income in 2021. Compared to 2020, there is a decrease of €3,142 in overtime tuition fee income and also a decrease of €6,123 in external tuition fee income.

Table 16: Revenues from non-endowment activities of the faculty year 2021

Item name	Sum
Sales scripts	8 569 €
Tuition fees for overstayed DS	22 058 €
Fees for the admission procedure	10 050 €
Fee for issuing documents	495 €
Tuition fees for external study	71 927 €
Other income (sale of car, prescription of damages, court costs and interest)	9 986 €

Proceeds from the use of the SFs	8 230 €
Total	**131 315 €**

The overall evolution of the level of revenues from non-subsidy activities since 2011 is shown in the following figure (Figure 7) and the costs from non-subsidy activities in 2020 are shown in Table 17 below.

Fig. 7: Evolution of the amount of revenue from non-subsidy activities from tuition fees and extra length of study since
2011 to 2020

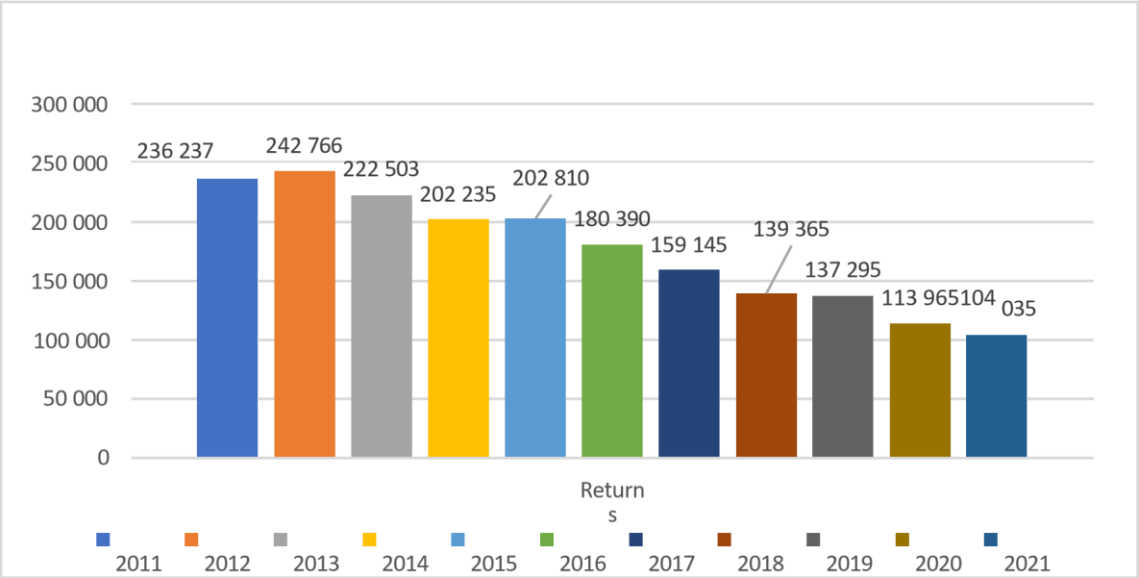


Table 17: Costs from non-subsidy activities year 2021

Item name	Sum
Formation of FR	7 289 €
Furniture and equipment for classrooms and laboratories	6 609 €
Material	1 292 €
Disposal of assets	1 053 €
Advertisement	1 740 €
Telephones, postage	2 614 €
Royalties	1 161 €
VTU Press	1 753 €
Rewards	39 910 €
DOVP	7 032 €
Deductions	15 273 €
Other services	1 629 €
Scholarships - payment	8 230 €
LF depreciation	44 747 €
Departmental contributions to depreciation	-37 505 €

Creation of SF from tuition fees	4 684 €
Total	**107 511 €**

**from tuition fees paid for external studies and for exceeding the standard length of studies*
10 % of the funding for creative staff incentives is diverted
*** 7 % of the revenue from external tuition fees has been used to generate resources for computerisation*
****from income paid from tuition fees for exceeding the standard length of studies (§ 92 (18) of the Higher Education Act)*
20% was used to create a scholarship fund

VII. Implementation of the measures adopted for 2021

a) Individual departments are covering depreciation and replenishing the reproduction fund, with a rate of 83% in 2021. This trend is positive and allows faculty to invest in fixed assets.

b) The performance in scientific activities is still above standard, which is able to cover the reduced income of money to the faculty budget under the influence of the decreasing number of students.

c) Despite a significant decrease in funding to the faculty budget, the incentive component of the salary was maintained. Personal allowances were € 19,600 higher in 2021 than in 2020. Unfortunately, due to the level of funding, exceptional bonuses were not paid in the summer months. However, these were replaced by rewards from the level of the Technical University covered by salary reimbursements from European funds. Before Christmas, special bonuses were paid to staff in a lump sum, according to job classification, and for the month of December, special incentive bonuses were paid to the top 10% of faculty staff.

d) Investment in scientific infrastructure continued in 2021 under the "TUZVO Virtual Science Park". Two more laboratories were completed within the framework of construction works and furnishing.

e) In 2021, there was a planned optimization of the faculty's staff composition. The number of faculty staff decreased and four employees were hired, which is reflected in the graph in Figure 5, but the average salary per employee was maintained (Figure 6)

VIII. Draft measures for 2022

a) Continue to create optimal conditions for maintaining or growing performance in science and research through the following measures:

- maintain the incentive component of the salary (given the decline in funding to higher education at least
  in the area of personal allowances),
- invest in the technical infrastructure of established laboratories to improve the competitiveness and performance of science and research,
- Continue to optimise teaching and reduce teaching load. These measures should also be prepared in the framework of the new process of accreditation of fields of study and their study programmes,

- Seek ways to reduce the risk of burnout among over-exposed creative workers, - creating pressure to optimise processes to reduce bureaucracy.

b) Considering the applicability of scientific research knowledge and its transfer into practice, it will be necessary to emphasize also innovations in the form of new technologies, software and methodological procedures, as well as direct cooperation with the practice environment in order to create the preconditions for future funding of science and research also from the public and private business environment.

c) High efforts will continue to be needed to attract projects from domestic and especially foreign grant agencies.

d) In making investments based on the use of the resources generated in the reproduction fund, consideration will be given not only to the performance of the applicant department, but also to the department's past performance in meeting its obligations in replenishing the reproduction fund to ensure value for money.